Formal Report 336/08

Trading Arrangements and Risk Management in International Electricity Trade

October 2008

Energy Sector Management Assistance Program

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Energy Sector Management Assistance Program (ESMAP)

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Trading Arrangements and Risk Management in International Electricity Trade

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Foreword

This study investigated the potential for internal and external energy trade, with a focus on electricity, for the Economic Cooperation Organization (ECO) countries and the risk mitigation options available to enhance trade for the region. The ECO comprises 10 member states in Central, Western and Southern Asia. Together, these countries cover a vast region that is home to both rapidly growing energy demand centers and to a diverse mix of energy endowments. However, while these characteristics are complementary at the regional level, several individual countries in the region have either potential energy shortages or surpluses. This presents significant opportunities for mutual economic benefit through international energy trade within the region, as well as externally with partners in neighboring countries.

One such potential trade arrangement which has received particular attention within ECO and among international donor organizations recently is the so-called CASA project. This would see transmission of electricity generated in the large hydro systems of the relatively low-demand Central Asian states to the fast growing economies of South Asia which face a near-to-medium term need to expand their access to energy supplies. The concept would involve a high-voltage transmission line built to transit electricity through Afghanistan. While the economic benefits to all parties are clear if there were an absence of risk, this and similar projects present a number of financial, commercial, technical and political risks which will need to be reduced before the projects become viable.

This report considers the types of trading arrangements typically seen in international electricity along with the financing options, governance frameworks and risk mitigation measures. Four international energy trade case studies are presented to draw insights from experience into the types of risks and mitigation strategies used elsewhere in the world. The potential of the CASA project is then assessed and a roadmap is presented for the development of electricity trade within ECO.

Abbreviations and Acronyms

AAA	American Arbitration Association
ADB	Asian Development Bank
AES	American International Electricity Utility
AfD	Agence Française de Développement
bbl	barrel of oil
bcm	billion cubic metres (of gas)
BOO	build own operate
BOOT	build own operate transfer
BOT	build operate transfer
BOTAS	Boru Hatlan Ile Petrol Tasima A.S. (Turkish oil and gas pipeline operator)
bps	basis points (a unit that is equal to 1/100th of 1%)
BTC	Baku-Tbilisi-Ceyhan oil pipeline
BTE	Baku-Tbilisi-Erzurum gas pipeline (see SCP)
CA	Central Asia
CAPS	Central Asian Power System
CASA	Central Asia South Asia
CCGT	combined cycle gas turbine
CEPA	Cambridge Economic Policy Associates
CIS	Confederation of Independent States
CP	contracting party to the ECT
CRIE	La Comisión Regional de Interconexión Eléctrica
CVT	variable transmission charge
DABM	Da Afghanistan Breshna Moassesa (Afghan state-owned electric utility)
DC	direct current
DFI	development finance institutions
DRC	Democratic Republic of the Congo
EBRD	European Bank for Reconstruction and Development
ECA	Economic Consulting Associates
ECA	export credit agreement or agency
ECO	Economic Cooperation Organization
ECOTA	ECO trade agreement
ECSEE	Energy Community in South East Europe (abbreviated to EC = Energy Community)
ECT	Energy Charter Treaty
EdF(I)	Electricité de France (International)

EdL	Electricité du Laos
EGAT	Electricity Generating Authority of Thailand
EGCO	Thai Electricity Company
EGPC	Electricity Generation Public Company (Laos)
EIA	Energy Information Agency
EOR	Ente Operador Regional (Regional Transmission Operator for SIEPAC)
EPC	Engineering, Procurement and Construction Contract
EPR	la Empresa Propietaria de la Red (SIEPAC transmission line company)
Eskom	South African Power Utility
ESMAP	Energy Sector Management Assistance Program
EU	European Union
FERC	Federal Electricity Regulatory Commission (USA)
FSA	fuel supply agreement
FSU	Former Soviet Union
GMS	Greater Mekong Subregion
GoL	Government of Laos
GSPA	gas sales and purchase agreement
GWh	gigawatt hour
HCB	Hidroeléctrica de Cahora Bassa (Mozambique)
HGA	Host Government Agreement
HVDC	high-voltage DC line
IADB	Inter-American Development Bank
ICC	International Chamber of Commerce
ICSID	International Centre for the Settlement of Investment Disputes
IFC	International Finance Corporation
IFI	International Financial Institution
IGA	Intergovernment Agreement
IPP	independent power producer
ISA	Interconexión Eléctrica S. A. of Colombia
IsDB	Islamic Development Bank
ISMO	independent system and market operator
ISO	independent system operator
ITD	Italian-Thai Development Public Company Ltd
IWRM	integrated water resource management
LHSE	Laos Holding State Enterprise
mcm	thousand standard cubic meters
MER	Mercado Eléctrico Regional (Regional Electricity Market among SIEPAC countries)
MIGA	Multilateral Investment Guarantee Agency
MO	market operator
MOTRACO	South Africa-Swaziland-Mozambique Transmission Company
MOU	memorandum of understanding
MOZAL	Mozambique Alumina Smelting Company
MW	megawatt
NAFTA	North American Free Trade Agreement

NAFTA	North American Free Trade Agreement
NEA	Nepal Electricity Authority
NGO	non-governmental organization
NT2	Nam Theun 2
NTDC	National Transmission & Dispatch Company (Pakistan)
NTPC	Nam Theun 2 Power Company
O&M	operation and maintenance contract
Offtaker	buyer or consumer who takes electricity supply off the transmission grid
OPIC	overseas private investment corporation
OTC	over the counter
PJM	Regional Transmission Organization (USA)
PPA	power purchase agreement
PPI	private participation in infrastructure
PPP	public-private partnership
PRG	partial risk guarantees
PRI	political risk insurance
PROPARCO	French Private Investment Agency
PSA	production sharing agreement (for oil and gas)
PSP	private sector participation
PX	power exchange
RAO UESR	Russian Joint Stock Power Holding Company, Unified Energy System of Russia
REEPS	Central Asia Regional Electricity Export Potential Study
RMB	regional market broker
RMC	regional market coordinator
RTO	regional transmission operator
RTR	Regional Transmission Grid of Central American States
SADC	Southern African Development Community
SAPP	Southern Africa Power Pool
SCADA	supervisory control and data acquisition
SCP	South Caucasus Pipeline
SIEPAC	Sistema de Interconexión Eléctrica para los Países de América Central
SO	systems operator
SOCAR	Azerbaijan State-Owned Oil and Gas Company
SOE	state-owned enterprise
STEM	Short-Term Electricity Market (part of SAPP)
supplier	generator or trader (seller) who exports electricity onto the transmission grid for sale to customers
TA	transmission agreement
TAP	Turkmenistan–Afghanistan–Pakistan gas pipeline project
Tcf	trillion cubic feet
TO	transmission operator
TOP	take-or-pay
TOR	terms of reference
TPAO	Turkish Petroleum Overseas Company
TSO	transmission system operator
TTCC	Transit Transport Coordination Council (ECO)

TTO	transit transmission operator
TWh	terawatt hour
UCTE	Union for the Co-ordination of Transmission of Electricity
UDC	United Dispatch Centre (Tashkent, Uzbekistan)
UESR	United Energy System of Russia
UNCITRAL	United Nations Commission on International Trade Law
UPS	Unified Power System of CIS
USc	cent of a U.S. dollar
UXO	unexploded ordinances
WAGP	West Africa Gas Pipeline
WAPP	West Africa Power Pool
WB	World Bank
WCD	World Commission on Dams
WMPA	Watershed Management & Protection Authority (Laos)
WTO	World Trade Organization

Currencies and Exchange Rates

Note: Most of the monetary values quoted in the report are in US$. Of these, many of those relating to ECO countries (such as those in Chapter 2) were taken from the Central Asia Regional Electricity Exports Potential Study (REEPS) report. Please refer to the rates used in the REEPS, December 2004: http://siteresources.worldbank.org/INTUZBEKISTAN/Resources/REEPS_Main_Report_Final_English.pdf.

Acknowledgments

This activity was task managed by Mr. Vladislav Vucetic thanks to the financial and technical support of the Energy Sector Management Assistance Program (ESMAP). Mr. Vucetic also provided helpful and insightful guidance and comments to Economic Consulting Associates (ECA) led by Ray Tomkins. The team completed its work in 2006, while the consulting firm made their final report available to the South Asia (SAR) Region in 2007 after undergoing a series of internal and external reviews. The report made it into production in 2008, under the publishing guide of ESMAP. Although the authors note that the proposed CASA Electricity Trade project featured in Chapter 8 has progressed significantly since the time the report was written and the project description may therefore be outdated, it is the intention of the authors that you find this report interesting and insightful.

In addition to overall team leadership, Mr. Tomkins led the strategic analysis, CASA project assessment and the trade development roadmap. Shane Avers led the case study research and development of the trade arrangements' typology framework and coordinated the compilation of the report. Catriona Cameron advised on the legal issues related to governance and dispute resolution. Peter Robinson provided valuable input to the Southern Africa case study and to the project assessment and roadmap. Charles Groom of Cambridge Energy Policy Associates (CEPA) contributed to the chapters on financial risk management and financing options. Peter Meier provided expert guidance on the typology framework as well as valuable comments on the draft. Marjorie Araya from ESMAP deserves special thanks for coordinating the editing, publication and dissemination process.

Executive Summary

Economic Consulting Associates (ECA) and Cambridge Economic Policy Associates (CEPA) have been engaged by ESMAP and the World Bank to prepare a policy paper for enhanced regional electricity trade involving the Economic Cooperation Organization (ECO) countries.

The study has reviewed the opportunities for increased electricity trade within the ECO region and exports outside the region, considered the types of trade that would be most likely to develop in the short and evolve over the medium and longer term, and made an assessment of the risks and obstacles to further trade development. Drawing on international experience of national and regional trading arrangements, as well as four case studies of regional trade, the study has reviewed the financing options including risk mitigation products, considered the requirements for good governance of international trade including dispute resolution procedures, and made an initial assessment of the proposed Central Asia South Asia electricity trade project (CASA). Drawing on all aspects of the research, the final Chapter of the report presents a roadmap for development of electricity trade in ECO.

Trade Opportunities and Benefits

The 10 countries that together form the ECO include significant energy endowments and some fast growing demand centers with complementarities among energy usage patterns. Cooperation on energy trade both within the ECO region and with its neighbors could lead to high value economic gains and provide impetus to further regional integration.

The region has internationally significant natural gas reserves around the Caspian Sea and in Iran (in addition to oil), large coal deposits in Kazakhstan and smaller reserves elsewhere, and considerable potential hydroelectric resources in the mountainous countries of Central Asia. The Central Asian countries also benefit from the presence of a number of partially completed generation projects, which favorably affect the economics of long-distance trade from them.

On the demand side, Pakistan is seeing annual electricity demand growth of as much as 7 and 8 percent and is now suffering supply shortages. Iran is also a large high growth country, currently averaging around 7 percent per annum, and although it has abundant fuel resources that could supply new domestic generation, it faces investment constraints and imports currently into the isolated eastern part of the country. Turkey also has fast-growing electricity demand and is facing potential supply shortages. Outside the region, India has similar demand growth to Pakistan and current shortages and represents a very large potential export market. Also outside the region, western China, Russia, and Europe are all potential destinations for energy from the ECO region.

A number of energy trade opportunities are being considered across the region, in electricity as well as hydrocarbons. Among these are projects to transit natural gas and electricity from the resource-rich countries of

Central Asia to the fast-growing and energy-hungry economies of South Asia. In October 2006, a memorandum of understanding was signed among four governments interested in Central-South Asia electricity trade (the CASA electricity project), with support from IFIs, including the World Bank, and potential project developers.

Opportunities for trade within the region include many small-scale bilateral trades utilizing existing infrastructure or relatively modest transmission reinforcements. Strengthening the interconnected grid has significant benefits (risk sharing, reduced reserve requirements, short-term trade opportunities and larger markets for private investors), but the main focus of this study is on the major projects which can be developed to export to the large, rapidly growing electricity markets in Turkey, Iran, and Pakistan. In this regard there are broadly two clusters of countries, each composed of predominantly exporting, transit or importing countries, with a further categorization among exporting countries by fuel type:

- ***East cluster*** consists of the following countries:
  - Pakistan (importing country with large, rapidly growing market)
  - Afghanistan (importing and transit country—existing interconnections with Iran, Turkmenistan, Uzbekistan, Tajikistan, the last two being strengthened, plus new 500 kV lines envisaged in CASA project)
  - Kazakhstan and Uzbekistan (exporting countries—fossil-fuel-based generation)
  - Kyrgyz Republic and Tajikistan (exporting countries—hydropower based generation).
- ***West cluster*** consists of the following countries:
  - Iran and Turkey (importing countries)
  - Turkmenistan (existing transit country)
  - Afghanistan (potential major transit country when 500 kV Herat line has been built)
  - Azerbaijan and Turkmenistan (exporting countries—fossil fuel based generation)

Recent gas price increases have a bearing on the relative economics of projects that may be carried out within many of the potential export markets. Both hydropower and coal generation have become relatively more attractive with the recent oil and gas price increases. A continuation of high gas prices will tend to enhance the attractiveness of the CASA project for exports to Pakistan.

In addition to the CASA project, a number of hydro- and thermal-based projects could be financeable if the appropriate risk management and institutional support measures are taken. These include further hydro generation in Tajikistan, coal-fired plant in Kazakhstan, and the completion of the Talimadan gas-fired plant in Uzbekistan. In addition, a gas-fired plant could be built at Bishkek in the Kyrgyz Republic.

Risks in Cross-Border Electricity Trade

In the absence of a comprehensive framework of institutional arrangements, regulation and legal systems, there are high risks in cross-border trades, especially those involving third-party transit countries. These can both raise the cost of financing and delay development, thus reducing the potential benefits of trade. Risks in electricity trade projects fall into three main areas: political and regulatory risks (country risks); commercial risks; and financing risks. These risk areas are interrelated, in particular by the state of the institutional, legal and regulatory frameworks for carrying out projects, as well as the legal system for enforcement of contracts.

The availability of external finance and the cost of financing projects depends on the assessment of risks, in particular the country risk ratings. The study has noted high levels of country risk in many of the ECO countries and this, combined with relatively high commercial risks in cross-border trade projects, reduces the financing options for bilateral trade projects. Private-sector participation in financing will be unlikely for projects involving both high country risks and high commercial risks.

The risks increase considerably when projects span more than one country and involve more than one major investment component, such as a power plant and cross-border transmission lines. Mechanisms to improve international coordination and cooperation are necessary to help manage these risks. Risk mitigation can be designed into the project itself, through careful planning and project structure, supported by strengthening the legal, governance, and institutional capacities in the trading countries, or provided by third-party risk insurers such as the World Bank Group.

Once projects come to be implemented, the benefits arising from them will help to bolster specific risk mitigation instruments. Equitable sharing of the benefits will build constituencies in each country with a stake in cooperation in the electricity sector, and this will progressively provide an underlying environment promoting risk mitigation.

Financing Options in Risky Environments

International and commercial financing institutions provide a range of funding and risk-mitigation products. Their applicability to trade projects in ECO depends on the risk profile of the country(s) and the specific project. Commercially structured projects can, in principle, be funded with a blend of equity and debt. State utilities may finance new projects through taking on additional loans. Conversely, the private equity investor would typically look to engage in the development of a transmission and/or generation and transmission project by providing equity alongside a highly geared structure to maximise potential returns. This inherently more risky structure is not tenable within a high risk environment except at very high cost. This limits the participation of the private sector as equity investors, but does not preclude other forms of private participation in electricity trade projects.

The higher the degree of political risk, the harder it will be to achieve any significant private equity stake, at least without significant guarantees as well as standard political risk insurance, which may not be available for all the countries.

More complex arrangements are likely to be required for multicountry electricity trade, possibly involving ring-fencing of individual country components to separate the lower risk from the higher risk components.

Governance of Trade Arrangements and Institutional Frameworks

International projects have additional risks and complexity to domestic projects and therefore require a further set of rules on top of the national rules. A key concern of participants, and a test of the robustness of the governance framework, is the extent to which disputes are likely to be efficiently resolved through the structure of agreements.

Two principal sets of rules will govern a cross-border electricity transaction or investment: intergovernmental agreements (IGAs) and private commercial contracts. The effectiveness of the contractual framework in reducing or mitigating risks will be influenced by a number of factors, including the legal jurisdiction, the dispute resolution procedures, the enforceability of judgments (in different countries) and the creditworthiness of the parties (perhaps enhanced by guarantees).

In projects involving PSP, the private parties will tend to prefer international arbitration to resolve disputes, as it gives them greater predictability in the outcome, which can reduce the project's risk profile and hence lower the financing costs. A significant element of multilateral investment treaties such as the *Energy Charter Treaty* is that these treaties contain express consents by each state to the submission of disputes to international arbitration.

The establishment of supportive institutional governance mechanisms and a transparent contractual framework consistent with international best practice can go a long way toward managing the wide range of risks in multicountry trade projects.

Evolution of Trading Arrangements in the ECO Region

Trading arrangements in electricity markets tend to evolve from simple bilateral trades to more complex forms of multi-party and multicountry trading. The study has defined four main steps in the evolution of trading arrangements: bilateral trade between neighboring countries; bilateral trade involving a third transit country; trade among synchronized national power systems; and multilateral trade within a regional pool mechanism. A further important distinction in terms of the risk profile of a project is whether it will mainly use existing facilities or require new investment in generation and/or transmission.

In the ECO region, trading arrangements in the short to medium term are likely to take the form of simpler bilateral exchanges and long-term PPAs. Multiparty trading (a regional pool) is likely to evolve from the initial establishment of national competitive electricity markets to a regional market and additionally requires detailed rules for competitive cross-border trading and access to networks. The full evolution would typically take many years and is not an immediate prospect for the ECO region.

Lessons from International Experience of Regional Energy Trade

Four examples of regional energy trade were assessed to draw relevant lessons for ECO. They were chosen to reflect similar challenges to those in the ECO region, in particular the challenge of developing investment in new infrastructure:

1. The Nam Theun 2 hydropower, interconnection, and trade project between Laos and Thailand.
2. The SIEPAC electricity transmission, regional market and trade project among six countries of Central America.
3. The Southern Africa Power Pool (SAPP) to promote electricity trade among 12 countries in southern Africa.
4. South Caucasus Pipeline constructed to transport natural gas from Azerbaijan to Turkey via Georgia.

Each case presents a different but overlapping set of lessons for ECO and illustrate that it is possible to bring to market a large, complex international energy project including new-build generation and transmission. At least two of the cases show that post-conflict environments are not necessarily a barrier to trade. Among the most relevant lessons are:

- Strong political commitment is necessary to advance large projects, and this is assisted by a favorable history of intergovernmental cooperation. It can be enhanced by creating powerful institutions at the regional level.
- The creation of a respected coordinating entity can serve to strengthen technical cooperation, act as a driver for integration, and provide a neutral forum for resolving disputes.
- The projects typically take at least a decade passing from the initial founding agreements to implementation and operation.
- The support provided by the external stakeholders such as the IFIs (e.g., World Bank and Asian Development Bank) is crucial to maintaining the momentum of project development and the resolution of critical issues.
- The foundation of project implementation rests on legally enforceable agreements between governments. This may be by multicountry treaty or by bilateral intergovernmental agreements, or multilateral government agreements.
- The creditworthiness of the main buyer is a prime consideration to reduce the payment risk to the project and facilitate financing of construction.
- The reduction of political risk through the involvement of international development institutions and their provision of risk

guarantees is an important element in the financing package; a sovereign guarantee from a participating government is also usually a necessary risk reduction measure.
- Private sector participation can be an important component of the project, both for funding and operational expertise. This also improves the confidence of commercial lenders to the project.

The SAPP project, which has evolved rather slowly, also provides some negative lessons of aspects to avoid in ECO.

The CASA Project

One component of this study is concerned with a more in-depth assessment of the CASA project. The project has considerable potential benefits but faces many challenges to become viable—from economic, political, and security perspectives. These lessons, both positive and negative, may be drawn on to improve the design and development of the CASA project.

If Tajikistan and Pakistan shared a direct border, there would still be significant risks in an electricity trade project. The involvement of Afghanistan as an unavoidable transit country adds a further level of major risks. Afghanistan would require extensive external support to establish the minimum necessary institutional development and security improvement to facilitate an investment project in electricity transit.

Once the security situation in Afghanistan improves, many of the other project risks would be similar to those faced by regional trade projects elsewhere. The success of those projects shows that these risks can be overcome. Financial risk mitigation instruments will almost certainly be required for the financing. In addition, risk management efforts should focus on institutional development with involvement of external stakeholders, and ensuring inclusiveness and sharing of benefits within a long-term development strategy to secure local population support.

Roadmap for Development of Electricity Trade in ECO

The conclusions of the study have been summarized in a set of suggested steps that could be taken by the ECO countries and by external stakeholders such as the IFIs. These steps, and the associated timeframe for short- to medium-term implementation, constitute a simplified roadmap for trade development and its supporting institutional framework. The immediate prospects within ECO are for the strengthening of intraregional trade within the CAR and of increased seasonal and base exports from both the west and east cluster exporters to Iran and Turkey. Kazakhstan will be well placed to export to Russia and China once the North-South interconnector has been completed.

Large-scale export projects from the west cluster countries to Iran and Turkey and from the east cluster to Pakistan will require the construction of new 500 kV transmission lines through Afghanistan. Such projects are longer term, both because of the long lead times involved and the current security situation in Afghanistan.

The evolution of electricity trade will be facilitated by the ECO countries, with the support of the IFIs and bilateral donors, working on strengthening the enabling environment for trade. The main areas on which the ECO countries can start work now are as follows:

- The investment climate—macroeconomic conditions, legal framework, property rights, etc.
- Putting the electricity sector in each country onto a commercial basis, so as to offer creditworthy partners for trade projects.
- Strengthening regional institutions, including creating new entities in the electricity sector to foster technical and regulatory cooperation.

1 Introduction

Economic Consulting Associates (ECA) and Cambridge Economic Policy Associates (CEPA) have been engaged by ESMAP and the World Bank to prepare a policy paper for enhanced regional electricity trade involving the Economic Cooperation Council (ECO) countries. The focus of this *Final Report* is on the arrangements for structuring international electricity trade, the risks inherent in cross-border trade and particularly trade in the region, and options available for mitigating the risks. The report identifies the trading arrangements, risk mitigation options, and financing arrangements that are most likely to facilitate electricity trade in the region.

Overview of Study

The objective of this study is the development of a set of recommendations and a roadmap for policy, institutional, and regulatory measures to support the development of electricity trade among the 10 member states[1] of the Economic Cooperation Organization (ECO) region (see Figure 1.1). These recommendations draw on international experience in developing regional trade in electricity, while at the same time taking account of the particular needs and state of development of electricity markets in the ECO region.

The terms of reference (TOR, see Annex 4) for the study require consideration of trade development among all of the ECO countries and their neighbors. The TOR also contains a particular emphasis on supporting the potential for exports from Central Asia[2] to South Asia (the CASA project). Specific export opportunities from Central Asia are as follows:

- Export of hydropower from the Kyrgyz Republic and Tajikistan.
- Export of fossil-fuel-fired generation from Uzbekistan, Turkmenistan, and Kazakhstan.

The main potential import customers for Central Asian electricity are Pakistan, Iran, Russia, and possibly China and Turkey (via Iran). Based on the experience of early trading in other regions, initial trade is likely to be on a bilateral basis, beginning with two types:

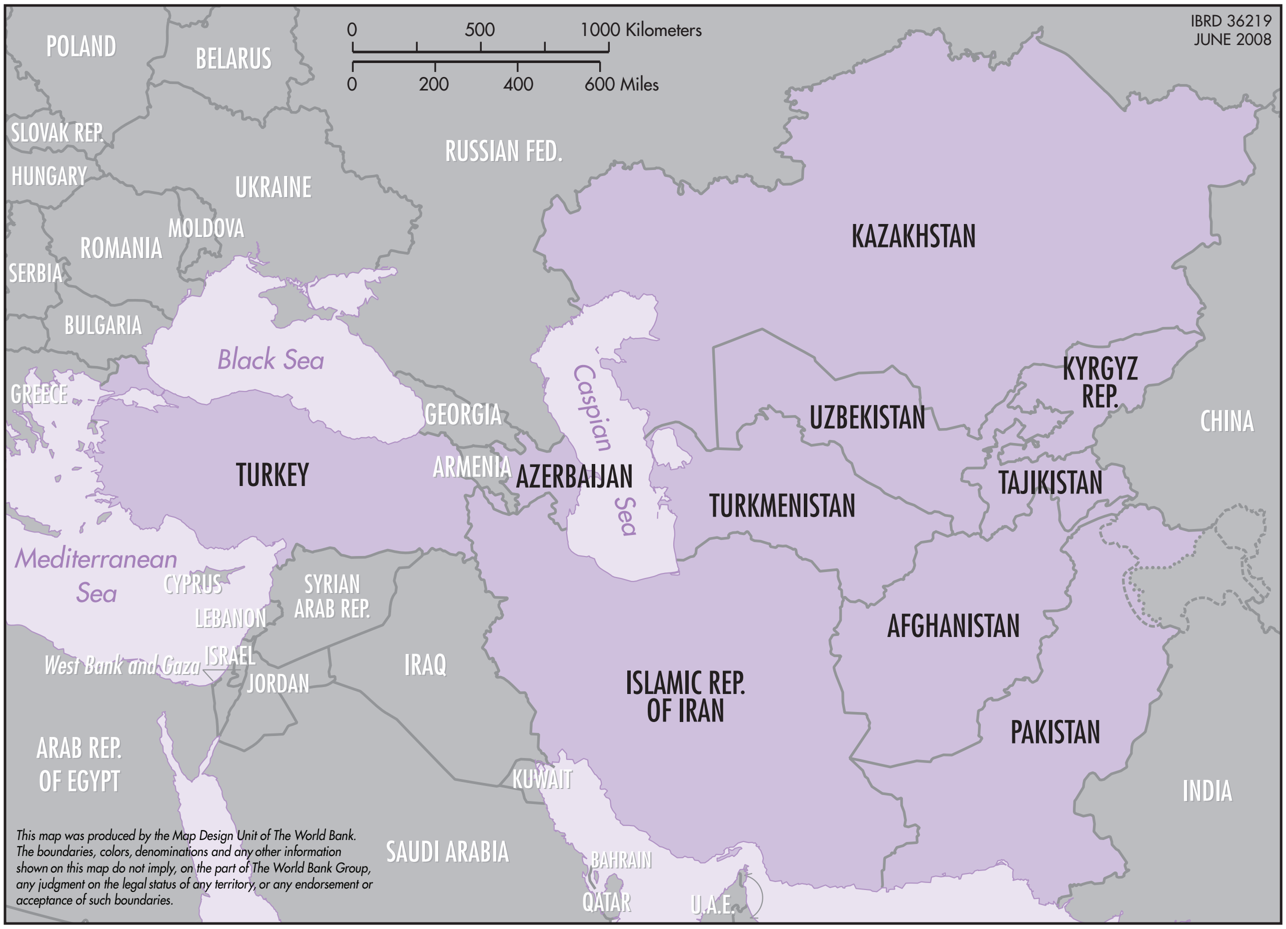
1. Seasonal exchanges and peak time energy swaps to take advantage of seasonal supply and demand complementarities.
2. Some dedicated projects to meet bulk power purchase requirements utilizing existing capacity.

The CASA project would differ from these types, as it would require major investment in both generation and transmission. A key aspect of export to South Asia (less so for trade to Russia) is the need for new transmission capacity. In the longer term, these export opportunities may provide the basis for the development of a regional market.

[1] Spanning the Middle East and Caucuses (Turkey, Iran and Azerbaijan), Central Asia (Kazakhstan, Uzbekistan, Turkmenistan, the Kyrgyz Republic, and Tajikistan), and South Asia (Afghanistan and Pakistan).

[2] The five Central Asian countries, which have historically formed the Central Asian Power System (CAPS) are: Kazakhstan, the Kyrgyz Republic, Tajikistan, Uzbekistan and Turkmenistan. However, Turkmenistan, which has chosen to isolate its electricity sector from the other CAPS countries, is often excluded from discussion of CAPS.

Figure 1.1 ECO Region Countries



Source: ECO Secretariat Web site—http://www.ecosecretariat.org/.

More broadly, the study will consider options for increased electricity trade from all the countries in the ECO region. The ECO region shares some characteristics and problems with other regions of the world (and for this reason the study includes some brief case studies—see Chapter 7) but there are also particular features of ECO that need to be reflected in future arrangements:

- Many of the countries of the region previously operated their power systems in coordination with Russia and other countries of the CIS. Both the infrastructure, and the institutions, that supported the trade are in disrepair, though the legacy provides a starting point for some future arrangements.
- Energy-rich countries of the region are already exporting some energy (electricity and gas) to countries outside the region, and this is likely to grow in future.[3] In respect of electricity, the countries with the largest export potential are Azerbaijan and Turkmenistan (in the

[3] The region includes major natural gas reserves in Central Asia and in Iran and Azerbaijan, and large coal reserves particularly in Kazakhstan. All the gas-rich countries either are exporting or intend to export to Europe (in some cases through the Russian pipeline system, as for Turkmenistan currently). There are also plans to export oil and gas to the East Asian markets, and ongoing discussions around pipelines to take gas to the markets of South Asia and onward by sea.

western part of the region) and Kazakhstan, Uzbekistan, the Kyrgyz Republic and Tajikistan (in the eastern part of the region). Besides markets within ECO (as the regional electricity interdependence grows), external markets are principally Iran, Turkey, Pakistan, China, and Russia.

- The region contains conflict and post-conflict countries, and poorly developed legal, regulatory, and commercial environments.
- Key transmission infrastructure is lacking, including interconnections between countries and internal transmission capacity within crucial transit countries (notably Afghanistan).
- Major new trade will require new infrastructure, involving investment in multiple countries and jurisdictions; the risks are significant especially when more than two countries are involved and risk mitigation will require a range of new bilateral and multilateral agreements.

The main elements to the work in this study are as follows:

- Identify the options for trading arrangements that can be developed to support trade in the region.
- Identify the *legal and institutional arrangements* required for differing levels of regional market development and how these can support the evolution from one stage to another.
- Identify the *risks faced by electricity export projects*, how to mitigate these through appropriate project structuring, and, in particular, how alternative market arrangements can contribute to this. This includes ensuring the enforceability of contracts and identifying mechanisms for dispute resolution.
- Set out *options for financing* electricity export projects and how these link to decisions on project structure.

These strands of the analysis are brought together in the final chapter, which presents the conclusions of the study and a roadmap for the development of electricity trade in the region.

Structure of the Report

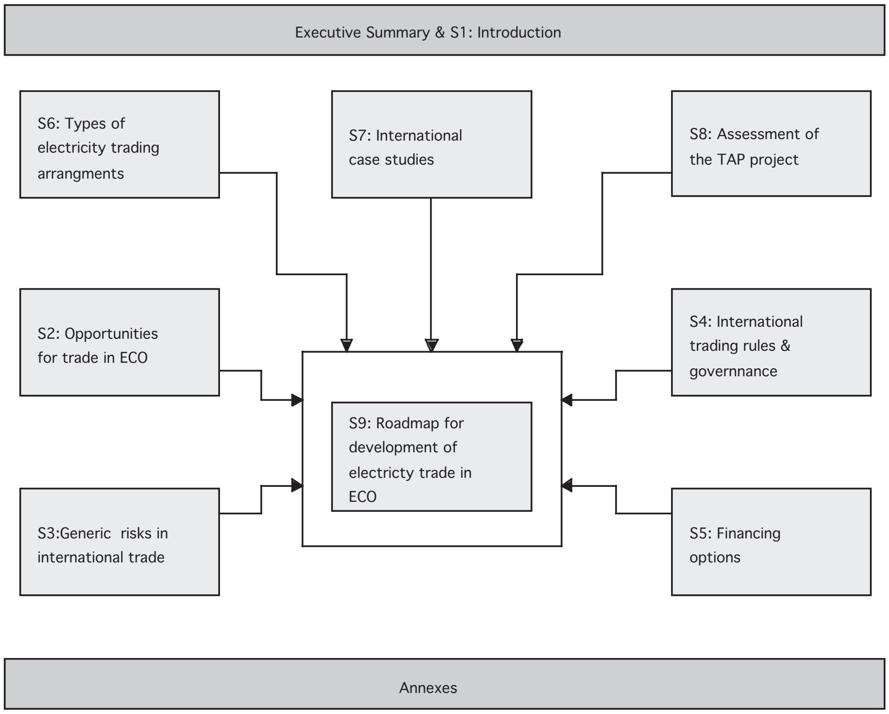
The *Final Report* has a modular structure so it may be read through in full or approached in parts, depending on the reader's intentions and interests. Several of the Chapters are self-contained, such as Chapters 6 and 7, and may be read independently of the rest of the report as background to the issues and experiences with international electricity trade. Other Chapters build on earlier parts of the reports (such as Chapters 8 and 9) and, while reading the referenced Chapters will give broad understanding of the discussion, readers may find it useful to jump to specific parts according to their interests.

The structure of the report, viewed in a modular form, is illustrated in Figure 1.2.

The *Report* content is arranged as follows:

- The **basis for future trade** is discussed in the following four Chapters:
  - Chapter 2 contains a **summary of opportunities for trade** in ECO and external export markets accessible to countries from the region.
  - Chapter 3 covers **generic risks related to international trade** projects. These are referenced and expanded in subsequent Chapters of the report.
  - Chapter 4 discusses the **rules that govern international trade**, disputes under those rules and options for dispute resolution.
  - Chapter 5 considers the **financing options** open to international trade projects in countries and regions with the risk characteristics that prevail in the ECO region.
- The **framework** for developing various types of trade is described in Chapters 6 and 7:
  - Chapter 6 describes four generic types of **international electricity trading arrangements** that together encompass a transition from simple to complex arrangements. The descriptions include the institutional requirements and risks and options for reducing risk.

Figure 1.2 Report Structure



- Chapter 7 presents four **case studies of international trading arrangements**, discusses the allocation of risk and approaches to risk mitigation, and considers lessons from each for the ECO region.
- The specific issues relating to **opportunities in the ECO region** are addressed in Chapters 8 and 9:
  - Chapter 8 provides an **assessment of the proposed CASA electricity export project** from Central Asia to South Asia.
  - Chapter 9 draws on the opportunities for trade in Chapter 2, typologies identified in Chapter 6, and lessons from international experience in Chapter 7 to provide a roadmap and conclusions for structuring **electricity projects in the ECO region**, including risks, risk mitigation, financing options and the role of the public and private sectors.

Further details on the international case studies and other supporting material are contained in the Annexes.

2 Opportunities for Trade

The basis for future electricity trade in the ECO region is analyzed in this report by considering four interrelated aspects:

1. The opportunities and challenges to trade between countries within the ECO region and with neighboring countries.
2. The analysis of risks in international trade.
3. The equity structures and financing options for infrastructure investment to support trade, taking account of the risks.
4. The rules that govern international trade, including the supporting institutional frameworks and dispute resolution mechanisms, designed to mitigate some of those risks.

We begin with a brief introduction to the first of these aspects, the opportunities to trade in the region. A more detailed assessment was provided in the *Inception Report,* which itself drew heavily on information in previous World Bank reports.[4] Our discussion includes an update from previous studies of the relative costs of competing generation options given changes in natural gas (and oil) prices during the past two years.

Overview of Opportunities

At the aggregate level, the ECO region is well endowed with sufficient energy resources to meet current and projected future needs and is geographically placed to trade both surpluses and periodic shortages externally. In fact, the energy supply and demand balance in the region is such that trade is an obvious and, in the near term, the only path to unlocking the value of its significant energy resources:

- Large energy sources are geographically separated from demand-growth centers, in some cases by multiple international borders.
- Seasonal hydroelectric production is asynchronous with demand in the generating countries, but is complementary to seasonal demand in other countries in the region.

The region's energy resources are summarized next, followed by a discussion of the potential trading countries and the infrastructure options to meet increased trade.

The Regional Energy and Energy Trade Picture

The ECO region contains countries that are relatively richly endowed in energy resources but have relatively low energy demand, and others that have high and growing energy demand but whose indigenous supply options are relatively limited.

- The electricity demand and supply situation in the region may conveniently be divided into two clusters (east and west clusters) with each country having potential as a predominantly export, import or transit state. The **east cluster** (Afghanistan, Kazakhstan, the Kyrgyz Republic, Pakistan, Tajikistan, Turkmenistan, Uzbekistan) is characterized

[4] See Central Asia Regional Electricity Export Potential Study (REEPS), World Bank 2004.

by large and growing demand in Pakistan. Additions to capacity locally are struggling to keep pace with demand growth: imported electricity is an attractive alternative to domestic generation, whether based on domestic or imported fuels. India also has a fast-growing electricity system and could potentially trade with Central Asia via Pakistan in the future.

- Low or no domestic demand growth is projected for Uzbekistan, Kyrgyz Republic, and Tajikistan.
- Kazakhstan by contrast is likely to experience some growth in demand (3 percent per year). The completion of the north-south interconnector will greatly strengthen the national electricity system and will allow exports primarily to the north and east (Russia and China) but also to the south when periodic surpluses are available from the coal-fired stations in the north.
- Large hydropower resources (both developed and potential) in Tajikistan and the Kyrgyz Republic will provide the basis for these countries to become significant electricity exporters.
- Complementarities in timing of demand peaks and supply surpluses between countries, with winter peaks in Central Asian countries and summer peaks in South Asia and Iran:
  - The timing of the demand peaks in South Asia and Iran is complementary with summer surpluses from hydro-generation in Tajikistan and the Kyrgyz Republic.
- Tajikistan and the Kyrgyz Republic face shortages during their winter peak.

The **west cluster** (Azerbaijan, Iran, Turkey, and Turkmenistan[5]) is characterized by the following:

- High rates of electricity demand growth are projected for Iran and Turkey.
- Large fossil fuel deposits exist in Azerbaijan and Turkmenistan, which are set to become significant electricity exporting countries.
- Iran also has significant fossil fuel deposits, but requires electricity imports, in part because of the seasonal fluctuations in demand already identified.
- Exports to meet the winter peak shortfalls in Tajikistan and the Kyrgyz Republic are important so as to allow those countries to operate their hydro stations so as to minimise flooding and conserve water for summer irrigation in the downstream countries.

Energy Resources and Demand

Table 2.1 illustrates the rich gas reserves in the centrally located Caspian Sea countries, the significant coal reserves in the North and South of the ECO region, and the large hydro potential in the mountainous eastern area and also in Iran.

On the energy demand side, the region has three high-growth centers in Pakistan, Iran, and Turkey, as shown in Table 2.2. Pakistan is expected to experience worsening supply shortages for the remainder of the current decade and India also faces shortages now. By contrast, in Central Asia only Kazakhstan is expected to see steady demand growth (around 3 percent per annum). Medium-term growth in the other ECO countries is forecast to be low or flat,[6] except in Afghanistan, which may see rapid growth (projected to be around 10 percent annually from the currently served level) but from a very low base. Outside the region, India is a very large and fast-growing potential market with existing supply shortages. The main demand centers and their projected growth rates are shown in Table 2.2.

Central Asia as a whole has its annual demand peak in the winter (October to March). The largest seasonal demand swing is in Kyrgyz Republic, followed by Kazakhstan, while the other countries have a reasonably

[5] Turkmenistan straddles the clusters and is placed in both.

[6] See Central Asia Regional Electricity Export Potential Study (REEPS), World Bank 2004.

Table 2.1 Major Energy Resources in ECO (Reserves and Potential)

	Natural Gas (tcf)	Coal (billion tons)	Oil (billion bbl)	Hydro (MW potential, developed)
Azerbaijan	1,370		76.0	
Kazakhstan	65-70	37.5	29.0	20,000 (2,000)
Turkmenistan	71	–	0.5	–
Uzbekistan	66	4.0	0.6	–
Tajikistan	–	3.6	–	40,000 (4,000)
Kyrgyz Republic	–	0.8	–	26,000 (3,000)
Iran	971	0.5	132.5	42,000 (2,000)
Pakistan	27	185.0	0.3	54,000 (6,500)

Sources: World Bank, BP.com (2006).
— indicates low or insignificant reserves.

Table 2.2 Main Electricity Demand Centers

Main Demand Center	Existing Total Demand (TWh)	Projected Annual Growth Rate	Current or Projected Supply Shortage?
Pakistan	86	7-8%	*Now*
Iran	145	7-9%	
Turkey	120	7-8%	
India	710	7-8%	*Now*

Source: World Bank, Energy Information Administration and TEDAS (2006).

flat annual demand profile. Generation availability is seasonal in the hydro-dominated systems of the Kyrgyz Republic (79.5 percent hydro) and Tajikistan. These systems have excess generation capacity in the summer, due to the timing of water inflows and release regimes and, conversely, face shortages during the winter period when water release is restricted.

In contrast to the Central Asian countries, Pakistan and Iran both experience demand peaks in summer. It is estimated that there is 121 MW of suppressed demand at the peak in Afghanistan. Pakistan has developed about 12 percent of its potential hydro capacity (see Table 2.1). Seasonality of this capacity leads to a reduced reserve margin during dry months.

Among potential external trade partners, India is a very large and fast-growing potential market. Russia's demand is expected to grow by around 2.5 percent per annum to 2020. Although there is currently a capacity surplus in the Russian system, it is constrained by transmission bottlenecks and a number of large plants are nearing the end of their operating lifetimes. China's Xingjian province is currently able to meet its demand through domestic production. However, with demand growth of 8 percent per year and weak interconnections with neighboring Chinese grids there may be an opportunity for increased export via Kazakhstan from Kyrgyz Republic (which currently exports around 5 GWh per year) and Tajikistan in the future. An export project would, however, need to prove its economic advantage over improved Chinese domestic interconnection, such as the 750 kV line announced as part of the 11th Five-Year Plan (2006 to 2010).

Potential Exporters and Importers in Central and South Asia

Within ECO, as already indicated, the group of countries that have greatest potential to develop electricity resources for export are the five Central Asian states. These are Kazakhstan, the Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan. Electricity exports from these countries could be fuelled by the large reserves of natural gas, coal and hydro-potential.

Figure 2.1 indicates the direction of potential increased cross-border electricity flows from the five Central Asian countries. The main potential export markets for this electricity are Pakistan, India, Russia, northwestern China (Xingjian), Iran, and Turkey. Afghanistan is also likely to continue to import a large portion of its needs from its neighbors, although its demand is relatively small. A more stable and predictable contractual framework for existing imports from Iran, Turkmenistan, Uzbekistan, and Tajikistan would be beneficial. For the larger export markets, Afghanistan represents a potentially important transit country. The Central Asian states can also benefit from trade among themselves.

The World Bank has calculated that Central Asian electricity can be competitive in cost terms with marginal generation in potential export markets.

Initial opportunities to gain from trade are likely to be trading peak energy at the margin to make more efficient capacity utilization and to overcome winter shortages within the Central Asia region.[7] Regional sharing of reserve would also allow individual country reserve margins to be reduced. Ancillary services are currently

Figure 2.1 Main Trading Opportunities in Central Asia

Source: World Bank, ECA graphic (2006).

[7] The Central Asian states have existing interconnection capacity.

provided by the major hydro-producing countries (Kyrgyz and Tajikistan), but these services are poorly priced. However, beyond these short-term trading opportunities, delivering higher volume trade to export markets will require large investment in new infrastructure. For these projects to go ahead, ways of mitigating the associated risks will have to be found.

Iran and Azerbaijan also have large hydrocarbon reserves. Although these countries are yet to develop as significant electricity exporters, both are important exporters of energy in the form of natural gas and oil. Besides the direct gains from any electricity trade that does develop, integrating the grids between the western cluster countries (Turkey, Azerbaijan, Iran and Turkmenistan) would provide the benefits of a larger, integrated network: sharing risks, reduced reserve margin requirements, opportunistic exchanges and a larger market area for private investors. However, development of the interconnected grid is more likely to take place if there is the prospect of larger trade in the longer term.

New Supply Options within the Central Asian Republics

At the time of the dissolution of the Soviet Union there were a number of new electricity generation projects under construction in Central Asia. The major projects currently moving toward completion are as follows:

- **Northern Kazakhstan:** Two new 500 MW coal-fired units at Ekibastuz are expected to be implemented between 2007 and 2011. There are also plans to rehabilitate the existing Ekibastuz I plant. The plant is owned by AES Energy, a private U.S. company.
- **Uzbekistan:** 800 MW Talimardjan I gas-fired steam plant (expected to be completed in the near future). A further three 800 MW units were planned, and the facility could be progressively expanded with the addition of these.
- **Tajikistan:** 670 MW Sangtuda I hydropower project. RAO UESR has formed a joint venture (holding a 75 percent stake) with the Tajik government to complete the project, which is expected in 2009.
- **Tajikistan:** 220 MW Sangtuda II hydropower project. Iran has signed an MOU with the government of Tajikistan to develop this project on a joint venture basis. Output from the plant would be for export to Iran (and would need to transit either Turkmenistan or Afghanistan).
- **Kyrgyz Republic:** 400 MW Bishkek II gas-fired CCGT plant. A new CCGT plant could be built on the site, which is largely prepared, using gas from the Tashkent-Almaty pipeline.

In addition, there are large hydropower projects in Tajikistan and the Kyrgyz Republic that could be further developed in the medium- to long-term:

- **Tajikistan:** 3,600 MW Rogun hydropower project. Part of Phase 1 construction has been completed, but the project would need to overcome complex issues related to water-sharing rights.
- **Kyrgyz Republic:** Kambarata I and II hydropower project. Kambarata I would be a 1,900 MW storage facility located upstream of the Toktogul reservoir.[8] Kambarata II would be a run of the river scheme located between Kambarata I and Toktogul (360 MW if Kambarata I is built, 240 MW on a stand alone basis). Construction of Kambarata II had begun and RAO UESR of Russia has provided assistance with feasibility studies into its completion. The storage capability at Kambarata I would have the advantage of overcoming the winter release restrictions on Toktogul.

Given the low demand projections for the Central Asian region, it is likely that demand within the region outside of the winter period

[8] Toktogul is a multiyear regulating reservoir designed to smooth water availability for downstream irrigation across dry and wet years. It is located in and controlled by the Kyrgyz Republic, and plays a crucial role in supplying irrigation in Uzbekistan and Kazakhstan.

could be met with rehabilitation and energy efficiency initiatives. Each of the projects just identified would then be primarily for export outside the region.

Possible Future Transmission Lines for Export from Central Asia

The existing 500kV transmission system among the Central Asian countries (blue lines) and the main options for new high-voltage transmission that could be built in the future to support large export from Central Asia (red lines) are shown in Figure 2.2.

The map shows the existing 500kV system concentrated in the border regions between the five Central Asian countries (aside from the new line to Ekibastuz in Kazakhstan, which is discussed next). This was designed to allow operation of the Central Asia Power System in the Soviet era. In order to transport electricity to export markets beyond Central Asia, the existing system would need to be extended with new transmission over significant distances.

Afghanistan would clearly be a key transit country for exports to Pakistan and potentially also to Iran. Exports to Iran could also transit Turkmenistan by extending the existing line there. However, Turkmenistan has electrically disconnected itself from the rest of Central Asia, and has distanced itself politically and economically in favor of closer ties with Iran. It could be that trade cooperation involving transit through Turkmenistan will remain difficult, further increasing the importance of Afghanistan as a transit route.

Export to Pakistan: A line connecting southeastern Tajikistan to northern Pakistan via a routing through Kabul in Afghanistan, as shown in Figure 2.2, would be around 900 km long. There is a proposal for annual transmission capacity of 1300 MW in the first phase, with 300 MW offtake in Kabul and 1000 MW in Peshawar. This project, known as CASA (Central Asia South Asia), is discussed further in Chapter 8. This route could potentially extend to allow exports to India.

Export to Iran: A potential line from Uzbekistan to Iran (Mashad), as shown in Figure 2.2, would be 1,150 km long. It would have annual transmission

Figure 2.2 Options for Future Transmission to Support Trade from CA

Source: World Bank REEPS, 2004; ECA graphics.

capability of 10 TWh. Exports to Iran could also potentially transit further west.

Kazakh grid interconnection and export to Russia: A 500 kV transmission line to strengthen the connection between northern and southern Kazakhstan is under construction. This could open the possibility of exports to Russia of surplus hydroelectricity from the Kyrgyz Republic and Tajikistan. However, the expanded capacity may more likely be used for southward transfers from northern Kazakhstan to meet demand in the south of the country.[9]

Export to China: Exports to China's northwestern province could be achieved by an interconnection with the existing grid near Almaty in Kazakhstan.

Constraints to Trade

Constraints and barriers to trade development have two implications: They condition the types of trade that are likely to be successfully implemented; and they lead to the need to develop risk mitigation measures. Within the ECO region, a significant number of challenges exist to developing trade. These include lack of infrastructure for transit, political, and security issues, weak institutional and regulatory frameworks, complex issues around riparian water use and management, transmission access, and pricing problems, including below-cost tariffs and low levels of payments being made for electricity.

As an example, almost all of the constraints to trade are apparent in Afghanistan. This is a key issue for the region, as Afghanistan's geographic location makes it an important energy bridge for wheeling from Central Asian energy suppliers to the large potential markets in South Asia, including the proposed CASA project.

The apparent cost advantage to Central Asian hydro faces two significant challenges:

- The cost of transporting electricity from them may be significantly increased by transmission risks, such as the cost of providing security (this applies to non-hydro generation also).
- Riparian water rights in the region have not been settled. This may result in higher costs (in the form of a risk premium passed to buyers) where there is a perceived risk of dispute over water use, and may delay development of some hydro-based projects.

The constraints to trade are further discussed in the following Chapters of the report. The issues in Afghanistan are specifically considered in Chapter 8.

Alternative Energy Transport Options

Energy export projects to deliver electricity to customers should demonstrate their economic competitiveness with alternative energy forms. In the ECO region, the main option to transporting electricity is to transport natural gas and use it for electricity generation closer to demand. The relative economics of electricity versus natural gas transport depends to a large extent on the costs of the transmission infrastructure and the energy losses incurred in transport, both of which are related to the distance.

There are a number of proposed gas export projects from the gas-rich countries of the ECO region and for gas imports to the growing energy demand centers in the region, on its borders and further afield. These include the following:

- A proposed **Turkmenistan–Afghanistan–Pakistan (TAP[10]) gas pipeline** (see Box 8.1 for more details) has been under discussion for several years. India has expressed interest in receiving gas from the project.
- India and Iran have signed an MOU to develop a proposed **Iran–Pakistan–India gas pipeline.** Three possible routes have been suggested, including two offshore that would bypass Pakistan. This project has

[9] In this case, the development of the line appears contrary to open trade, which may have enabled southern Kazakh demand to be met by imports from its neighbors, and more in step with the tendency to promote self-sufficiency.

[10] More recently, this project is being referred to as TAP(I) given the involvement of India.

the benefit of not requiring transit through Afghanistan, although an overland route would need to transit areas of unrest in western Pakistan.

- Another proposed pipeline project would bring gas to **Pakistan from Qatar.**
- A proposal exists to develop a **trans-Caspian pipeline** to take Turkmen gas west to the markets of Europe.
- Both Kazakhstan and Turkmenistan have been pursuing possible export pipeline opportunities for natural **gas and oil to China, Korea, and Japan.**

Transporting natural gas has a physical security advantage over electricity transmission since the pipelines can be buried. However, meshed electricity transmission networks are more robust than a single pipeline as there are alternate paths to transport energy.

The comparison of the economics of transit of electricity or gas (for subsequent conversion to electricity using similar technology) rests on two factors:

1. The comparative costs of gas and electricity transportation over different distances and volumes.
2. The comparative prices of gas in the two locations, taking into account transit fees and how much economic rent is captured by the transit countries.

If the latter factor is set aside, transportation costs would be the main consideration, although the breakeven point (distance, volume) is likely to differ for different gas prices, due to the value of electricity losses.

Since gas pipelines have major economies of scale for carrying larger volumes of energy, and loss rates are constant with distance (whereas electricity loss rates increase with distance), gas transportation tends to become more economic than electricity with larger volumes and longer distances. As a very rough guide, the economics of transmission tends to favor gas for distances greater than around 1,000 km, and volumes above 5 to 10 bcm/yr. For example, a recent study[11] of electricity transmission and trade among the Black Sea region countries found that for distances of 1,000 km electricity transmission would be more economic at volumes below 5,000 MW (roughly 7 bcm of gas pa). For larger volumes of energy of 13,000 MW (16–18 bcm pa) gas pipelines would be economic at distances down to 500 km, with electricity being economic for shorter distances. Gas pipelines become increasingly economic at longer distances above 1,000 km.

Costs of New Generation Projects

The comparative cost of generation between the exporter and the importer is the main driver for trade. The cost difference must be large enough to compensate for the cost of transport. The latter depends on distance and on whether existing transmission infrastructure can be used or new investment is required. The cost differences must also be robust enough to have a reasonable expectation of persisting over the medium to long term, especially where the financing of new investment is involved.

Allowing for the cost of transmission, several of the potential new generation projects in Central Asia mentioned on page 9 may be economic as export projects. These potential plants include two new gas-fired projects (including two stages at Talimardjan), which could serve exports to Pakistan, Afghanistan, and Iran.

Calculations of the relative economic costs of the plants have previously been made and compared against the marginal generation cost in the potential export markets.[12] Previous estimates suggest the Talimardjan I (gas-fired plant in Uzbekistan) and Sangtuda I (hydro project in Tajikistan) are least cost for export to Pakistan, Iran, and Afghanistan. In addition to lower economic costs, an advantage of these projects compared with the larger hydro

[11] "Study of Electricity Trade Potential in the Black Sea Region," Economic Consulting Associates Ltd. for World Bank, February 2006.

[12] See World Bank REEPS report.

options is that they do not require riparian agreements.

Gas prices in market economies have approximately doubled over the last two years,[13] through their linkage to the international oil price. Although gas producer and transit countries have historically benefited from preferentially lower gas prices, this situation is rapidly changing as gas price increases are being implemented very widely. The rising gas price is likely to have affected the relative costs of the new generation options in Central Asia, particularly those fuelled by gas compared to hydro, and potentially changed the ranking of viable export projects, possibly making some nonviable (and vice versa). In contrast with gas, coal prices have not seen the same increases.

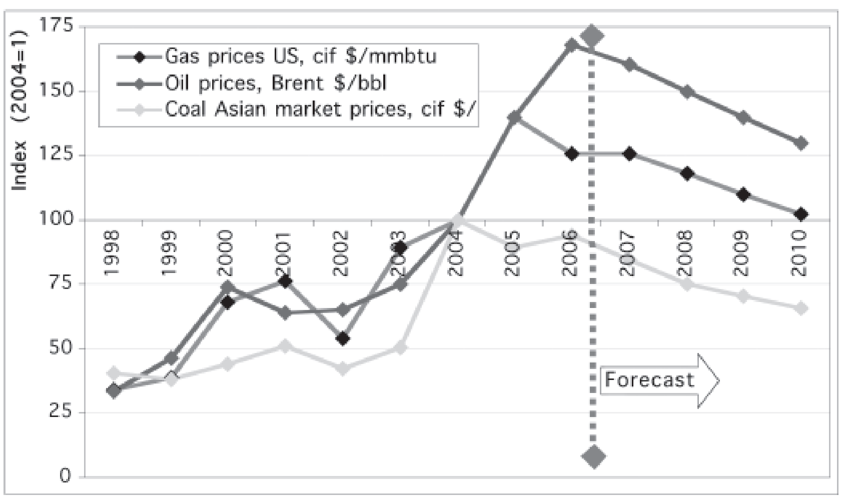
We have calculated the average incremental cost of three gas-fired generation options taking into account recent increases in gas prices.[14] These generation options are Talimardjan I and II in Uzbekistan and Bishkek II in the Kyrgyz Republic. We begin with a discussion of the gas price assumptions.

Gas Price Scenarios

The historical relationship between oil, gas, and coal prices is shown in Figure 2.3. Although gas price trends have followed oil prices (with a slight dampening of rises after 2004), coal prices have moved more independently, particularly after 2004.

Gas prices in the Western European spot market are now around US$250/mcm. Applying a similar percentage discount as was used in previous estimates to account for the isolation of Uzbekistan from international markets (see footnote 15) gives a price for Uzbek gas of US$140 to 180/mcm.

Figure 2.3 Trends in International Oil, Gas and Coal Prices



Source: EIA historical data, World Bank commodity forecasts.

[13] Another factor affecting gas prices from the region is the development of the gas market and infrastructure to bring gas to market. In particular, the Caspian Sea region, in which Kazakhstan, Uzbekistan, and Turkmenistan all have gas reserves, has seen ongoing development toward linking it to international markets. Russia has recently signed new gas import contracts with both Kazakhstan and Turkmenistan, in furtherance of its aim to provide the main channel for Caspian gas to Europe. The recent prices have reportedly been around $100/mcm; two years ago Turkmenistan was receiving $30-50/mcm. Border gas prices in Turkey, which is soon to start receiving gas from Azerbaijan, are now approaching $250/mcm (Azeri gas will be capped at a significantly lower price for the initial contract).

[14] The assumptions on other investment and operating costs and plant characteristics are the same as those used in REEPS.

An alternative price indication is given by recent rises in the price of Turkmen gas and the preferential prices charged for Russian gas to neighboring states.

In September 2006, Turkmenistan announced a renegotiated price for sales to Russia of US$100/mcm (the previous prices had risen from US$30 to US$65/mcm in recent years). During the past year, Gazprom has increased the prices it charges to a number of FSU countries, indicating that in the future, prices may converge toward those paid in Western Europe. In January 2006, the price to Ukraine was increased to around US$95/mcm using a formula that bundles Russian gas priced near Western European levels (around US$230/mcm) with lower-priced Turkmengas (under the contracts terms at the time). The price will increase further in 2007. Other transit countries are also experiencing gas price rises. Georgia has agreed to an increase from US$110/mcm to US$235/mcm in 2007. Even Belarus is now under pressure from Russia to have its gas price increased from US$46 to US$105/mcm.

The increased Turkmen price and changes in international gas markets suggest that US$100/mcm is a reasonable low case assumption for the long-term price of Uzbek gas. We have also considered the effect of US$150/mcm and US$200/mcm, allowing for further convergence to the international price.

Cost of New Gas-Fired Generation Options

The results of the cost calculations for new generation using higher gas prices in a range reflective of recent and possible future prices are given in Table 2.3, along with the low gas price range used in earlier cost estimates.[15] Prices are in 2004 dollars.

Effect of Higher Gas Prices on Project Viability

The effect on the cost ranking of generation projects is given in Table 2.4. It is clear that higher gas prices have a significant effect on the relative economics of generation. With a low gas price, two of the gas-fired options had previously been ranked among the four least-cost options. If the gas price changes to US$100/mcm all three gas projects would shift to be among the five highest-cost projects. The positions of the Talimardjan projects in Uzbekistan worsen further if gas prices are assumed to rise to even higher levels.

For all higher gas prices considered, hydropower plants make up four of the five least-cost options. The cost advantage of the Sangtuda I and Rogun I hydro projects are reaffirmed by the analysis.

Table 2.3 Costs of New Generation Options

			Economic Cost (cents/kWh) at Various Gas Prices			
Project	Capacity (MW)	Financial Cost (c/kWh)	\$35-40/mcm	\$100/mcm	\$150/mcm	\$200/mcm
Talimardjan I	800	2.44	1.68	3.79	5.41	7.03
Bishkek II	400	3.24	2.55	4.01	5.15	6.30
Talimardjan II	2,400	1.75	2.76	4.87	6.49	8.12

Source: World Bank REEPS, 2004 and ECA calculations with updated fuel prices.

Note: Stated gas prices are for Uzbek gas and apply to the Talimardjan (Uzbekistan) projects. Prices used for Bishkek II (Kyrgyz Republic) are for Uzbek gas with an additional $5/mcm for the cost of transmission.

[15] The gas prices used in REEPS were $35/mcm for the Uzbekistan projects and $40/mcm in the Kyrgyz Republic (incorporating the cost of transmission from Uzbekistan). REEPS acknowledged that these prices were below those in international markets at the time ($80-120/mcm for Russian supply to Western Europe) but applied a discount to these prices to reflect Uzbekistan's isolation from competitive and creditworthy markets.

The calculations do not adjust for changes in international coal prices, since there has been less change in them and the impacts would be much less than for gas prices. It is not surprising that the relative cost of coal-fired plants, in particular the Ekibastuz rehabilitation, is improved when higher gas prices are used. If gas prices remain high, the viability of new coal fired options either for export or located in the buyer's country improves.[16]

In each higher gas price scenario, the Rogun II and Kambarata II hydro projects became the fourth- and fifth-ranked projects, respectively. However, while the economics suggest that these projects would become more viable than the competing gas-fired options, their viability in practice will be challenged by the need to settle issues relating to water usage.

This analysis considers relative costs among competing export projects within the Central Asia region. A more complete analysis of export projects should also consider the cost relative to domestic options in the consuming markets. The competitiveness of hydropower vs. gas or coal will be affected not just by fuel and operating cost, but also by water availability, the impact of seasonal inflows on the system reserve margin and by environmental costs of the gas and coal options.

In Pakistan, where hydro is a relatively high proportion of the fuel mix, the available capacity in the system is below the name plate installed capacity for part of the year due to seasonality in water availability. Further development of hydropower in Pakistan (which could anyway be delayed by interprovincial disagreements) is therefore unlikely to serve peak demand during these periods. The timing of water availability to Central Asian hydro plants is complementary to peak demand in Pakistan. This, combined with the cost advantage in the presence of high gas prices, suggests a continued cost advantage to Central Asian hydro projects for export to Pakistan. However, these projects will have to contend with the constraints to trade from the region.

Table 2.4 Cost Ranking of New CA Generation Options

				Ranking by Economic Cost			
Project	**Fuel**	**Capacity (MW)**	**Financial Cost* (c/kWh)**	**$35-40/ mcm**	**$100/ mcm**	**$150/ mcm**	**$200/ mcm**
Talimardjan I (Uzbekistan)	Gas	800	1.75	1	6	8	8
Sangtuda I (Tajikistan)	Hydro	670	2.44	2	1	1	1
Rogun I (Tajikistan)	Hydro	1,200	2.91	3	2	2	2
Bishkek II (Kyrgyz Republic)	Gas	400	2.67	4	7	7	7
Ekibastuz I Rehab (Kazakh)	Coal	2,000	2.66	5	3	3	3
Talimardjan II (Uzbekistan)	Gas	2,400	2.92	6	9	9	10
Rogun I & II (Tajikistan)	Hydro	2,400	3.24	7	4	4	4
Kambarata II (Kyrgyz)	Hydro	240	3.95	8	5	5	5
Ekibastuz new (Kazakhstan)	Coal	1,000	5.05	9	8	6	6
Kambarata I (Kyrgyz)	Hydro	1,900	8.54	10	10	10	9

Source: World Bank REEPS, 2004 (columns 4 and 5); ECA calculations (columns 6-8).

*Financial cost is a levelized tariff over 20 years (see REEPS for underlying assumptions).

[16] Subject to environmental constraints.

Conclusions on Trade Opportunities

The review of opportunities for trade within the region as well as exports from the region have revealed a range of options, including small-scale bilateral trades utilizing existing infrastructure, as well as large-scale export projects requiring major new investments.

There is complementarity within the region since some countries have rapidly growing demand (e.g., Pakistan) while others are relatively resource rich (e.g., hydropower resources in Tajikistan, and the Kyrgyz Republic; fossil fuels in Turkmenistan, Kazakhstan, and Uzbekistan). On the export front, potential demand is growing in large neighboring countries including China, Russia, Iran, and India. Nevertheless, significant barriers to expansion of trade must be addressed.

As the market for gas matures and prices become more internationalized, gas price increases will also have a bearing on the relative economics of projects that may be carried out within many of the potential export markets. Both hydropower and coal generation have become relatively more attractive with the recent oil and gas price increases. The competitiveness of hydropower vs. gas or coal will be affected not just by fuel and operating cost but also by water availability and the impact of seasonal inflows on the system reserve margin and environmental considerations.

The analysis suggests a continued cost advantage to Central Asian hydro projects for export to Pakistan. However, these projects will have to contend with the constraints to trade from the region.

As gas prices rise, the improvement in comparative economic ranking of the Rogun I and Sangtuda I hydro projects in Tajikistan will tend to increase the attractiveness of the CASA project for exports to Pakistan. This is discussed in more detail in Chapter 8.

3 Risks in International Energy Trade Projects

The previous Chapter summarized the trade opportunities both within ECO and for exports outside the region. It was also noted that significant barriers to trade exist, which add to the risks of trade and new investment. These must be identified and addressed in order to create a framework for sustainable trade expansion. This report addresses the assessment of risk by firstly reviewing the generic types of risk in electricity trade (this Chapter), secondly reviewing governance and dispute resolution procedures (Chapter 4), and thirdly reviewing risk mitigation options in financing mechanisms (Chapter 5).

The aim of this Chapter is to provide a general review of risks in international electricity projects, particularly those involving two or more countries. The general risk analysis will be developed in subsequent Chapters to consider specific risks in trade between the ECO countries, particularly in relation to the types of trade likely in the short and medium term, and in the proposed CASA project.

The range of alternative trade arrangements that are possible vary in the way in which they assign risk among parties and the degree to which they are able to mitigate those risks. A number of the project risks themselves are generic among the different types of trade arrangement. We discuss these generic risks in this Chapter and refer back to them in the Chapters that follow.

We group these risks and set those groups out in order of their potential impact on international trade projects in emerging markets. The three groups are analyzed below:

1. **Political/regulatory risks,** which derive from the institutional, governance, legal, and regulatory framework in the country, and so are also referred to as *country risk.*
2. **Commercial risks,** which relate to the characteristics of the project and the market.
3. **Financial risks,** which reflect the creditworthiness of the borrowers and their ability to repay the loans, also dependent on the security of the projected project revenues.

These risks and the subrisks that accompany them are listed in Table 3.1 and discussed further. If the highest-level risks are not allocated satisfactorily, then the project is unlikely to proceed.

Political and Regulatory Risks

Political risk (or country risk) arises wherever political intervention can override or change the rules of the market to the disadvantage of the project. Regulatory risk is included in this category because even where "independent" regulators exist, experience suggests that it takes several years before they are able to exercise the decision-making powers independently of the government. Political risk is likely to be a major concern for projects in most countries of the ECO region. The experience elsewhere in the world, for example in electricity projects in southern Africa (see discussion in Chapter 7), illustrate that political risk can be the factor that holds

Table 3.1 Types of Generic Project Risk and Risk Mitigation

Political Risk Mitigation Matrix

Risk Type	Potential Mitigation	Mitigation Agent
Expropriation risk	Reputational impact of government expropriation	Host government
	Diplomatic ramifications	Foreign government/ trade agency
	Contract specifies compensation from government for loss of earnings	Government
	Political risk insurance	Contracting parties
	Involvement of IFIs	IFIs
Security risk	Law and order and military action	Government
	Private security force	Contracting parties
	Address underlying cause	Government
	Political risk insurance	Contracting parties
Breach of contract risk	Carefully structure contracts to ensure fairness	Contracting parties
	Support contracts with investment treaties (e.g., ECT)	Governments and contracting parties
	Political risk insurance	Contracting parties
	Involvement of IFIs	IFIs
Legal and regulatory risk	Clear, comprehensive legal framework and strong judiciary	Host government
	Agreement with government to freeze' current legal environment	Host government and contracting parties
	Allow pass-through of costs due to change in regulations	Government
	Host government takes a financial stake	Host government and contracting parties
Currency transfer restrictions risk	Payment in commonly traded currency	Contracting parties
	Open financial system and independent monetary authority	Host government
	Political risk insurance	Contracting parties
	Involvement of IFIs	IFIs
Dispute resolution risk	Strengthen regulatory regime, independence of judiciary	Host government
	Arbitration in neutral third-country Use third-country law as substantive law of contract and to govern arbitral proceedings	Host government and contracting parties
	Ensure project is economically viable and contract terms are fair and agreed transparently	Contracting parties
	Use ICSID arbitration	Host government and contracting parties

Table 3.1 *continued*

Commercial Risk Mitigation Matrix

Risk Type	Potential Mitigation	Mitigation Agent
Planning risk	Perform careful due diligence on site	Project sponsors
	Project agreements and finance are contingent on planning approval	All contracting parties
	Government assists fast-track approval, coordinates planning authorities, provides streamlined planning process	Government
	Include government as joint-venture partner	Government and other project sponsors
Design risk	Pass cost overruns to contractor through EPC contract	Project contractor
Construction risk	Pass cost overruns to contractor through EPC contract	Project contractor
Volume risk	Long-term firm power sales or take-or-pay agreements	Buyers and sellers
	Sovereign guarantee to back-up long-term contract	Government
	Include a premium in price for non-firm energy	Buyers and sellers
Supply risk	Routine maintenance	Operator
	Prudent management of hydro resource; provision of alternative supply in case of low water inflows	Operator
	Coordinate regional water sharing	Regional governments
	Law enforcement or military protection against sabotage	Governments, possibly private operators
Payment risk	Sovereign guarantees	Government
	Credit guarantees or other securities	Buyers
	Escrow account, advance payment	Buyers and sellers

Financial Risk Mitigation Matrix

Risk Type	Potential Mitigation	Mitigation Agent
Financing risk	Sovereign guarantees	Government
	Protection against payment risk, volume and supply risk, regulatory risk	As for mitigation of these risk types
	Financial close contingent on finalization of planning and design	Planning and design agents
Exchange rate risk	Index payment to commonly traded currency	Contracting parties
	Use commercially available exchange rate hedging products	Party with exchange rate exposure
	Use domestically sourced components and labor where possible	Construction contractor
Funding risk	Government provides finance support	Government
	IFIs provide finance support	IFIs

Source: ECA 2006.

back otherwise economically attractive projects from proceeding.

The level of political risk in the region is illustrated in the Table 3.2, which shows country risk ratings for the region.

It is useful to consider the types of political risks that will need to be assessed before a project can proceed. Political risks have been analyzed into specific subrisks, most commonly by providers of political risk insurance. For this purpose, as the projects under consideration may not be attractive to private providers of political risk insurance, we have used the categorization employed by MIGA and then added further specific political risks that need to be dealt with in international trade projects.

MIGA is able to provide four point cover for eligible projects.[17] The four points of cover equate to four specific subsets of political risk:

1. Expropriation
2. War and civil disturbance
3. Breach of contract
4. Currency transfer restrictions

Each of these and two further types of political risk are discussed further.

Table 3.2 Country Risk Ratings

Country	Risk Rating
Afghanistan	High
Azerbaijan	Medium high
Iran	High
Kazakhstan	Medium
Kyrgyztan	High
Pakistan	High
Tajikistan	High
Turkey	Medium
Turkmenistan	High
Uzbekistan	High

Source: Oxford Analytica: Political and Economic Risk Map 2006.

Where disputes arise, enforcement of contract will preferably be through arbitration or other judicial process. This will be supported where there is an independent judiciary and strong rule of law, but as discussed this is often not the case where there is political risk. Also, in some countries arbitration may not yet be available for contracts between an investor and the state (or only domestic arbitration may be permitted), or the relevant state may not be party to the New York Convention on the recognition of international arbitral awards.[18] In these cases, enforcement may ultimately be diplomatic, economic, or even military.

The involvement of MIGA and other IFIs provides a route to diplomatic enforcement, as does direct engagement between governments of the parties involved.

The contractual terms may specify compensation from government in cases such as expropriation or breach of contract. However, the value of such clauses is limited in the context of political risk, which by its nature may involve the government reneging on contract terms.

The selling country government may also take an interest in resolving cross-border disputes. An example of economic enforcement is the Laos–Thailand trade, where Thailand is Laos's main partner in other trade, most trade routes are across the Thai border, and Thailand acts as a financial center for Laos business. Each of these factors affords Thailand opposing leverage against deliberate interruption to supply on the Laos side. In the case of projects to supply electricity to South Africa, the South African military is a deterrent because it is the dominant force in the region. South African armed forces have taken steps in the past to ensure continued supply from hydro plants in Lesotho during civil unrest in that country.

In the case of cross-border trade, fixed assets that are located in neighboring countries have greater insulation from political risk in the buying country.

[17] New cross-border investments originating in any MIGA member country—all ECO members are MIGA members, as are the countries of likely project sponsors.

[18] New York Convention on enforcement of arbitral awards (1958), the promotion of which is a key aspect of UNCITRAL. The Convention requires contracting states to enable arbitration clauses in contracts that they are a party to and to recognize through their courts decisions made in such arbitration.

Expropriation

Expropriation refers to loss of control, ownership, or rights to an investment as a result of acts by the host government. In extreme cases of government policy change, there is a risk of asset nationalization.

Host governments should be aware of the potential impact of expropriation decisions on their international reputation and on the availability and cost of inward investment in the future. Where investors are choosing among alternatives, the reputational impact can act as a strong control on expropriation.

In cross-border investments there are likely to be diplomatic ramifications of expropriation actions. This will also be the case if a foreign government takes an ownership interest in the project or has an active and influential trade promotion agency.

As with other political risks, IFI involvement can encourage governments to respect property rights.

War and Civil Disturbance Risk (Security Risk)

A major risk for transmission projects in many of the countries in the ECO region is physical security risk arising from war, terrorism, or civil disturbance. The clearest example of this is the CASA project that would transit politically unstable regions in Afghanistan and Pakistan.

Unlike gas pipelines, it is not economically viable to bury electricity transmission lines. An electricity transmission line transiting a country is vulnerable to physical disruption due to its length, the fact that it will be elevated above ground, and the susceptibility to disrupting attack at any point along it (for an example, see Box 3.1 and Chapter 7 on sabotage of power lines). The increased risk of interruption to supply contributes to increased project cost, due to the lost supply during interruptions, the need to provide physical security in an unstable environment, and a higher cost of finance to cover the additional risk (or by limiting finance options). These costs inevitably raise the transmission tariffs and reduce the economic benefit of the project.

Although there is also physical security risk to a generation facility, the single concentrated location of these assets makes it easier to provide security for them, although their fuel supply lines may be vulnerable.

Security risk will be affected by the country's law and order and military capability and effectiveness. In multicountry projects, the protection responsibilities may be shared among the governments. In some cases, civil unrest may be largely contained by security forces and the project may suffer only minor disruption. Security risk will also be affected by underlying social and political factors, which are generally outside of the control of nongovernment project

Box 3.1 Cahora Bassa: A Large Electricity Project in a War Zone

The Cahora Bassa project in Northern Mozambique includes a 2,075 MW hydroelectric plant connected to South Africa by a 1,360 km dual HVDC transmission line. The project entered service in 1977 (see Box 6.2 for further detail on the project).

When construction began in 1969, a conflict that was to be the Mozambican war of independence was already well underway. Following independence in 1975, Mozambique entered a period of civil war that lasted until 1992.

During the civil war, the transmission line was severely damaged and transfers to customers in South Africa were stopped for 17 years. The original agreement and supply contract were suspended under force majeure and amended in the Cape Town Agreement of 1984.

The 1984 agreement included new commitments to the security of the transmission line. The governments of Mozambique and South Africa agreed to take necessary measures to protect the line and its staff against attack and to share the protection costs between them.

However, the damaged lines remained out of service, and their rehabilitation did not begin until 1995, when a construction contract was awarded to a consortium of international engineering firms. Work on the first line was completed in 1997 and full operation was restored in 1998.

Source: ECA (2006).

sponsors and need to be addressed as part of broad social dialogue.

Private project sponsors may engage their own security forces, subject to sovereign government agreement, to protect assets and assist in investigations.

International agencies, such as MIGA, can provide insurance for these specific risks (although in practice available cover may be limited, as discussed further in Chapter 5).

Breach of Contract

A key risk for project sponsors is breach of contract, whereby the relevant contract counterparty—in particular the host government or government entities/state-owned enterprises—breaches or repudiates a contractual agreement. Where host governments are involved in the contract structure, this also raises complex issues of sovereign immunity and attribution of actions to the state, increasing the risks surrounding contract performance.

The risk of breach of contract will be greater where the environment in which the contract is to operate is subject to significant changes or instability—for example, foreign exchange crisis, political instability, or privatization processes—or where the contract is perceived to be imbalanced in the assignment of risks and rewards.

Crucially, MIGA requires that in the event of such a breach of contract, the investor can invoke a dispute resolution mechanism, and such an arbitration mechanism is a key risk mitigant. However, a series of recent rulings (see, for example, dispute resolution risk discussed later) have highlighted the limitations on the effectiveness of arbitration to reduce the risks of unilateral breach of contract, including a refusal to respect or apply the agreed dispute resolution mechanism as set forth in the contract (see Chapter 4).

Bilateral and multilateral investment treaties (such as the Energy Charter Treaty) that address the responsibility of the host government for respecting investment agreements and for actions of subnational government and state-owned enterprises can offer an additional level of protection (see Chapter 4).

Legal and Regulatory Risk

In addition to the subrisks identified in the MIGA categorization, there remains the additional risk for international trade projects of adverse legal and regulatory change, application or enforcement, both at the economy wide and the industry- or project-specific level. The risk is that the legal or regulatory environment will change in a way that affects the operation, costs, payments to or receipts from the project, so impacting the potential returns for investors.

Uncertain legal or institutional environments or unfair legal or regulatory decisions are often directly a result of the political environment prevailing in a country.

Legal and regulatory risk may arise from deficiencies in existing laws or sector regulation (the absence of clear rules), uncertainty as to the content of the laws, or unpredictability as to their application (particularly where some degree of discretion is involved, as is the case in "independent regulation" of utility sectors) or uncertainty as to the ability to enforce those laws. Minimizing this risk requires a clear, comprehensive legal framework that supports and protects infrastructure investments.

Other legal and regulatory risks include the major restructuring of the market or the creation of a competitive power market to replace a state run monopoly. Operating costs can be affected by changes to regulations such as safety or labor law. Risks arising from the application of the regulatory framework become greater where the relevant project is cross-border, and operating in more than one regulatory framework.

Legal and regulatory risk is present at each phase of the project. It is of particular concern during the operational phase due to the length of this phase (running over several decades) and the fact that the physical investments are sunk and may not be removable from the installed location. Changes to the legal environment resulting from market reform may result in reduced asset values or stranded assets.

Cross-border electricity trade is likely to be most successful where operating across similar jurisdictions, and consistent regulatory and legal frameworks for operation and regulation of electricity sectors (including basic common principles regarding market access, market structure and fair competition).

Finally, legal, and regulatory risk will extend to risks associated with the competency, efficiency, and independence of the judiciary, and the ability to resolve disputes in an unbiased manner or without inordinate delay.

The risk of adverse legal and regulatory change may be limited by careful structuring of the initial contracts to include agreements with the host government to freeze the current legal environment. This might specify the current legal and regulatory environment as applicable to the project and allow future changes to apply only with agreement between the parties. This would require close discussion between the project sponsors and government.

Where the government has a financial stake in the project, as an equity partner or debt provider, it may be discouraged from allowing legal or regulatory change that impacts adversely on the cost of the project. As with other political risks, the host government should also be aware of the reputational effects of an unstable legal and regulatory environment.

Currency Transfer Restrictions

Currency transfer restrictions limit the ability to convert local currency into foreign exchange to transfer outside of the country. The level of risk arising from potential restrictions will vary by country and according to governments' macroeconomic policy and currency availability.

To mitigate this risk payment may be specified in a commonly traded (i.e., liquid) foreign currency, such as U.S. dollars, and paid into a foreign country account (this can also help to manage exchange rate risk). This can be specified in the contract terms. A common currency and locating payment in a country with an open financial system is the approach taken in SAPP (see Chapter 7). The nature of the risk is then transformed into any underlying payment risk.

The involvement of IFIs can assist in discouraging governments from imposing monetary restrictions on investors, as this will impact on the availability of future IFI assistance.

Governments can impose currency transfer restrictions, and it is up to governments that want to promote foreign investment and trade to demonstrate that they do not pose this risk. Relaxing restrictions on convertibility and granting independence to monetary authorities will assist with this.

Dispute Resolution Risk

In an attempt to protect against both contract breach risk and risk of rbitrary changes or application of local laws and regulations, international investors have traditionally looked to mandatory dispute resolution through arbitration. The availability of arbitration (and particularly international arbitration) to resolve disputes is seen as an important risk mitigation tool (this is discussed further in Chapter 4).

However, even where arbitration is available, a number of recent cases have illustrated some limits to arbitration in cases involving large-scale infrastructure investment. These include the Hubco project in Pakistan and the Dabhol IPP in India, which is summarized in Box 3.2.

In each of these cases, the project documents provided for resolution of disputes by mandatory arbitration. Notwithstanding this, in each case courts in the host country either enjoined the international arbitration proceedings or assumed jurisdiction over disputes. The local courts have assumed jurisdiction on the basis of local laws that are argued to apply to the projects, notwithstanding the strict contractual terms—including an assertion of exclusive state regulatory jurisdiction (Dabhol), arguments that force majeure events or changes in local law override the project documents, or that the project documents were invalid or from the outset violated an applicable local law. For example, in the case of Hubco, the contractual arrangements

Box 3.2 PPA Payment Dispute and Local Court Intervention

India—Dabhol Power Project

The Dabhol power project is a large (over 2,000 MW in two phases) liquefied natural gas-fired plant to the south of the Indian city of Mumbai. It was originally developed as an IPP by a consortium of U.S. investors led by Enron (DPC) and Indian financial institutions, under a memorandum of understanding signed with the government of the State of Maharashtra in 1992. The total project cost is around US$2.65 billion (reduced from the initially planned US$3 billion), with complex financing arrangements for the second phase (US$1.8 billion) involving more than 40 Indian and international commercial and governmental parties.

The project agreements included guarantees from both the State of Maharashtra and the Indian government, including the waiving of sovereign immunity (claims could be made against any of their assets), take or pay conditions for the 20-year lifetime of the agreement, and international dispute arbitration with English law as the procedural law. The U.S. government's Overseas Private Investment Corporation (OPIC) provided loan guarantees and political risk insurance to the project.

The project entered a long-running legal dispute in 2001 following financial difficulties on the part of the offtaker, Maharashtra State Electricity Board (MSEB). The tariff for offtake from the first phase specified in the original PPA was higher than the mandated retail tariff chargeable to MSEB's customers, which was set below cost, leading MSEB to default on payments. In 2001, DPC attempted to take the issue to international arbitration but was blocked by injunctions from Indian courts. In all, injunctions were issued against five arbitrations between the project company and Maharashtra and Indian governments. Work on phase II of the project, which was near completion, was suspended (in part due to the bankruptcy of Enron, the major private sector party).

The local regulatory authorities claimed jurisdiction over disputes. The Indian legal position was that the original contract formation violated a number of local legal requirements, including that it be competitively and transparently tendered, and that the project award process was corrupt. The project company claimed that the intervention of local courts was politically motivated and without legal justification.

The project structure had been criticized by opponents for being unbalanced in favor of the project company, for being prepared in haste and without proper public consultation and expertise on the government side. The World Bank refused funding for the project on the basis that it was uneconomic and poorly structured and exposed the MSEB to significant uncontrolled risk.

In 2005, the remaining shareholders reached an agreement for transfer of their share in the project to publicly owned companies, thereby shifting what had been the largest single foreign private-sector-led project in India to the public sector. The two main foreign private shareholders called on the OPIC loan guarantees.

Source: ECA (2006).

underpinning the project were judged by local jurisdictions to have been founded on corruption and violations of local law and arbitration on the basis of the initial contracts was blocked. These cases highlight the continuing risks to a project of the application of local laws.

The Dabhol experience also illustrates the PPA Payment Dispute and Local Court Intervention including, crucially, a willingness and ability to pay. It is up to the project sponsors, including buyers who may be state entities that are required to on-sell to users at subsidized prices, to ensure that the project fundamentals are sound and that it is able to stand on its own feet economically.

Where the project documents specify local law to be the governing law of the contracts, the risk that changes in local law will flow through onto the project structure is greater. Local laws may legitimately be used as an argument for the assertion of jurisdiction by local courts, and this is true also in developed markets such as the United States and Europe. In the case of large energy projects, which often have a high profile, particularly in developing and growing markets, changes to local law that affect the initial project terms may have political motivations.

Even where the project agreements specify a law other than the law of the host country as the governing law of the contract, changes in local laws may impact on the project, and mandatory local laws may be used as a basis for local courts assuming jurisdiction. In particular, in energy projects that involve large assets (such as generation or transmission facilities) that are essentially physically stranded in the host country, local regulations (such as safety, labor or environmental regulations) can have a significant impact on project operation. The choice of location for the arbitration proceedings (and therefore the law that will govern the arbitral proceedings, as opposed to the substantive law of the contract) will also affect the level of risk arising from local court interference (on the basis of local arbitration laws which may give the local courts a supervisory role).

Host governments may be reluctant, for political as well as practical reasons, to accept foreign substantive law (or even international arbitration in a neutral third country) for projects that are entirely domestic in nature. However, in the case of cross-border projects, such as those under consideration in this study, such choice should be more acceptable (and precedents exist in the case studies considered in Chapter 7, such as SCP, NT2) and should be considered as a means of reducing risks of both contract breach and change of law. Close consultation between project sponsors and government is required at the time of contract formation to reach agreement on the applicable law and location.

It should be noted that even where a neutral third country is chosen as the seat of arbitration, the effectiveness of an arbitration award may be impacted by local courts, through the power to review and annul awards on certain limited grounds (under the New York Convention on the Recognition and Enforcement of Foreign Arbitral Awards). The use of the ICSID arbitration for disputes between investors and states is specifically designed to mitigate this risk, and consent to use of ICSID (for example in the ECT, or other investment treaties) provides an additional risk mitigation mechanism for potential investors (see Box 4.2 for an overview of the ICSID).

Commercial Risks

Commercial risks arise from the characteristics of the sector (i.e., electricity), the market (i.e., electricity buyers, as well as fuel markets) and the specific project characteristics (e.g., hydroprojects take a long time to build with added risks during construction). In the case of trade projects, different conditions in the exporter and importer countries can complicate the process for developing and operating the project in a timely and profitable manner.

A number of commercial risks will need to be considered and allocated before the project can commence. These are described below and approximately follow the sequence of the project life cycle. Hence, payment risk is at the end of this subchapter, although it is probably the most critical commercial risk area to most projects.

Planning Risk

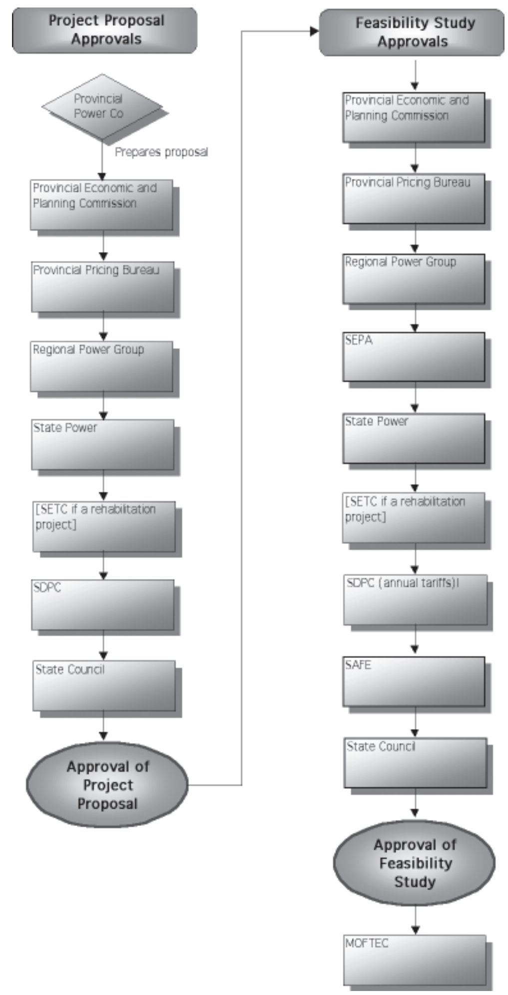
Planning risk relates to administrative delays in gaining planning approval for the construction of project facilities. It is affected by the regulatory and institutional environment, although major projects like power plants and transmission lines will generally require high-level government approval and backing in addition to the normal approval mechanisms. Specific regulations and requirements that can cause planning delay include licensing, land use permission, environmental, and social impact controls. Delays and risks of failure increase with the number of permits and approvals required and the number of agencies involved in providing planning approvals.

China was an early proponent of aiming to develop power projects in a PPI framework with private-sector funding. Due to the complexity of the planning process and the related risks, many projects were developed as joint ventures with national and local authorities, rather than as BOTs (see Box 3.3). The inclusion of government agents in JVs encouraged them to try to limit planning delays, but risk transfer to the private sector was more limited.

For projects involving two or more countries, additional delays can arise due to the different

Box 3.3 Power Project Planning and Approval Process, China (2000)

The risks of delay and approval failure increase with the number and complexity of steps involved, the number of permits required and the number of separate agencies required to give approvals or reviews. The planning and approval process for large projects in China in 2000 involved 18 major steps and 10 key agencies (national, regional and provincial), as summarized in the diagram below:



During the mid- to late-1990s, China was an early proponent of developing power projects in a PPI framework with private-sector funding. Private participation in the power sector started in 1984 but only became formalized with the Electricity Law in 1995. By early 2000, there had been 45 large power projects involving private developers, with a total installed capacity of 35 GW, about 12 percent of total capacity in China at that time. Large projects are those over 100 MW that require central government approval. There were also estimated to be up to 200 small projects with an installed capacity of about 6000 MW, mostly implemented by local organizations.

Lack of clarity in the framework led some projects to experience problems after they knowingly or unknowingly short-circuited parts of the formal approval process. Due to the complexity of the planning process and the related risks, many projects were developed as joint ventures (JV) with national and local authorities, rather than as BOTs. The presence of the state organization as a JV partner reduces planning and regulatory risk in the absence of a fully developed regulatory framework. The local partner would build consensus for the project and assure a smooth passage through the approval process. However, the prevalence of JVs resulted in limited transfer of risk to the private partner.

Source: "Power Sector PPI Framework Initiative in China," ECA for the World Bank, July 2000.

processes and procedures required in each country, including the sequencing of steps in the approval process. An option for reducing project risk early on is to make signing the IGA contingent on the necessary planning permission being provided by both governments.

Measures for gaining fast-track approvals once the government has given overall policy approval to a project include the government taking some responsibility for obtaining some of the land access and other planning approvals, and the government setting up an interagency task force among relevant planning authorities to ensure coordination and rapid consideration of applications.

Design Risk

Design risk concerns delays or costs arising at later stages of the project due to problems that were not foreseen or allowed for in the initial project design. A source of design risk can be inadequately specified standards for construction and safety, with tighter standards being imposed after initial project approval. In projects spanning two or more countries, incompatibility of construction or operating standards can be an added source of risk.

These problems can lead to delays due to such things as rerouting a transmission line, resizing of components, increases in security or environmental protection, with consequent additional cost.

Project sponsors must take care to check that designs meet standards in all countries and to use best practice design from the outset. The involvement of private-sector design contractors can assist in providing up to date expertise, as well as international experience. The responsibility for cost overruns due to poor design can be passed to the contractor through the EPC contract.

Construction Risk

Construction risk is the risk of delays or cost overruns during construction. It is affected by design risk. In addition to the effect of design risk, cost overruns can result from poor project management and implementation, labor disputes, exchange rate fluctuations, unforeseen technical problems encountered during construction, and changes in the project environment such as regulatory or economic conditions.

Construction delays create a financial cost to project developers by extending the period of construction, during which interest is charged but not matched by incoming cash flow. There is also a cost created in delay to the start-up of trade and therefore affects the other party as buyer or seller who is not able to complete the transaction as planned.

Hydroelectric projects have been found to be particularly prone to cost overruns (or underestimates in cost) when compared with thermal electric projects. Among specific issues, large dams suffer from uncertainty related to the geotechnical conditions, which are often difficult to assess before actual construction begins. The study carried out by the World Commission on Dams (WCD) found an average cost overrun in real terms of 21 percent (56 percent in nominal terms) among 81 large dam projects.[19] Among 248 dam construction projects, the average (nominal) overrun was 50 percent.

The WCD study also found a tendency toward project delays. Half of 99 dams surveyed saw commissioning delays, with 30 percent of projects delayed by one or two years. Surveys of thermal plant commissioning have also found regular occurrence of delay.

Construction risk is affected by two conflicting approaches for multicountry projects. Each country can be responsible for construction of the segment in its own territory: this can minimize delays due to local problems, but can exacerbate coordination risks; or a single EPC contract can be given, but this can lead to complexity of dealing with a number of different countries/administrations. In the SPC project (see Chapter 7) both approaches were used in part.

The cost of construction risks should be attributed to the party undertaking the construction through the EPC contract. They will be responsible for contracting for labor and materials and managing the construction. To ensure this risk is transferred to the delaying party, the construction contract may include penalties or compensation for overruns.

Construction delays can also have a knock-on effect to fuel supply agreements and other related agreements. An example of fuel supply take-or-pay penalties is given in Box 3.4. Such penalties can also be passed through to the EPC contractor.

Volume Risk

Volume risk (also referred to as demand or market risk) is the risk of downward fluctuations in the volumes actually required by the offtaker.

[19] The Report of the World Commission on Dams (Chapter 2), November 2000. Available at www.dams.org//docs/report/wcdch2.pdf. The study found a large variation around the average.

Box 3.4 Power Plant Construction Delay and Gas Supply Take-or-Pay Penalties

Thailand—Ratchaburi Power Plants

The Ratchaburi power plant, 100 km southwest of Bangkok, is an Electricity Generating Authority of Thailand (EGAT) project with a generation capacity of 3200 MW from a mix of both combined-cycle and conventional duel oil and gas thermal plant. Fuel for the plant is supplied under take-or-pay contracts from the Yadana gas field in the Andaman Sea off the Myanmar coast. The take-or-pay contract was signed in mid-1998 between the Petroleum Authority of Thailand (PTT) and the Yadana consortium, a mix of foreign investors and the Myanmar and Thai state oil groups. The take-or-pay (ToP) contract allows PTT to take in later years any gas it fails to lift initially, but nevertheless has severe ToP penalties.

The Ratchaburi plant suffered construction delays caused by the late arrival of key components and the need to modify the burners to suit the Yadana gas. This meant the plant was unable to take gas from the Yadana gas field when delivery was planned to begin. As a result, PTT was fined by the Yadana group for breach of contract and made to pay interest to cover the delay. For the first contract year that began in July 1998, PTT paid the Yadana group approximately US$50 million. PTT, in turn, called on EGAT to cover part of the liability for the delay.

Source: ECA (2006).

Downward volume fluctuations create costs for the supply and transmission parties. The lower cash flows create payment problems for generation and transmission asset financing charges and generation fuel charges where fuel is supplied on a take-or-pay contract.

This risk mainly applies to non-firm energy, for which there is not a specified contract volume and total payment. The volume risk in firm energy contracts would be covered in the payment terms decided between buyer and seller. This can be supported by a sovereign guarantee from the government. For nonfirm energy, the seller may require a premium in the price to cover the risk of lower demand.

Supply Risk

Supply risk relates to interruptions in supply from the generator or the transmission system. Interruptions impose costs on demand customers equal to the value of their lost load. Security of energy supply is a common cause limiting international trade.

Supply outages may result from equipment failure or unavoidable causes, such as severe weather. The operator should have an obligation to make reasonable efforts to avoid such outages—for example, through planned maintenance—and to reestablish supply as quickly as possible once an interruption occurs. Supply outages may also occur due to failure or delays in delivery of fuels, for fuel-fired generation (the reverse problem may also occur, as shown in Box 3.4).

In the case of hydropower projects, supply risk is affected by variability in hydrological conditions. This can be reduced through prudent management of storage facilities, but a degree of natural variability remains, particularly for run-of-river facilities. This risk may be managed by the generation operator by allowing a nonfirm supply component related to average inflows, or making provision for alternative sources of supply (e.g., thermal capacity).

A further and potentially more fundamental risk relates to changes in the usage and sharing of upstream water assets. This is a real concern among the riparian states of the Central Asian river systems and represents a significant barrier to the development of potential new hydro facilities in the region. This issue brings into stark focus the role and importance of coordination and cooperation among governments of the riparian region.

Supply may also be interrupted due to deliberate action with political motivation. This sort of security of supply risk is difficult to mitigate through commercial or contractual arrangements. It is a potentially serious impediment to international trade where supply reliance is viewed as a potential political and economic vulnerability. Governments are best placed to provide protection against sabotage, although project operators may also contract private security forces.

Payment Risk

Payment risk is the risk that the counterparty to a trade will not make its contracted payments. It affects the project on an ongoing basis during the operation phase, but is also a risk to contractors during the design and construction phases.

This is probably the single most important risk in energy (or other) trade projects, though it is not independent of other factors (such as the legal and regulatory environment). Trading arrangements cannot be put in place unless there is a creditworthy buyer, or adequate guarantee support (credit enhancement) can be provided.

Payment risk is directly related to creditworthiness of the trade partners, and all buyers should be carefully vetted prior to contracting. Private sector participants will require greater assurances of payment since they are unlikely to hold the political influence that the state-owned utilities may use to enforce payment. Sovereign guarantees, as well as other measures to enhance credit such as bank credit guarantees or secured deposits, will be required where there is a question of insufficient creditworthiness.

Short-term delays in payment may be avoided by use of an escrow account or advance payment.

Payment risk impacts on the next major risk category discussed: financing risk.

Financial Risks

Financing Risk

Financing risk relates to the ability of financiers to recover their investment and make a return on capital. The main risk elements are the project's commercial viability (mainly dependent on prices, market risk, and payment risk. Prices are, in turn, affected by regulatory risks), the securities provided, and the enforceability of contracts. As a result, protections against these risks are also protections against financing risk.

In most cases financing risk is directly related to payment risk since the cost of capital is repaid through the cash flows generated over the lifetime of the project. However, in projects such as power plants where the capacity cost is paid separately from the energy cost, low (or zero) levels of operation can exacerbate the unwillingness or inability of the offtaker to continue to make the capacity payments. Delayed or upheld payment can result in default on investment repayments.

Where the private sector provides finance to the project, the level of financing risk will directly affect the cost of capital. Perceived risk is greater during the construction phase and early production (while volume risk is still quite large). It is common for such projects to be refinanced at lower rate once operation has settled down and a cash flow track record can be seen.

Given the relatively short tenors of most commercial and some development finance institution debt products and the perceived level of risk, high short-term financing costs can arise. There is thus a risk that transmission charges (and tariffs for associated generation projects) will be unacceptably high in the early years of a project's life. Where end-user prices are controlled or subsidized from state revenues it may be possible for government to structure tariffs that smooth the higher initial level into later years while still meeting the project's repayment requirements.

Where there are concerns about credit-worthiness the sovereign guarantees extended to mitigate payment risk also provide coverage against financing risk. Financial closure will normally be contingent on the completion and agreement of all aspects in the planning phase. Where there is IFI involvement in financing, there is an opportunity for the IFI to apply some pressure to encourage agreement among the parties and to contribute momentum to the process. The SIEPAC project (see case study in Chapter 7) provides an example of where the implicit threat of withdrawal of IFI financing evidently helped to ensure that contracts and institutional arrangements were agreed and finalized.

Exchange Rate Risk

Exchange rate risk relates to fluctuations in the value of project components, fuel, or payments denominated in a foreign currency and availability of foreign currency, for example, to make cross-border payments. This risk applies especially to purchases during the construction phase for capital-intensive projects. Exchange rate risk is greater, depending on the size of the foreign component in construction. Exchange rate risk affects all the revenues of cross-border trade.

Exchange rate risk may be managed by indexing payment to a commonly traded foreign currency, such as U.S. dollars or hedging instruments. The indexation terms would be included in the contract pricing formulae. However, hedging instruments may only be available for short tenors, creating currency mismatches, higher costs, and potentially unacceptable exposures for potential investors.

The construction contractor may lessen exchange rate exposure during the construction phase by using locally sourced components and labor, where available.

Funding Risk

Finally, the funding risk is the risk that the necessary mix of project funding, whether grant, loan, mezzanine or equity product will not be available.[20] This will most likely be due to the political, commercial, and financial risks having been inadequately addressed. It may also be due to inadequacies in local financial markets or relate to government's individual budget programs and the programs of development and/or commercial institutions not being open for particular projects or territories or having limited availability.

Where private financing is not available, the government may provide capital support (if it is not limited in its own budget). Alternatively, IFIs can provide grant or loan funding assistance or can assist in mobilizing private sector finance.

Conclusions on Risks in Electricity Trade

Risks in electricity trade projects can be categorized in a way similar to many other infrastructure projects into three main areas: political and regulatory risks (country risks), commercial risks, and financial risks. These risk areas are interrelated, in particular by the state of the institutional, legal, and regulatory framework in which projects are carried out, the legal system for enforcing contracts, and the commitment of governments and other actors to respecting contract terms and property rights. The cost of financing projects depends on the assessment of risk, in particular the country risk ratings.

A starting point for risk mitigation is to ensure that projects show sound underlying economic and financial viability. Equitable sharing of those benefits will build constituencies in each country with a stake in cooperation in the electricity sector, and this will progressively provide an underlying environment promoting risk mitigation.

Many of the commercial risks can be borne by contractors or parties to the trade, with risk allocated appropriately in the contract terms. The risk of politically motivated intervention can be reduced by ensuring fairly structured contract terms, especially prices, from the outset.

Where it is difficult to reduce risk through contractual terms or project fundamentals, sovereign guarantees can provide reassurance, particularly to the private sector. Governments may also offer project developers compensation in the event of loss of assets or income.

More fundamental risks related to the political, legal, and regulatory environment can be reduced over time by the actions of motivated governments to strengthen their institutions

[20] Mezzanine finance is used to describe a form of finance, which has characteristics that place it between debt and equity (hence the term *mezzanine*). It is typically unsecured and ranks behind senior debt (but ahead of equity) in cash waterfall terms (i.e., payment hierarchy), and is therefore higher risk but offers a commensurately higher return.

and demonstrate a favorable investment environment. The international reputation of a government can provide a valuable check on political risk, and this can be backed up with diplomatic efforts by foreign governments and IFIs. Failing this, political risk insurance is available from international agencies such as MIGA.

Severe security risks are difficult to mitigate for electricity transmission projects. Where the investment environment remains weak, risk reduction may ultimately depend on the threat of diplomatic, economic, or even military consequences.

The risks are compounded when projects span more than one country and involve more than one major investment component, such as a power plant and cross-border transmission lines.

Specific risk characteristics in potential projects among ECO countries are discussed in subsequent Chapters. However, in relation to multi-country trade, it is clearly important to strengthen intercountry coordination as a potential political risk mitigant. The complexity and financial commitments in international trade projects requires coordination among the parties to reach consensus on the planning and construction of projects, conditions for project start-up, monitoring, and dispute resolution. A common coordinating body consisting of representatives from the participating utilities, governments, and investors is best suited to this role.

4 Governance in International Trade Arrangements

The term *governance* is used here to denote the set of rules, regulations, laws, institutions, and procedures that formalize the framework for carrying out international electricity trade projects and determine the degree of predictability of commercial outcome for the participants. As international trade involves a level of risks beyond those in national projects, some international rules are needed on top of the domestic rules. A key concern of participants, and a test of the robustness of the governance framework, is the extent to which disputes can be efficiently and fairly resolved.

This Chapter introduces the overarching rules that can be agreed between trading parties to govern international electricity projects, the types of disputes that can arise within these agreements, and the options for resolving these disputes.

Rules Governing International Trade

Two principal sets of rules will govern a cross-border electricity transaction or investment:

- Intergovernmental agreements (IGA)
- Private commercial contracts

Intergovernmental Agreements

The first set of rules is that contained in international agreements between states involved in trade and in customary international law. The interpretation and application of these agreements will be governed by issues of *public international law*.[21]

Intergovernmental agreements (IGAs) may take a number of forms:

- **Treaties or bilateral or multilateral agreements** concerning general issues of investment protection and promotion (both within the host country and cross-border), trade, and transit. These agreements might be concluded not only between states within the particular region, but also with states outside the region, whose nationals may be investors into the region. The Energy Charter Treaty (ECT) is a key example of such treaty, covering issues concerning investment, transit access and noninterference, and trade barriers (further discussion of the ECT is provided in Chapter 9 and in Annex 2).
- **Intergovernmental agreements** in relation to a specific project, providing overriding norms or principles governing the project (which may or may not be a joint investment), governing only the conduct of the specific states involved in that transaction. The SCP project (see Chapter 7) was implemented through two IGAs between the three countries (Azerbaijan, Georgia, and Turkey), together with a set of host government agreements (HGAs) between each government and the private parties to tie all the parties together.
- **Multilateral agreements** or treaties concerning the detailed operation of an electricity

[21] Public international law, also referred to as simply *international law,* is the supranational system of law that governs relations between states and international institutions. It is distinct from private international law, which deals with relations between legal and natural persons (for example, companies operating internationally) where there is potentially a difference between the outcomes of laws applicable in their home jurisdictions. Private international law is likely to be used in the case of private commercial contracts.

trading market, and establishing the market institutions and rules. The rules in these agreements will generally only govern the actions of members of the relevant market/region. The SIEPAC electricity market project (see Chapter 7) was implemented through a set of multiparty agreements.

Traditionally, the only entities with standing in public international law are states, so that the rules arising under the described types of agreements must be enforced by and resolved between states. States will rarely take up actions on behalf of their nationals under such treaties. However, as already discussed, in many modern treaties (commonly referred to as *investment treaties*), states have agreed to extend to investors that qualify as a national of the other state certain assurances and guarantees and consent to the submission of disputes regarding such guarantees to independent third-party dispute resolution mechanisms. This represents a significant limitation on the relevant state's sovereign immunity. Such rights are commonly referred to as *diagonal.*

Private Commercial Contracts

The second sets of rules are those in private commercial contracts between market participants, including governments and state companies. These will involve issues of, and be interpreted in accordance with, domestic/national laws. In the absence of a choice of law provisions, the most relevant laws will be those of the state in which a particular investment or transaction occurs (the *host state*). Even where another governing law is chosen, mandatory and overriding rules of the

Box 4.1 The Energy Charter Treaty (ECT)

The most important multilateral energy agreement to which ECO member states have already subscribed is the **Energy Charter Treaty (ECT).** The Contracting Parties to the ECT include most of the ECO countries, namely Azerbaijan, Kazakhstan, Kyrgyzstan, Tajikistan, Turkey, Turkmenistan, and Uzbekistan. The remaining ECO states are observers to the Treaty. The ECT was the first binding multilateral investor protection treaty to cover investment and trade and the first to apply transit rules to energy networks. It was also one of the early investor protection treaties to provide binding international dispute settlement, between state parties and between states and nonstates.

The ECO countries are therefore already parties to or observers of a significant agreement that provides an important component for building a favorable investment climate for electricity trade. The key elements of the ECT are as follows (further details of the ECT are given in Annex 2.

- Investment protection.
- A basis for trade in energy, energy products, and energy-related equipment, based on the WTO rules.
- Freedom of energy transit.
- International dispute settlement, including investor-state arbitration and interstate arbitration.

The ECT also contains commitments on governmental cooperation—for instance, with regard to transfer of technology, opening of financial markets, and the development of competition rules.

The ECT includes several international dispute resolution mechanisms. The two basic forms of binding dispute settlement are as follows:

1. State-state arbitration for basically all disputes arising under the ECT (Article 27).
2. Investor-state arbitration for investment disputes only (Article 26).

Special provisions have been developed for the resolution of interstate disputes in the area of trade (Article 29, Annex D) and transit (Article 7). These derogate from the otherwise applicable provisions on state-to-state dispute settlement.

The ECT dispute resolution mechanisms were included in the IGAs for the SCP project.

Source: ECA (2006).

host state may apply, including rules contained in a relevant regulatory framework.

An important subcategory of such contracts is any agreement entered between an investor and the host government (host government agreement, HGA), or project agreements in the form of a license, concession, or affermage (the NT2 case study in Chapter 7 provides an example of where a concession agreement has recently been used in an international electricity trade project). It is important to note that, in most civil law countries, the project/investment agreement is governed by administrative law, while in other countries, while it may be governed by contract law, it may be supplemented by special provisions developed for government contracts for the provision of public services.

Enforcement of Agreements

A key aspect of the set of agreements that have been put in place is the extent to which the parties' performance of their obligations can be effectively enforced. A number of important elements of the contractual framework enter into this:

- The legal jurisdiction of the contracts.
- Dispute resolution procedures.
- The enforceability of judgments (in different countries).
- Creditworthiness of the parties.

Disputes in International Electricity Trade

Types of Disputes

As a result of the different rules that govern cross-border electricity trade, disputes can arise at three key levels and these will need to be accommodated within the dispute resolution mechanisms:

1. State to state
2. Investor to state
3. Private party to private party

State to State

The first category concerns disputes between states. This may arise over the interpretation or application of general bilateral or multilateral treaty obligations or obligations under customary international law (e.g., concerning principles of expropriation, state responsibility), as well as under project-specific IGAs.

As already noted, these disputes are governed by principles of international public law. They raise complex issues of sovereign immunity and attribution, and resolution of such disputes can be long and cumbersome. States are generally reluctant to take up the cause of an individual investor of their nationality.

Investor to State (or State Subsidiarities)

In relation to investor-to-state disputes, two subcategories of dispute arise:

1. Disputes where there is no direct prior relationship between state and investor (e.g., in form of project agreement, license or other host-government agreement). The government interferes instead in the project by exercising its regulatory, administrative, or permitting powers.
2. Where there is a contract-based relationship (sometimes the qualification of a license as a contract can pose problems). Such contracts are generally not with the state but with one of its instrumentalities, state enterprises, or subnational governments.

In the second category, the dispute concerns issues of domestic laws (either of the host country or, if different, the governing law of the contract).

In relation to the first kind of dispute, traditionally the rights of private investors (including an SOE of another country) are limited to an action against the government in the domestic courts of the host government, under private laws of the host state (for example, on the basis that the host government has breached some domestic investment promotion or other law, has acted ultra-vires, etc.).

However, where, under a relevant intergovernmental agreement or in domestic legislation, the state has bestowed rights directly on the national of another state and given its consent to submit such dispute to a dispute resolution mechanism (*diagonal rights*), the investor will be entitled to bring a claim directly against the state under public international law. In this case, the relevant dispute concerns not any contract the investor has with the state instrumentality but the host government's treaty obligations.

There is generally no requirement in this case to exhaust domestic remedies, whether under the contract or domestic law provisions, even where such remedies are stated to be exhaustive.

The establishment of such rights is an important aspect of creating a favorable investment climate. However, the exercise of such rights is not straightforward. Complex issues of state responsibility and attribution come into play—for example, whether the actions of a SOE, or other governmental entity can be attributed to the state.

Private Party to Private Party

In addition to relations between private companies or individuals, this category would include disputes with or between SOEs acting in a commercial manner (not performing a government function). This may include contracts between various SOEs acting as market agents in a cross-border electricity project or trade.

In the absence of a multilateral framework establishing a required dispute resolution mechanism for such transactions, the mechanism for resolution of such disputes will be provided for in the contract.

Dispute Resolution

An essential element of promoting investment into and trade in electricity in the ECO region is the development of neutral, effective, and binding dispute resolution mechanisms.

International investors will value (and may require) the ability to submit disputes under international arbitration. The key reasons for this are as follows:

- Arbitration is under tried and tested rules, which are well understood by international parties.
- The procedures can be made neutral with respect to the various countries and parties involved.
- Enforcement is through international treaties.

An effective dispute resolution mechanism is particularly important in the case of cross-border trade, given the increased complexities involved, and multiple legal jurisdictions of relevance. However, the multiple layers of rules add to the difficulty of developing effective mechanisms.

In choosing the dispute resolution arrangements, various elements need to be agreed:

- The governing law of the subject matter of the dispute (this will depend on whether the dispute is an investment treaty dispute or a dispute under a private contract).
- The forum (courts, arbitration, a specialist tribunal).
- The seat of the arbitration.

Disputes between states will typically be resolved through diplomatic channels (IFIs may also play a role as arbiters in disputes such as those regarding international trade), but failing this, may either be resolved under international arbitration or by an international court.

The principal option in the case of disputes based on private commercial contracts or administrative law is between judicial (court) proceedings and arbitration (domestic or international).

In the case of an agreement between an investor and a state instrumentality (such as a concession or license), the ability to choose international dispute resolution mechanisms may be limited. Certain legal systems provide that the settlement of disputes arising out of agreements related to the provision of public services is a matter of exclusive competence of domestic judiciary or administrative courts. Even where this is not the case, contracting authorities will be reluctant to submit to nondomestic court processes for dispute resolution, at least in relation to contracts concerning investments within the borders of the host country.

In cross-border contracts, by contrast, parties may be more open to submission of the contracts to arbitration, particularly international arbitration. International arbitration is typically only available where a dispute involves two or more parties from different states (or otherwise involves foreign elements) and is decided in a final and binding manner, by private tribunals, rather than litigated in national courts (see Chapter 3 for a discussion of the risk that domestic courts will refuse to recognize international arbitration clauses).

Investment treaty arbitration is a subcategory of such arbitration, and serves to resolve disputes between investors and foreign states in which they have invested, outside of the terms of any relevant contract.

International Arbitration Options

The principal options for international arbitration are between:

- Ad hoc arbitration
- Institutional arbitration

In the case of **ad hoc arbitration,** the parties specify in the agreement all aspects of arbitration:

- Applicable law.
- Rules under which arbitration will be carried out.
- Method for selecting arbitrator.
- Language.
- Place of arbitration.
- Issues subject to arbitration.

The rules of an existing arbitration institution may be used without submitting to administration by that institution.

In the case of **institutional arbitration,** the parties specify in the agreement an arbitration institution to administer the arbitration from time of demand for arbitration through award. The principal institutions include the following:

- The International Chamber of Commerce (ICC) Court of Arbitration.
- International Centre for Settlement of Investment Disputes (ICSID) (see Box 6 for further discussion of ICSID).
- American Arbitration Association (AAA).
- The Arbitration Institute of the Stockholm Chamber of Commerce (particularly in contracts dealing with East-West trade).
- The London Court of International Arbitration.

However, institutional arbitration may also be through specialist tribunals established to deal with the specific types of disputes. For example, the designation of the regional Regulatory Commission (CRIE) as the international dispute resolution tribunal for specific types of disputes arising under the MER market in Central American electricity trade, and the SADC Tribunal in the case of SAPP in Southern Africa (these are discussed in more detail in the case studies in Chapter 7).

In either case, the parties must select *rules to be applied.* Unless an arbitral institution is selected to administer the arbitration under its rules, parties must develop their own rules or select rules of a specific arbitral institution, such as these:

- Arbitration Rules of the United Nations Commission on International Trade Law (UNCITRAL) (1976), which are widely accepted, *off the shelf* rules designed to be used in ad hoc arbitrations; they are not related to an arbitral institution.
- Rules of the International Center for Settlement of Investment Disputes (ICSID). These rules cover only state/investor disputes.
- Rules of other relevant institutions, such as the ICC, the Stockholm Chamber of Commerce.

Some institutions may administer arbitration according to their own rules or the rules of another institution (ICC will only administer according to its own rules).

Submission to Arbitration

A key factor to bear in mind is that jurisdiction in international arbitration is based exclusively on consent of parties (unlike personal and subject matter jurisdiction required in courts).

In order for an investor to be able to take disputes with a state (whether under a contract or under public international law or treaty obligations), the state must consent to submit such disputes to arbitration. This is relatively straightforward in terms of obligations under a specific contract.

The significant element of multilateral investment treaties such as the *Energy Charter Treaty* is that these treaties contain express consents by each state to the submission of

Box 4.2 ICSID Arbitration

The ICSID Convention, an initiative of the World Bank established in 1966, provides a mechanism for arbitration of disputes between investors and States in relation to breach of international law (treaty) obligations concerning investment.[22]

The jurisdiction of the Centre extends to: (1) any legal dispute (2) arising directly out of an investment, (3) between a contracting state (or any constituent subdivision or agency of a contracting state that has been designated to the Centre by that State) and (4) a national of another contracting state; and (5) which the parties to the dispute consent in writing to submit to the Centre.

Parties may agree that such local company because of foreign control will be treated as a national of another contracting state for purposes of the convention. A national of another state may be a state-owned entity of the other state, provided that that SOE was not performing essentially governmental functions nor acting as agent for the government in respect of the subject matter of the dispute.

Consent to Jurisdiction

The parties' written consent to arbitration under ICSID need not be expressed in a single instrument; and once the parties have given their consent, neither party may withdraw its consent unilaterally. A host state may "offer" to submit disputes to ICSID arbitration in investment promotion legislation or a treaty, which an investor may "accept" by submitting a request for arbitration with the Centre.

Self-contained System

ICSID is a self-contained system that, unlike, for example, ICC or arbitration conducted under the UNCITRAL Rules, is entirely removed from domestic court systems. There is no location of the arbitration, and an ICSID arbitration is conducted solely in accordance with the international law provisions of the Convention and of the regulations and rules adopted pursuant to it.

Arbitral awards rendered pursuant to the Convention are binding on the parties and not subject to any appeal or to any other remedy except those provided for in the Convention itself. Unlike awards under other arbitral tribunals, enforced in accordance with New York Convention on the Recognition and Enforcement of Foreign Arbitral Awards, national courts have no power to review the awards in any way. They must enforce the pecuniary obligations imposed by the award as if it were a final judgment of the national courts.

It is not possible, therefore, either to resist recognition and enforcement of an ICSID Convention award in any national court or to seek to vacate, annul or set aside an ICSID Convention award in a national court. The only remedies available against an award rendered under the ICSID Convention are those contained in the Convention (annulment through application to the ICSID tribunal, on one or more specified grounds—that the tribunal was not properly constituted, that it manifestly exceeded its powers, that one of its members was corrupt, that there was a serious departure from a fundamental rule of procedure and that the award failed to state the reasons on which it was based).

Source: ECA (2006).

[22] Among the ECO countries, Iran and Tajikistan are not contracting states to ICSID, while the Kyrgyz Republic is a signatory to but has not ratified the Convention.

disputes to international arbitration in the event that an investor in an energy project chooses this course. This submission covers disputes in relation to the obligations of the state under the treaty, regardless of whether these obligations are also reflected in a contract between the investor and the state. In the case of the Energy Charter Treaty, the investor, if it chooses the path of international arbitration, may elect from one of three dispute resolution mechanisms:

1. The ICSID (if both the home state of the investor and the host state are parties to the ICSID Convention) or to the ICSID Additional Facility Rules for the Administration of Proceedings by the Centre.
2. A sole arbitrator or an ad hoc arbitration tribunal established under the UNCITRAL Arbitration rules.
3. The Arbitration Institute of the Stockholm Chamber of Commerce.

Conclusions on Governance

International projects have additional risks and complexity to domestic projects and therefore require a set of rules on top of the national rules. A key concern of participants, and a test of the robustness of the governance framework, is the extent to which disputes can be efficiently and fairly resolved. Two sets of rules will govern a cross-border electricity transaction or investment:

1. Intergovernmental agreements (IGA)
2. Private commercial contracts

A key aspect of the set of agreements and their impact in reducing risk is the extent to which the parties' performance of their obligations can be effectively enforced. This depends on a number of elements of the contractual framework:

- The legal jurisdiction of the contracts.
- Dispute resolution procedures.
- The enforceability of judgments (in different countries).
- Creditworthiness of the parties.

Disputes in projects involving private-sector participants may arise between states, between states and private parties, or solely between private parties. Resolution may be by ad hoc arbitration procedures—in which case the parties specify in the agreement all aspects of arbitration—or by institutional arbitration under a set of international rules (e.g., ICSID, UNCITRAL or Stockholm ICC). Private parties will tend to prefer international arbitration to resolve disputes. The key reasons for this are as follows:

- Arbitration is under tried and tested rules that are well understood by international parties.
- The procedures can be carried out neutrally with respect to the various countries and parties involved.
- Enforcement is through international treaties.

The significant element of multilateral investment treaties such as the *Energy Charter Treaty* is that these treaties contain express consents by each state to the submission of disputes to international arbitration in the event that an investor in an energy project chooses this course. Such an approach has the potential to reduce the project's risk profile and hence lower the financing costs.

5 Financing Options for International Trade Projects

Introduction

The risk profile of a project and the allocation of those risks among the project parties are the key determinants of a project's ability to attract private financing. As noted in Chapter 3, the assessment of all risks, but in particular the country risk ratings, affect the cost of financing. The range of barriers to creating bankable projects in the ECO countries are compounded by the added risks of cross-border trading, especially when the involvement of the private sector is sought. This Chapter considers the options for financing international electricity trade projects in the ECO region, taking account of the potential project types and risks. It covers the following topics:

- Background on private sector participation.
- The investment context and country risk ratings.
- The potential financing parties and their investment products in the areas of:
  - Funding
  - Risk mitigation
- The potential application of those products to different types of projects and countries.

Some terms that apply to the financing and structuring of electricity projects are summarized and defined in Table 5.1.

Table 5.1 Definition of Electricity Project Financing and Structuring Terms

Term	Definition
PRG: Partial Risk Guarantee	In private sector transactions, PRGs cover debt amounts against specific risks. PRGs typically cover private lenders against the risk of a public entity failing to perform its obligations with respect to a private project.
PRI: Political Risk Insurance	Political risk insurance is insurance that covers various types of political risk, including (among others) political violence (such as revolution, insurrection, civil unrest, terrorism or war); governmental expropriation or confiscation of assets; governmental frustration or repudiation of contracts; wrongful calling of letters of credit or similar on-demand guarantees; and inconvertibility of foreign currency or the inability to repatriate funds.

Table 5.1 *continued*

ECA: Export Credit Agreement, or Export Credit Agency ECG: Export Credit Guarantee	Export credit agreements are designed for medium and long-term export financing. They are granted directly by a bank (or a group of banks) to a foreign buyer (or a borrower acting on behalf of a buyer) who has signed a contract with an exporter. The repayment of the loan is often guaranteed by an export credit guarantee agency based in the exporting country.
HGA: Host Government Agreement	An HGA is a legal agreement between a foreign investor and the local government that is designed to reduce financial and political risks posed to investors by sudden changes in national law. If a country breaks an agreement by interrupting or modifying a project it must pay a penalty, which can risk deterring interventions necessary to protect rights and enforce national laws that apply elsewhere in the country.
FSA: Fuel Supply Agreement	A FSA is a contract involving the supply of fuel for electricity generation. It is normally developed between the entity supplying fuel and the owner of the power plant generating the electricity.
PPA: Power Purchase Agreement	A PPA is a contract involving the generation and sales of electricity. It is normally developed between the owner of a power plant generating the electricity and the buyer of the electricity.

Source: Cambridge Economic Policy Associates (CEPA) (2006).

Background on Private Sector Participation

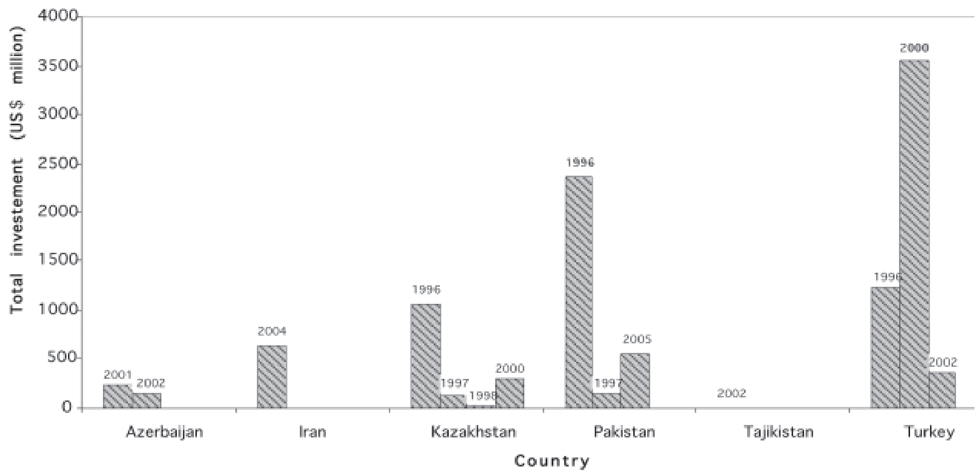
Private investment in power projects has proved difficult in many countries and, as cross-border projects are considerably more complex, electricity trade carries more risk for the project sponsors. These are some of the reasons behind the patchy record of private sector participation (PSP) in power during the last 10 years.

Figure 5.1 illustrates the low and lumpy level of private participation in electricity over the 10-year period to 2005 in the target region. No data were found for Afghanistan, the Kyrgyz Republic, Uzbekistan, and Turkmenistan, so it is possible that no private participation was recorded over the period in those countries. A minimal level of investment was recorded in Tajikistan, and the only countries to have recorded any private participation in electricity over the period 2003 to 2005 were Iran and Pakistan.

It should be noted that Figure 5.1 shows the total investment in projects with some PSP—the value of private participation will be a fraction of this.

The figure illustrates that investment involving PSP has been difficult in these countries, as the risks are high. This suggests that the private sector is unlikely to finance the very highest risk projects, even if political risk insurance was available, although it may be more willing to fund medium and lower political and commercial risk projects. This indicates that there is likely to be a slow build-up, within the current risk and investment environments in the region, to the level of private-sector involvement in electricity projects.

Figure 5.1 Total Investment in Electricity Infrastructure Projects with Private-Sector Participation 1995–2005



Source: The World Bank PPI website.

Investment Context and Risk Ratings

The options for financing international electricity trade projects will largely be driven by the perceived risk profile of the projects put forward. As described in Chapter 3, these risks can be grouped into political risks, commercial risks, and financial risks. Political risk will be the initial driver for project financing in the ECO region. In this Chapter we classify countries by subcategory of political risk. Whereas in advanced economies precise risk rating categories are available, for the ECO countries only a very broad rating classification is possible. The subcategories used are *very high risk*, *high risk*, and *medium risk*. Within the ECO region, we do not consider any of the likely trade projects to involve solely low risk countries.

Risk Classification

From a financing perspective, energy trade projects may be classified as high risk if they have either of the following:

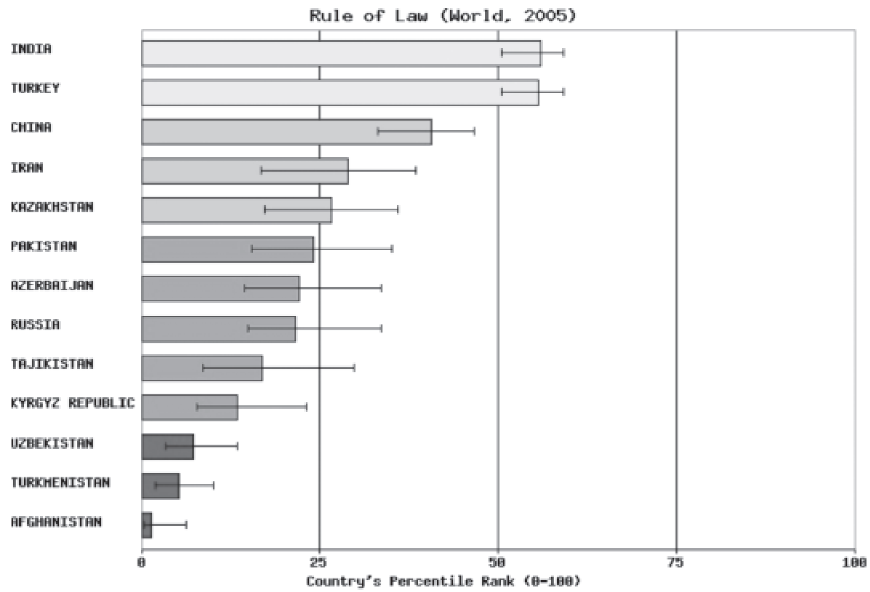
- High levels of political risk due to the levels of political risk in either the originating, transit (if applicable) or recipient country.
- High levels of commercial risk, such as very weak off-taker creditworthiness.

Political risk will be the dominant factor, and high political risk countries (buyer, seller, or transit countries) will have difficulty supporting any energy trade project involving private finance (without risk mitigation measures from parties outside the private sector), however low the commercial risk. Moderately high-risk countries will only be able to support commercial projects involving private finance if the commercial risks are low and then, typically, with specific risk mitigation support. Conversely, countries with low political risk should be able to find funding on commercial terms for projects with moderate to high commercial risk. The analysis below sets out a framework for classifying risks.

In Figure 5.2, we use the *rule of law* criterion from the *Governance Matters V* study[23] as the best single indicator of political risk for the energy

[23] Kaufmann D., A. Kraay, and M. Mastruzzi 2006: Governance Matters V: Governance Indicators for 1996–2005, World Bank.

Figure 5.2 Relative Governance Rankings



Source: Governance Matters V: Governance Indicators for 1996–2005.

trade projects considered in this Chapter. The rule of law is defined as follows:

> *"the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, the police, and the courts, as well as the likelihood of crime and violence."*

The bars in the chart indicate the percentage of countries in the world, which ranked lower in the Rule of Law indicators. Low country percentile ranks indicate a low relative rule of law.[24] The chart covers both the ECO countries and some of the major likely importers of ECO generated electricity.

From Figure 5.2 we can rank the ECO countries as to their Kaufmann scores and into the following groups:

- **Very high risk:** Afghanistan, Turkmenistan and Uzbekistan—below 15th percentile.
- **High risk:** Kyrgyz Republic, Tajikistan, Azerbaijan and Pakistan[25]—below 25th percentile.
- **Medium-high risk:** Kazakhstan and Iran—between 25th and 50th percentile, although recent events in Iran may cause the ranking for Iran to be downgraded.
- **Medium risk:** Turkey (like India) is "medium" risk— over 50th percentile.

These risk classifications are used below. For future projects, say 10 to 15 years from today, it is necessary to consider likely direction of the political environment in terms of its ability to attract private participation.

[24] The thin black lines extending from either side of the end of each country's governance indicator bar indicate the range of statistical significance (within a 90 percent confidence interval).

[25] The rating for Pakistan is perhaps low considering its large number of IPPs, its recent good performance in payment, and the transparent implementation of a private power policy managed by the Private Power Investment Board. However, it suffered a damaging contract dispute with the Hubco power plant operators during the late 1990s.

Very High Risk Countries

Based on our knowledge and experience of project finance transactions, we think it is highly likely that projects in very high risk countries will only be funded by governments, donors, and bilateral/multilateral agencies or state utilities on a grant or concessional basis. It should be observed that this would therefore present major challenges to private participation in the financing of the CASA project (see Chapter 8) unless the project is structured to ring fence certain components, at least until the risk profile of Afghanistan improves.

This judgment is also likely to apply to higher commercial risk projects in high and possibly medium-high risk countries.

High Risk Countries

For projects that are located in countries that are below the very highest level of political risk, projects can then be classified as follows:

Medium or Medium-High Levels of Commercial Risk

These projects are likely to be considered only by donors as per very-high-risk projects.

Low Levels of Commercial Risk

These projects can attract a fuller range of funding options, including senior debt provided by IFIs / bilaterals and potentially market-based lenders with strong risk mitigation, soft loans, and public and private equity chasing high risk and high return projects.

Medium or Medium-High Risk Countries

For these countries, projects of both medium or medium-high and low levels of commercial risk will be considered by a full range of funders. But as already noted, none of the electricity trade projects under review involve exclusively medium risk countries.

Potential Funders and Their Products

Participants in funding could include:

- Donors.
- International financial institutions.
- National utilities.
- Potential private sector participants: developers, contractors, private equity funds and market-based lenders.

Donor Funding

Donor funding for the highest risk projects is likely to take the form of providing grants for technical assistance or grants for government budget support, although the latter will only tend to be available once certain levels of governance have been attained, otherwise support will remain purely project based.

Donor funding for the medium-risk projects is likely to take the form of providing a blend of grants and soft loans. In some instances, grant components can effectively be used to buy down the cost and risk profile of projects, facilitating public- and private-sector lending. Soft loans can be provided at submarket interest rates and with noncommercial door-to-door tenors, including grace periods. Such loans are likely to be on a government-to-government basis.

International Financial Institutions

International Financial Institutions (IFIs) include multilateral, bilateral, and national/regional development banks and funds, which can be broadly grouped into:

- *Development banks,* which are largely state funded.
- *Development finance institutions* (DFIs), which may include private sector funders.

Development banks will often have both public sector and private sector windows, with projects being funded by one or the other depending on availability. A number of development banks are active in the target region, including the Asian Development Bank (ADB), European Development Bank (EBRD) and World Bank. As an example, ADB has a significant technical assistance and lending program in the energy sector,[26] typically with the relevant government ministry acting as client, and with loans on-lent from the relevant ministry to a project. ADB provides approximately 90 percent of its funding to sovereign governments with the remaining 10 percent going to private-sector projects.

DFIs and private-sector windows of development banks may be willing to provide project finance to high- and medium-risk projects by way of long-term loans, partial equity funding, and local currency funding mechanisms:

- **Foreign currency loans** can be provided on a standalone basis or can be packaged alongside commercial lenders: both the IFC and EBRD, for example, typically use A and B loan structures for senior debt investments, with the A loan being provided by IFIs and the related B loan provided by commercial lenders, such as the established international banks, on a *pari passu* basis. Investment terms, including loan tenor, margin and repayment profile, will vary according to the exact nature of political risk cover provided and the commercial risk profile.
- **Equity funding** can be provided alongside the majority of equity provided by the project sponsor.
- **Local currency** can be provided either directly or by way of local currency guarantees, although availability of either will be highly dependent on specific country and project characteristics.

DFIs and private sector windows of development banks will tolerate certain levels of political risk, but will be concerned with the commercial risks identified in Chapter 3.

It should be noted that some IFIs (including the World Bank) have developed regulatory risk mitigation methods, including regulatory risk guarantees, which are intended to address this problem. These are discussed further in Chapter 5.

National Utilities

A state utility may itself act as a project funder, but most utilities in the ECO region will be cash constrained. A utility's ability to raise third-party funding will typically be constrained by a relatively weak balance sheet and lack of internationally recognized credit rating. In Pakistan, the transmission company (National Transmission and Dispatch Company, NTDC) has recently succeeded for the first time to raise a small commercial loan for a transmission project, although the revenues from that transmission service have been ring-fenced for debt servicing. The loan has a short tenor and is for a purely domestic project.

Most ECO national utilities will therefore be more dependent on state funding, whether from ministry of finance or government backed development banks/funds, or indirectly by donors and bilateral/multilateral agencies.

Potential Private-Sector Participants

In principle, the private sector can provide funding through a number of routes:

- Developers providing risk capital (equity and subdebt).
- Contractors providing risk capital (typically equity, but also supplier credit with export guarantees from their own governments).
- Private-sector venture capital and private equity funds.
- Market-based lenders.

Private participation is likely to be only partial for most projects under consideration in

[26] See www.adb.org for details.

the region, as most private sector investors will not accept the level of political risk in very high risk countries and will only consider medium or low risk commercial risks in high risk countries with full political risk insurance (PRI). PRI has restricted availability and limited appeal to certain private investors, due to the potentially lengthy and uncertain pay-out process (see below).

Providers of Risk Mitigation Products

Potential risk mitigation products can be divided into those that are:

- Event specific, that is they pay out when a given event triggers a loss, such as PRI and partial risk guarantees (PRGs)
- More general default guarantees, such as partial credit guarantees

PRGs of the type offered by World Bank can be seen as an enhanced form of PRI—development banks are able to provide this degree of cover because their exposure is normally counter-guaranteed by the host government of the country in which the investment takes place.

Note that in theory, PRI can provide protection against adverse regulatory actions, but the difficulty lies in proving that specific events have occurred to trigger payout under the PRI cover. Most PRI providers effectively include "denial of justice" clauses; that is, they only pay out after arbitration, or when justice has been denied, or when the government entity has failed to pay out.

PRGs are offered by many development banks, including the ADB in addition to the World Bank. They are event specific products and differ from PRI (such as provided by MIGA) due to the broader range of risks offered, such as enhanced breach of contract and covering host country obligations. Certain providers, such as ADB, can offer PRGs without a counterguarantee, albeit at more market related pricing.

It was noted in Chapter 3 that actual availability of cover can be a limiting factor: for example, MIGA can insure up to US$200 million per project and could seek to syndicate for higher amounts, but as there may be few willing insurers (ADB and OPIC are possible candidates), availability may in practice be constrained for larger transmission and distribution projects in higher-risk countries, and without that cover the project may well not attract any form of commercial or development finance.

Commercial investors would typically require full cover for the types of projects under consideration—MIGA can cover equity investors up to 90 percent and debt up to 95 percent—but that cover will be an additional cost to the project. Pricing for political risk will depend on the points of cover (political risk subsets) required: it ranges from 45 basis points (bps) to 175 bps for the first three points of cover listed in Chapter 3. Breach of contract might add a further 30–50 bps.

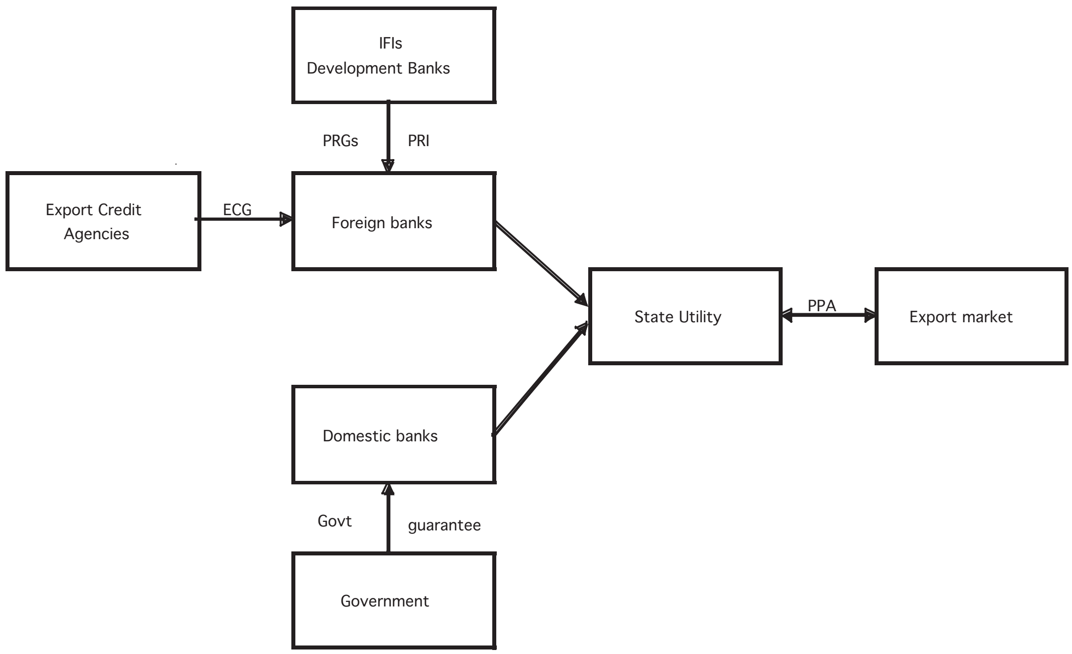
Partial Credit Guarantees will normally only cover the back end years of any loans, their aim being to increase tenors.

Potential Application—Conclusions on Financing Options

The applicability of funding and risk mitigation options depends on the risk profile of the country(s) and the project. Project structure will vary depending on whether the ownership (equity financing) is predominantly in the hands of the government and state-owned entities, or predominantly in the hands of private firms. Commercially structured projects can, in principle, be funded with a blend of equity and debt. At one end of the project risk profile, state utilities may finance new projects through taking on additional loans, some of which may come via local banks with the backing of government guarantees (see Figure 5.3).

At the other end of the risk profile, the private sector would typically look to engage in the development of a transmission and/or generation and transmission project by providing equity alongside a highly geared structure to maximise

Figure 5.3 Illustrative Predominantly State-Owned Project Financing Structure



Source: Cambridge Economic Policy Associates (CEPA) (2006).
Note: PRG = Partial Risk Guarantee, PRI = Political Risk Insurance, ECG = Export Credit Guarantee, PPA = Power Purchase Agreement. For definitions of these terms, see Table 5.1.

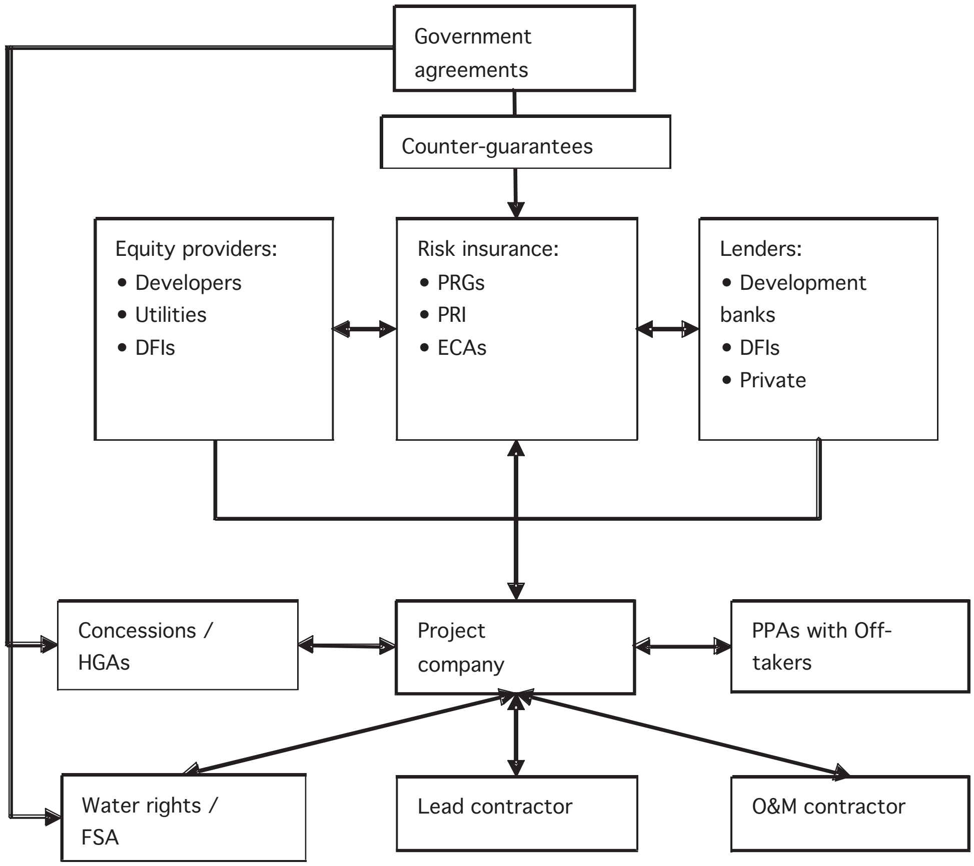
potential returns (although we recognise that high levels of gearing can increase the risk of a project breaching its covenants and going into default). The higher the degree of political risk, the harder it will be to achieve any significant private equity stake, at least without significant guarantees as well as standard political risk insurance. Figure 5.4 illustrates a possible project structure for a commercially viable project in a medium or high-risk country.

More complex arrangements are likely to be required for multi-country electricity trade, possibly involving ring-fencing of individual country components. The Nabucco gas pipeline project[27] is an example of a five-country project in which each of the national utilities is responsible for the financing, construction, and operation of the segment within their own borders. However, this project is currently proving difficult to bring to financial close.

The likely financing options for different combinations of political and commercial risk are summarized in Table 5.2.

[27] The proposed Nabucco pipeline would transport natural gas from Turkey to Austria, passing through Bulgaria, Romania and Hungary.

Figure 5.4 Illustrative Predominantly Private Project Financing Structure



Source: Cambridge Economic Policy Associates (CEPA) (2006).
Note: PRG = Partial Risk Guarantee, PRI = Political Risk Insurance, ECA = Export Credit Agreement, DFI = Development Financial Institution, HGA = Host Government Agreement, FSA = Fuel Supply Agreement, PPA = Power Purchase Agreement. For definitions of these terms, see Table 5.1.

Table 5.2 Financing Options in the Presence of Risk

	Political risk >	Very High	High		Medium	
	Commercial risk >	Any level	Medium/high, medium	Low	Medium/high, medium	Low
Provision of financing and risk mitigation	Donors, IFIs, bilateral agencies	Grant finance May provide limited foreign currency risk mitigation (if private sector involved. Could provide to state utility)	Grant/concessionary finance (soft loans)	Senior debt finance Risk mitigation	Senior debt, partial equity Risk mitigation role	Mainly risk mitigation role
	Governments / State utilities	Finance if available Sovereign guarantees (if private sector involved. Could provide to counterparty state utility)	Finance if available, Sovereign guarantees	Finance if available, Sovereign guarantees	Finance if available, Sovereign guarantees	Finance if available, Sovereign guarantees
	Commercial lenders	Very low or none—require very strong mitigation (e.g., Political risk insurance)	Low or none—require very strong risk mitigation	High-risk appetite lenders supported by risk mitigation	Medium-risk appetite lenders supported by risk mitigation	Medium-risk appetite lenders supported by risk mitigation
	Private equity	Very low or none—require very strong risk mitigation	Low or none—require very strong risk mitigation	High-risk appetite investors supported by partial risk mitigation	Medium-risk appetite investors, possibly no risk mitigation	Medium-risk appetite investors
Project participation	State utilities	Project leader, main commercial partner (i.e., buyer or seller)	Project leader, main commercial partner	Project leader, main commercial partner	Smaller project role, but large commercial role	Smaller project role, possibly commercial role
	Private participants	Very low or none—require very strong risk protection assurances	Low level (e.g., Contracting, supply)	Larger contracting, supply role	May take project lead (e.g., NT2) supported by risk mitigation	Project lead supported by risk mitigation

Source: Cambridge Economic Policy Associates (CEPA) (2006).

6 Types of International Trading Arrangements

International (as well as national) electricity trading tends to evolve from simple types of transactions involving two parties to more complex forms of multiparty and multicountry trading. Simple bilateral trade can be between a buyer and seller within a country, or between national utilities across a border. Multiparty trading can involve multiple buyers and sellers, including independent suppliers and traders, and pooling arrangements. These generally evolve from national electricity markets to regional markets involving detailed rules for competitive cross-border trading and access to networks.

The full evolution will typically take many years, during which time the various elements of the supporting institutional framework can be gradually developed both nationally and internationally. This Chapter sets out a general typology of four main types of trading arrangements for international electricity projects, which characterize the principal stages in the evolution of a regional market. It discusses them in terms of their main characteristics, the supporting institutional and legal framework, and the specific risk characteristics. This typology is later used to discuss the case studies (Chapter 7) and the potential options for trade in the ECO region (Chapter 9).

As international electricity trade evolves from simple arrangements toward increasing integration, allowing higher levels of complexity of trading methods, it may facilitate realization of greater benefits from trade through the efficient sharing of resources and capacities. The pace and extent of this evolution depends on the specific characteristics of the parties, requirements, objectives, opportunities and constraints to trade in each case. Risks to trading parties may increase with greater trading complexity—this must be offset by developing the framework of rules and governance arrangements to support it (e.g., legal and institutional coordination within the region). These steps take time and there are likely to be higher risks in bypassing the intermediate evolutionary steps.

Among the key determinants of the form of trading arrangements will be all of the considerations that contribute to project risk including the capacity in the institutional, legal, and commercial framework in the partner countries, as well as the technical capacity for trade.

At each stage of the evolution of the market, the benefits and risks should be examined by considering the following:

- Why increase trade?
    - What is the potential scope and scale of trade, and what is the existing level of trade?
    - What are the overall benefits of increasing trade, and how they may be shared among the partner countries?
- How to trade?
    - Who are the buyers (offtakers), and are they sufficiently creditworthy to facilitate efficient project financing?
    - Is the existing level of institutional, legal, technical, and commercial development within and between the potential trade partner countries adequate to support more complex trade?
    - What is the profile of risks impacting on the trading arrangements, and what is the most effective way to manage the mitigation of risk?

Growth in volume of trade will tend to lead over a period of time to changes in the types of trading arrangement, bringing with it a change in risk profile and consequent need for appropriate risk mitigation measures. These are best understood by considering in detail the main types of trade, their specific risk characteristics, and typical supporting institutional framework. We therefore consider firstly the international experience in types of trade and their place within the evolution toward integrated markets; and secondly, the types of trade most relevant to the ECO region. These are discussed for four main types of trading arrangements applicable to ECO over a number of evolutionary stages.

Forms of Trading Arrangement

General Forms—International Experience

The form and arrangements in place around the world for international electricity trade vary between countries and regions depending on the scale and degree of complexity of the trade, and the resulting level of integration required between the trading partners. Although the evolution of trading arrangements is slightly different in each case, the move from simple bilateral contracting to more integrated forms of multicountry trading tends to involve a simultaneous development of institutional, commercial and operational rules and mechanisms with their associated entities (such as national regulators).

A simplified picture of some of the commonly found elements within the spectrum of arrangements for electricity trade between countries and within regions along with the required supporting structures and arrangements is illustrated in Figure 6.1. This highlights the increasing integration between the markets and technical operations as the complexity of trading arrangements increases, but also the necessary changes in the supporting framework for the coordination of institutional, commercial, and operational structures and procedures. Evolution to a single market would take a considerable period in the ECO region, so the immediate interest is in the earlier stages. It is

Figure 6.1 Spectrum of International Electricity Trading Arrangements

Increasing integration →

	Bilateral exchanges	Long-term PPAs	OTC contracts	Regional exchange	Single market
Institutional					
market operator	n/a	n/a	National MOs	Regional PX with National MOs	Single MO/PX
regulator	National regulators	National regulators	National regulators	National regulators	Regional regulator?
Commercial					
contracts	Framework agreements & ad hoc contracts	Negotiated long-term contracts	Negotiated long-term contracts	Standard contracts / Short-term contracts	Standard contracts / Short-term contracts
pricing	Opportunity exchanges	Negotiated PPA price	Negotiated contract price	Regional PX price / national prices diverge	Unified regional pricing framework
Operational					
planning / scheduling	National scheduling	National scheduling	National scheduling using notified contracts	Linked national scheduling	Regional scheduling

Source: ECA (2006).

OTC over the counter MO = market operator PX = power exchange nonetheless useful to have an indication of the direction of longer-term development.

Factors Affecting Trading Arrangements in ECO

In the ECO region, and in particular within Central Asia and between it and its neighbors, trading arrangements in the short to medium term are likely to take the form of the first two shown in Figure 6.1: bilateral exchanges and long-term PPAs. For larger trade projects including those where some generation investment might be needed, these could be backed by intergovernmental agreements and, particularly where there is involvement of the private sector, sovereign government investment and revenue guarantees. Characteristics influencing the pace of evolution of trading arrangements to the more complex forms likely to develop in the ECO region include the following:

- The need for new-build transmission lines.
- The involvement of third-party transit countries.
- Weak institutional, legal, and commercial environments.
- Creditworthiness problems of some potential offtakers.
- Post-conflict countries.

The requirement for large-scale investments and a desire to introduce international best practice make participation of the private sector desirable. However, it is likely that while trade relations develop, the governments in the region will need to take a prominent role throughout the project lifetime in order to mitigate the project risks.

Four Trade Typologies for ECO

In the Chapters that follow, we categorize typical international trading arrangements into four typologies relevant to the ECO region. The arrangements differ in the level of trade they support and the degree of sophistication and coordination required of the supporting institutions and agreements. The four typologies, some of which are subdivided into subtypologies, are as follows:

- **Typology 1:** Bilateral trade between neighbors
  - Subcase 1a: state-to-state utility transfers.
  - Subcase 1b: dedicated trade from new facilities.
  - Subcase 1c: private-sector involvement.
- **Typology 2**: Bilateral trade via a transit country.
- **Typology 3:** Trade among synchronized systems.
- **Typology 4:** Multilateral trade within a pool mechanism.

The remainder of this Chapter describes the characteristics of each of these typologies and subcases in turn. For each, we discuss:

- Key characteristics of the form of trade.
- Supporting framework requirements.
- Specific risk characteristics.

We also provide examples from international practice and indicate the relevance of the form of trade to the ECO region.

Throughout the discussion the party that is on the selling side of trade is referred to as the supplier, while the party who is the buying on behalf of the ultimate consumer is referred to as the offtaker.

Bilateral Trade between Neighbors (Typology 1)

Overview

The least complex arrangement for cross-border electricity trade is direct bilateral trade between two neighboring countries. This is commonly the starting point for the development of international trade, often motivated by mutual security of supply benefits. In its simplest form, small cross-border bilateral trade is quite common, and there are several examples within the ECO countries.

Direct bilateral trade is an appropriate first step where the trading countries have poorly developed institutional, legal and commercial frameworks. For this reason, we refer to this arrangement as typology 1. We consider three subcases:

1. State-to-state trade involving nationalized utilities and existing facilities.
2. Larger dedicated projects involving new facilities (generation and/or transmission).
3. Private-sector involvement.

The complexity increases progressively as trade moves from simple state-to-state transfers toward large dedicated cross-border projects. As the volume of trade increases, technical and related institutional and economic issues need to be addressed for the interconnection of the systems. Systems that are not synchronized may trade between parts of their systems that are electrically islanded (i.e., enclave projects), or be connected by a direct current (DC) link. A key step-change in complexity with larger projects, technically, institutionally and in cost terms, is the synchronization of parts or all of neighboring systems.

Initially, agreements for small mutually beneficial transfers develop at the utility-to-utility level, with authorization at the outset from governmental level. As transfers increase or larger transfers are proposed, greater involvement and communication may be established at the intergovernmental level. This may involve meetings between the respective energy or trade ministries and the establishment of a trade working group. The working group will include experts from the electricity sectors and representatives from the interested ministries. Most large dedicated projects in new markets are underpinned by Intergovernmental Agreements (this is also often true for other larger and more complex forms of trade). The degree of high-level governmental involvement will reflect and affect the scale and speed at which trade arrangements develop.

Each of the three subcases is discussed in greater detail in the next Chapter.

Subcase 1a: State-to-state Utility Transfers

Key Characteristics

The state-to-state utility transfer subcase is usually characterized by small-scale imbalance trading of existing surpluses through existing border crossings. This may be at high voltage transmission to provide occasional support to system reliability but more typically will develop in an ad hoc manner at the local level, usually at low voltage, using the subtransmission or distribution networks. The recipients in this case are small areas that are (or can easily be made) electrically part of the supplying country and may be isolated from the main grid within their own country. The trade is peripheral to the capacity of two systems that are otherwise intended to continue their independence. The motivation for trade at this early stage of evolution is to take advantage of conveniently located and timed surpluses rather than to increase interdependence or trade for larger economic benefit.

The features of this subcase are:

- Trade is carried out between state-owned utilities, often local utilities.
- Trade is generally for small quantities of nonfirm energy.
- There is often complementarity between the demand-supply balances in the two countries that give security of supply benefits and cost benefits at the margin.
- Trade is often to serve demand centers close to the border that are isolated from or poorly connected to the main grid in their country.
- Settlement arrangements are quite simple, with payment often for the difference in net transfers only. Equal volumes in opposite directions are deemed to cancel each other.
- Trade may be governed by agreements between utilities and between governments or begin with relatively informal agreements between utilities.
- Trade is between electrically islanded parts of the system: that is, the systems are not synchronized for the purpose of facilitating trade.

The interutility and intergovernment links established during this stage of trade development can form the first steps toward greater integration. Trade arrangements in this category may progress beyond small imbalance transfers to larger and firmer trade as relationships and agreements between the utilities and respective governments develop. However, trade remains within the capacity of existing infrastructure and trade facilitation is not a driver for system expansion.

This type of trade is suited to situations where the transfers are small or where there are roughly matched flows in both directions so that the net transfers are small.

Examples of small cross-border transfers within ECO at present include the following:

- Between the isolated grid in eastern Iran and western Pakistan (Balochistan) to the south and Turkmenistan to the north.
- Between Afghanistan and its neighbors Iran, Turkmenistan, Uzbekistan, Tajikistan.
- Azerbaijan with Turkey and Iran.

The case of Turkmenistan–Iran is an example where trade is increasing from the state-to-state case toward larger scale dedicated trade under more formalized arrangements. Exports to Iran from Turkmenistan are currently as high as 230 GWh per year.

Supporting Framework

The supporting framework in the state-to-state case consists of agreements at the utility level supported by authorization from government. Although transfers are small, and therefore security of supply is not a large concern, political sensitivities often mean that government involvement (at the Ministerial or even higher level, as was the case for the development of Nepal–India trade—see Box 6.1) is required from the outset. The arrangements are likely to be utility to utility at the detail of metering and accounting.

The agreements to support this level of trade will include:

- A commitment, possibly at the governmental level, between the sides to supply the stated areas.

Box 6.1 Small Cross-Border Trade

Small-Scale Trade between Nepal and India

Cross-border electricity trade takes place between Nepal and India at a number of points along the border. In the financial year ending 2006, the Nepal Electricity Authority (NEA) imported 266 GWh from India and exported 101 GWh. Imports are used to cover domestic capacity shortfalls.

Trade of around 5 MW initially developed in the 1970s to supply customers not connected to the Nepalese national grid from India and to improve security of supply to the bordering Indian states through backup supply from Nepal. Interconnections are now at 11, 33 and 132 kV, providing a cross-border capacity of around 50 MW, and there are plans to upgrade it to 150 MW through new 132 kV connections.

The Power Trade Department within NEA negotiates and manages PPAs and short-term trade with the Power Trading Corporation of India. Payment for short-term trades and small cross-border transfers is only made for the net imbalances.

Developing Trade from a Small Base

An intergovernmental agreement signed in 1991 created the India-Nepal Power Exchange Committee, headed by the Managing Director of NEA. Its role is to coordinate improvements in existing trade and to pursue larger-scale hydro projects. The legal and institutional arrangements for larger-scale trade were further developed in the 1997 Indo-Nepal Power Trade agreement, which frees licensed private sector parties to arrange cross-border trade. Other enabling agreements have also been reached with the aim of furthering larger-scale trade.

However, exports to India have been declining in recent years and the large-scale trade opportunities have yet to yield fruit. This is partly due to a failure or inability to deal with construction and political risk in Nepal and concerns about the creditworthiness of counterparties on the Indian side.

Source: ECA (2006).

- Agreements on metering covering issues such as timing and how differences between meter readings on either side of the border will be handled.
- Tariffs and how payment will be made.

When volumes begin to increase the arrangements evolve toward the more complex cases discussed later.

At this nascent stage of trade development, payment is often only for the net difference in transfers with equal flows in opposite directions cancelling each other out. For trade of this type, which is primarily out of convenience, pricing is likely to be simple. Depending on the conditions and status of the supplying electricity system, there may be minimum but not strict commitments on the quality of supply.

Material changes to these arrangements will be largely unnecessary unless the conditions change. If demand grows to create more of a supply burden or more significant reliance, there is likely to be pressure to increase the complexity of the arrangements, particularly concerning metering and tariffs.

Specific Risk Characteristics

Volumes traded in this subcase are small, with the result that risk at the aggregate level is low. Security of supply concerns are limited to the border areas, whose electricity consumption is proportionally a small part of the consumption within the country's system, and supply is a small part of the counterparty's system. In the extreme case that supply was interrupted, temporary supply could be provided from portable diesel or truck-mounted generators.

Payment risk is also limited by the small-scale nature of the transfers. Again, payments for this level of trade are low relative to the total system costs on the supplying side of the border, making the relative risk small. In cases where transfers are made in both directions, the net payment risk will be further reduced.

Since this subcase sees no system expansion (aside from minor local system reinforcement if necessary) there is no planning, construction, or financing risk.

Subcase 1b: Dedicated Trade from New Facilities

Key Characteristics

Trade in this subcase involves a larger volume requiring new facilities to be built, and consequently introducing much higher levels of risk (e.g., planning, construction, and financing risks). This may be new generation where existing surpluses are insufficient to meet planned trade, new transmission to carry existing surpluses or increased volumes from new generation and ensure stability, or both. In this case, trade remains limited to direct transfers between two neighboring countries.

This situation may occur between neighbors where one has a growing demand and the other has potential supply capacity due to an abundance of fuel or hydropower resources or an installed capacity surplus. In the simplest case, these conditions create clear benefits to trade for both sides.

The development of larger dedicated projects may evolve from small confidence-building projects that have low risk. This provides valuable working experience between the sides where there is little history of trade or cooperation. It also allows the trade arrangements to be tested and, where problems are encountered, adapted to more effective approaches. An example of this confidence-building evolution is given by the large Nam Theun 2 project, which was preceded by a number of smaller hydro projects such as the Theun-Hinboun IPP (see Box 6.3).

A number of technical alternatives are available for interconnection of the dedicated projects with the offtaking system:

- Enclave or islanded basis
- Direct current (DC) link
- Synchronized systems

In projects developed on an enclave basis the generation[28] is electrically islanded from the

[28] Less often, the demand center can be served through the converse arrangement.

transmission system in the supplying country and directly connected to the receiving country's system. In this case the generation source is in effect a part of the offtaker's system, but happens to be located in the supplier country.

Another interconnection option is a direct current (DC) link between the generation source and the demand offtake. A voltage converter station is required at each end of the line. A DC link is a technically complex option with high associated equipment and operation costs. An example of a dedicated generation project connected to the demand center by a DC link is the Cahora Bassa project between Mozambique and South Africa (see Box 6.2).

Under a more advanced stage of interconnection, the two countries' electricity systems can be synchronized for trade, essentially operated as a single system (although scheduling and transmission planning can continue to take place from locations in both countries). This usually requires significant investment in technical capacity as well as in system operation. The trade and security of supply benefits from this arrangement must be sufficient to outweigh the high associated costs. International trade within the SAPP arrangements in Southern Africa provides examples of all three interconnection option (see Chapter 7 for more details of SAPP). UCTE in Europe is an example of an advanced synchronous area (see Box 6.4).

The increased scale and financing requirements make projects of this type targets for International Financial Institution (IFIs) involvement. In addition to their role in providing finance, IFIs can play an important role through technical

Box 6.2 Cahora Bassa Hydro and Transmission Project

The Cahora Bassa project involves a 2,075 MW hydroelectric plant on the Zambezi River in Northern Mozambique connected to South Africa by a 1,360 km, 533 kV dual HVDC transmission line. The second line, located 1 km parallel to the first, provides backup. The line is capable of transporting 1,920 MW to the converter station near Pretoria. At the time of commissioning in 1977, it was the largest hydro scheme in Southern Africa. In 1999, the project provided 3.5 percent of Eskom's total supply. Since the late 1990s, some energy from the station has also been supplied to Zimbabwe.

The project was developed under power purchase and sale agreements signed between the Portuguese (the colonial rulers of Mozambique) and South African governments (represented by state-owned utility Eskom) in 1969. A construction joint venture was formed between Eskom and a company (Hidroeléctrica de Cahora Bassa, HCB) part owned by the Portuguese (82 percent) and Mozambican (18 percent) governments. HCB entered into a BOO contract for the generation facilities and transmission to the border. Eskom were obliged to build the transmission line and converter station in South Africa.

The supply agreement included some electricity swaps between Eskom and Electricidade de Moçambique, whereby Eskom supplied southern Mozambique from its network in Eastern Transvaal and netted these transfers off the total imports to South Africa from Cahora Bassa.

Supply from the project was stopped for 17 years as a result of damage during the Mozambican civil war (see Box 3.1). The 1984 Cape Town Agreement, which suspended and revised the original supply agreement, established a Permanent Joint Committee of experts whose role was to advise the two governments on issues related to technical, maintenance and economic aspects of the project. The committee was formed of an equal number of experts from both sides and operated according to a set of jointly agreed rules. The committee was also granted authority to review and advise on tariffs.

Following Mozambican independence from Portugal in 1974, majority ownership in HCB remained with the Portuguese government in the original proportions. Considerable outstanding debt remained a barrier to the transfer of the asset to the Mozambican government. Due diligence on the sale was completed in 2006 and in October the two governments signed an agreement whereby Portugal reduced its ownership stake to 15 percent and transferred the remainder to Mozambique for a sum of US$950 million.

Source: ECA (2006).

assistance and as neutral coordination and mediation parties. IFIs can also provide planning and institutional discipline and add momentum to the project.

Supporting Framework

The larger scale of trade and investment under this subcase requires a more detailed set of supporting institutions and agreements at the governmental level. The supporting framework must now provide protection and mitigation against the increased risks. The supporting framework of agreements will include:

- **Intergovernmental Agreements** with all countries as parties to guarantee:
  - Investments in new facilities (in the form of a concession agreement)
  - Offtakes
- **Power purchase agreement** between supplier and offtaker

Larger-scale trade of this type is usually given legal underpinning by an intergovernmental agreement (IGA), sometimes in the form of a treaty.[29] This is the framework agreement for the project that specifies the intent of the parties, establishes the legal context and jurisdiction, and provides a reference for the derivative agreements that will enable the planning, execution, and ongoing operation of the project as well as incorporating the allocation of risk among the parties.

The framework agreement usually requires ratification in each co untry's legislature and entry into force through enabling legislation. It thus becomes a law and takes precedence over all/most previously enacted laws of the country. This was the case with the SCP projects (see Chapter 7), where the IGAs (and HGAs) become public documents once they became laws.

The power purchase agreement (PPA) will specify in detail the terms for the trade including firm volumes and timing of supply and price. The delivered price will incorporate the cost of transporting the electricity from the generation facility to the point of delivery.

The development of the necessary supporting agreements and structures should involve meetings between the respective government representatives, including the energy and finance ministries, and the utilities. An international trade working group, representing experts from both sides, is usually established to coordinate feasibility studies and develop the project concept that will form the basis of negotiations on the IGA.

Formalized supporting institutional arrangements are required at the project level following the signing of the IGA. The key decision makers in government may be represented by a high-level committee. The working group structure can be continued, expanding where necessary, incorporating a secretariat and project management function and acting as a central pool of expertise to advise the high-level committee. This project management organization can be delegated a coordinating role under the terms of the IGA for the various tasks that require common agreement between the trading parties. These include facilitating discussion and agreement on issues such as metering, reconciliation and payment arrangements. This organization provides a forum in which differences of view can be discussed and resolved.

At this increased level of trade the formalized agreements must ultimately be backed by **dispute resolution procedures** (see Chapter 4) that are acceptable to all parties and are credible. A neutral country (i.e., one that has no commercial or other interest in the trade arrangement) is often chosen to locate the dispute process especially arbitration proceedings. For example, arbitration for the Laos-Thailand Nam Theun 2 project (see Chapter 7) is located in Singapore.

[29] For example, the Marco Treaty of the Electrical Market of Central America, which forms the Framework Agreement for the SIEPAC project. See Chapter 7 for further details.

Specific Risk Characteristics

At the level of complexity represented by this subcase, it is necessary to consider the range of issues and risks related to international electricity trade. Planning, construction, financing, supply, and payment risk all become relevant.

In projects of this type each of the two trading utilities take responsibility for the parts of the project that fall within their territory. One utility builds part of a new transmission line to its side of the border where it meets the part of the line built by the other utility. Similarly, new generation is the responsibility of the utility in whose territory it is being built.

In this case the first clear delineation of risk between the parties is on the basis of location. This leads to splitting of those risks associated with parts of the project that lie on both sides of the border, notably transmission related risks. This highlights a further risk, that of coordination between the parts of the project being carried out by different organizations. This is also a dependency risk.

Planning risk—the close involvement of the state in projects of this type should enable planning risk to be reduced early in project development.

Financing risk—the state-owned utilities that are the parties in this subcase have the financial backing of the state, which is able to draw on lower cost sovereign rated financing. Project financing arrangements should be stated in the IGA. Whether the utilities are named as equity financiers or parties to debt, it remains the governments who ultimately bear the financing risk, since the utilities are their agents. Having committed themselves to the project through the IGA the respective governments in effect agree to financially backing the project. Governments should also be the appropriate party to bear foreign exchange risk.

Construction risk—The utility may have some advantage over a nonutility developer in reducing construction risk due to its local knowledge and existing capacity in the country. The ability of the construction utility to mitigate delays due to labor disputes will depend on the specific labor market and laws. The state-owned utility will not necessarily be better able to reduce this risk, or the risk of other construction delays, than a non-state utility.

Supply risk—Under the larger transfers, the buying side is accepting a degree of dependence as part of that country's electricity supply (or fuel supply to dependent local generation) is now originating from its neighbor. Interruptions can occur for reasons related to outages or events beyond the operator's control, or due to deliberate interruptions. It is often the case that a country will be reluctant to open itself to a supply vulnerability without corresponding leverage over its trade partner.

Dedicated new built generation projects are typically the case for hydropower facilities, since the fuel resource is location specific. Where generation is based on fossil fuels there is the option of transporting the fuel for generation within the demand country. This reduces a number of sovereignty risks that arise due to the location of the generation assets. However, the fuel supply risk, which cannot be diversified in this way, then remains (see Box 3.4).

Payment risk—The risk of non-payment is more serious in this case than in subcase 1a. The fixed costs of dedicated facilities involving multimillion dollar investments will be financed on projected income streams as laid out in the PPA. An interruption to payment presents financial costs to the financiers and may threaten project continuity.

Subcase 1c: Private-Sector Involvement

The third subcase within arrangements for bilateral trade between neighbors considers the entry of the private sector. This subcase builds from either of the previous two but is made more complex by the need to contract with private parties and ensure their performance.

Small Cross-Border Transfers

The private sector may be involved in small cross-border trade where an existing concession is held in a border area, and this is extended to include service to customers on the other side of the border. The private sector in this case may be serving energy to a rural electrification concession or an off-grid town, or may be delivering energy from the state-owned utility over a privately developed network. Such small private operators are likely to have relatively unsophisticated commercial resources, although it could conceivably be a larger operator where there is a larger border settlement. The private sector may also be on the customer side (in which case many of the risks discussed next are still relevant).

A private party selling across the border will seek to relate cross-border sales clearly to costs and to make a return on the activity. They will require well-defined and verifiable metering arrangements and certainty of settlement. The private sector is unlikely to be satisfied with the relatively informal relationships, which may be in place between state utilities.

The arrangements that develop for private-sector involvement in cross-border trade at this level will depend on who the counterparty to trade is: the utility in the receiving country or the utility in the operating country. Which of these the private party will prefer is likely to depend on the specific circumstances of the trade:

- The creditworthiness of the purchaser in the receiving country (payment risk).
- Ease of billing and payment arrangements, and whether these are already in place (transaction costs, as well as exchange rate risk).
- The extent to which regulations governing trade within the two counties allow and facilitate private sector cross-border trades.
- Whether the contract is for firm or non-firm energy (volume risk).

In the ideal case where cross-border trade is facilitated by the legal environment, commercial arrangements are in place or can be established without difficulty, and there is little payment risk, the private-sector party will be willing to trade directly with customers across the border on mutually agreed terms. Where one or more of these conditions is not met, additional risk will be introduced, prompting the private sector to seek assurances that its investment will be protected, or barriers will exist to trade, whose resolution may require the involvement of the state-owned utility.

Where there is a payment risk in the purchasing country, the state-utility in the selling country may be in a stronger position to mitigate this than a small, private-sector party. This will be particularly so where there are exchanges in both directions between the state utilities.

A private party may mitigate many of its cross-border sales risks by contracting with its host country utility, rather than directly with the final purchaser. The utility would in turn have a back-to-back agreement with the purchaser in the receiving country. This would also remove the need for a small private operator to arrange cross-border payment and billing (which the state utility may already have in place), and may overcome issues in the existing legal framework that restrict private trade.

The private party may have an existing relationship, including for payment, with the utility in its country and, assuming that it has been satisfied with this relationship in the past, it will be willing to enter into further commercial terms with the utility. It should be easier to expand terms between existing partners than to establish new terms with the receiving country utility. This arrangement is then very similar to the case of utility-to-utility exchange of small quantities across the border but with one side contracting part of the exchange to the private sector. The state-owned utility is choosing to contract with the private party because it has an existing supply capacity in the border area, which is able to meet the cross-border demand at a lower cost than either utility or an alternative private supplier.

If the contract is for small nonfirm trades, the private party may be willing to contract directly with the receiving country customer and accept the risk on a small volume. Indeed, this may provide a valuable learning period during which the commercial relations between the two sides can be tested before trade is increased to a larger scale.

Box 6.3 Precursor to a Larger Export Project (Theun-Hinboun IPP)

Completed in 1998, the Theun-Hinboun was one of the first hydro IPPs in Asia (Laos PDR) whose output is dedicated to a buyer in another country (Thailand). The project was developed on a build-own-operate-transfer (BOOT) basis under a 30-year concession by a public-private partnership. It provided an important learning and confidence building experience as a precursor to the larger Nam-Theun 2 (NT2) hydro project (described in Chapter 7). NT2 was also structured on a BOOT basis and included the private sector.

The project is a 210 MW run-of-river involving a 5.2 km diversion from the Theun to Hinboun River and a 85 km 230 kV transmission link to the Thai border. The Thai buyer (EGAT) is responsible for transmission on the Thai side.

The project was developed by a consortium formed of Nordic Hydropower—a JV of Statkraft SF (Norway) and Vattenfall AB (Sweden)—with 20 percent of the equity; the Government of Laos (60 percent, held by the Laos utility Electricite de Laos) and the MDX Corporation of Thailand (20 percent). The Asian Development Bank provided a loan to the Government of Laos to help finance its portion of the equity.

The total cost was US$240 million, with a 61:39 debt:equity ratio. US$58.6 million in debt was provided by Export Credits, US$14.8 million by the Nordic Investment Bank, and the balance in commercial credits provided by six Thai banks (US$62.8m).

There is no sovereign guarantee from the Thai government.

The PPA obliges EGAT to purchase between 95 and 100 percent of the output. The base tariff (set in 1994) was 4.3 cents/kWh, escalated at 3 percent p.a. for the four-year construction period, then by 1 percent per year for 10 years thereafter. The tariff is denominated in both U.S. dollar and Thai baht with payments split equally between the two currencies. A similar dual-currency split was used for NT2.

Project implementation was relatively smooth, without significant construction delays. This was partly due to the absence of major environmental impacts. In this sense the smaller project differs from NT2, whose development was delayed for consideration of the environmental and social consequences.

Source: ECA (2006).

New Facilities for Larger Dedicated Trade

For larger projects the private sector will have higher risk perception, especially concerning political risk, than state-owned utilities and will require assurances that this risk can be mitigated and suitably compensated.

The ability to attract private involvement to larger projects and the level of involvement will depend on the ability to reduce risk to an acceptable level. We can distinguish between two cases:

1. Where trade arrangements are poorly established and perceived risk is high.
2. Where trade is established or there are close and robust commercial and legal ties between the trading countries.

Where a trade project is among the first of its kind and there is little history of large-scale energy trade or private-sector participation, it is likely that the private sector will be willing to take only a minor role and bear limited risk. In such cases, the private sector may be willing to act as a contractor for specific design or construction services, bid to supply components, or be involved in providing maintenance services during operation of the project. The private party will prefer a contractual structure that clearly specifies roles and responsibilities and limits liability for unforeseen events. They are likely also to want payment security, perhaps through a payment structure that provides some advanced payment and is weighted toward the beginning of the contract or where payment is secured against performance.

In most cases where there is not an established history of international trade and cooperation and strong contract enforcement through the courts, private parties will require sovereign guarantees to cover their exposure to payment risk. This will be increasingly so for larger projects.

An IFI may have some role in providing the security guarantee. The involvement of IFIs can also encourage private-sector debt participation through the reduction in perceived risk by association with IFIs' creditworthiness and political influence.

The Nam Theun 2 project (see Chapter 7) provides a recent example of substantial private-sector participation in building large, dedicated facilities for cross-border trade from a developing country (Laos PDR). This project was partly facilitated by a number of political risk mitigation measures provided by IFIs and international bilateral institutions. Other important features for attracting private finance were as follows:

- A creditworthy purchaser.
- A considerable period of project preparation that contributed to an overall lower-risk project design.
- A track record of smaller projects that served to build confidence in the trade relationships.

Nam Theun 2 illustrates that with appropriate risk mitigation, it is possible for the private sector to take a large role. However, it also indicates that this is not likely in a large project without first taking the intermediate steps to reduce risk in the overall political, regulatory, and commercial environment, and that this process can take several years. Large-scale projects that seek private participation will benefit if they are built on a foundation of progressive development of smaller capacity building initiatives.

Where trade relations are more established and there is a history of legal settlement of disputes, the private sector will be willing to take a larger role, and may in fact take full project responsibility. This is frequently the case in advanced markets such as Europe and North America. The critical factor here is confidence in strong contract enforcement through the legal system. Where there is a dispute that cannot be resolved directly between the parties, the case would proceed through the agreed legal channels. In the meantime, trade would continue in the expectation of a fair settlement according to the contracted terms.

A current example of private-sector involvement in a large trade project is a new interconnecting transmission line being built between the Netherlands and the United Kingdom. However, this line is to connect advanced markets where there is no need for government backing. The fact that the new line will carry nonfirm energy trades further illustrates the confidence of the parties in the viability of the project. However, it should be noted that there are well-established competitive markets on either side of the link, providing a predictable revenue stream.

Bilateral Trade via a Transit Country (Typology 2)

This type of trade arrangement follows from the direct bilateral trade type except the buyer and seller country are separated by a third country through which traded energy must transit. The transit country may also take some of the energy for its own use.

The discussion of this trading type begins with an overview of the supporting framework and risk characteristics that are general to the trading arrangement. This is followed by discussions of the supporting contractual arrangements and specific risk characteristics for the different transit transmission operator roles.

Key Characteristics

The crucial difference between this and the previous case is the requirement for transmission through the transit country and the extension of the contracting and institutional framework to include an additional country, which may or may not buy or sell electricity itself. The risk structure is changed under this scenario, and the inclusion of a new transmission owner/operator introduces the need for new contractual arrangements. The key new risks that are introduced relate to the transit transmission.

For the purposes of transiting electricity, a Transit Transmission Operator (TTO) will be required. Three possibilities for the role of the transit country in the trade project and in relation to the TTO are as follows:

- The transit country's transmission utility takes the role of TTO and owner of the transit transmission assets. It builds the transmission line and provides transit services. As TTO, it is paid a fee by the two trading parties for transporting the energy.
    - A variant on this arrangement could see a specialist trader acting as an intermediary among the two trading parties and the transmission owner. In this case, the transit transmission owner (and perhaps also the owners of other transmission assets that are used in the trade) would be paid by the trader who would pass these costs to the trading parties through its charges to them.
- The transit country utility is the TTO and owner but the commercial and contractual arrangement sees it act as a trader, with a more high profile commercial involvement in the project. It buys the energy at the point of entry to the transit system (seller country border) and sells it at the exit (buyer country border). Its costs and return are provided through the difference in price.
- The transit country grants a concession to an independent TTO to build and operate the transmission line through its territory. The transit country takes a concession fee for granting this right but otherwise is not commercially involved in the transmission activity. The transmission line under this arrangement could be built on a BOO or BOOT basis.

There are therefore two roles that the TTO might have:

- A **transfer role** in which it provides a service to the trading parties
- A **trader role** in which it is a party to trade

Variations on these then concern whether the TTO is owned by the state or privately. In most cases in transition economies and where international trade is in the early stages of development, ownership will be taken by the state utility. This is most likely to be the case in the ECO region.

Variations are also possible if outside contractors are employed to provide design, construction, and operation (e.g., management and maintenance) services. Outside contractors may be private contractors or parties to the trades, or the state-owned utilities in the buyer or seller countries.

The options for financing the line will be heavily influenced by the risk profile in the investment and operating environment. In each case, the level of perceived risk will be a deciding factor in attracting project partners.

For early projects in risky environments, the private sector is unlikely to take a large finance or project role unless the risks can be sufficiently mitigated. Other financing options in high-risk environments include one or a consortium of the three national utilities, directly by governments, and by IFIs or bilateral donors and funders. If sufficient risk mitigation can be provided, it may also be possible to attract private-sector lenders in addition to equity partners.

In projects with lower risk that are deemed commercially viable by investors, joint-venture or consortium arrangements may allow an increased number of financing partners. These arrangements allow risk to be pooled and spread among participants. For example, for the Nam Theun 2 project, a joint-venture project company was formed among the national utility and two private-sector companies. Participants with interests up or downstream of the transmission (i.e., as generators or customers) may be willing to participate in a joint venture to fund and build the transmission line.

If the host utility is unwilling or unable to finance the project, a concession can be granted to the supply or offtake utility, a third party, or a consortium to plan, construct, and operate the line. In the SCP pipeline project, this was undertaken by a consortium of largely private companies (see Chapter 7).

Where a new transmission line is built, it will be designed to supply a specified volume of firm energy. This will determine the sizing of the line and the tariff level. The tariff in the PPA can include both a capacity and energy charge.

A transmission line that is built to carry seasonal surpluses will face an uneven load factor at different times of the year and a lower annual load factor than one built to carry firm nonseasonally dependent loads. The cost per unit transported in this case will be higher, and the tariff will need to reflect this. The higher cost for low load factor lines is likely to affect the economics of seasonally derived trade projects.

Further transfers on a nonfirm basis are also possible where there is additional capacity. This will be charged at a different tariff to account for the uncertain nature of the demand.

The more complex three- (or more) party arrangement that arises with the inclusion of a transit country requires more complex payment systems. A regional bank may act as a settlements agent or provider of an escrow account to manage coordinated payments and cash flows.

Supporting Framework Overview

The supporting framework must take account of the additional party to the trade. The changes that are needed depend on the role played by the transit country. The supporting framework of agreements will include:

- **Intergovernmental agreement** with all three countries as parties (or several IGAs between pairs of countries).
- **PPA** between the buyer(s) and seller(s) of electricity.
- **Transmission agreement (TA)** between transit service operator and the utility or utilities that require access and delivery.

If the transmission assets are financed or operated by a joint-venture company there would also be a shareholders agreement among the parties. There will also be financing agreements, which will contain references to the terms of the main project agreements.

The transit country government will be party to the intergovernmental agreement. At the simplest level, the IGA will grant a transmission corridor across its territory. For transit trade it is necessary that the IGA also contains the following:

- The commitments of the transit government as determined by its role in the trade arrangements.
- Access guarantees to the transmission line and to its interconnections with the supplying and receiving transmission systems.
- Undertakings to protect the physical security of the transmission line.

These undertakings and requirements will be detailed in the transmission agreements, guaranteed by the IGAs. The counterparty to the agreements on the transit side will depend on who is the TTO. Where the transit is to be provided by the transit country, in most cases that country's transmission utility (most likely state-owned in ECO) will act as TTO and agent to the government for executing the agreements.

Dispute resolution arrangements will be expanded to include the transit country.

The supporting frameworks and specific risk characteristics for the two TTO role cases are further discussed in this Chapter. First, the generic risks for this type of trading arrangement are discussed in the next Chapter.

General Risk Characteristics

Many of the transit case risks related to the supplier and offtake parties are the same as under the direct cross-border bilateral trade case

(Type 1b). In particular, the supply (including fuel supply), demand, payment and financing, planning, and construction risks remain for these parties. With the addition of transit and a third-party country, most of the key new risks introduced in each project phase relate to the transmission line. In addition, the interparty dynamic is expanded so that the counterparty to some risks is shifted.

As with the direct bilateral case, the key financial risks of payment and financing or default risk are connected. The flow of these risks among the parties is the direct reverse of the flow of electricity. The cash flows are therefore connected in a chain, which in the ECO region is likely to require the underpinning of a chain of sovereign guarantees anchored by the offtaker.

In the case where the transit party is one or both of the supplier and offtaker the risk profile for some risks is simplified to something more like the two-party case, and much of the risk allocation is placed on them. However, the additional transmission risks associated with transiting a third country will remain.

A joint venture or cross shareholding arrangement can be used to share risk among the parties. The interdependence created by the mixing of ownership across the countries and project components leads to risk sharing among the parties and a common interest in avoiding interruption and dispute. However, JVs also have the disadvantage that they may reduce the level of transparency in the transactions (e.g., see Box 3.3).

Types of Risk

As mentioned, many of the risks in Type 1 bilateral arrangements also apply to this case, and these are not discussed again here. Most of the risks that differentiate the transit case relate to the transmission line. This is particularly the case for a line through a country with high political and security risk, such as Afghanistan.

Physical security risk—If the transmission line runs through territory where there is a security risk, this will be one of the most significant barriers to its development.

There is some international experience with security forces dedicated to protecting energy corridors (for an example, see Chapter 7). Most governments would not be willing to allow foreign armed security guards on their territory. For example, during the negotiation of the SCP pipeline, the project sponsors wanted to provide security by their own armed guards, but this was eventually not permitted by the Georgian government. However, many governments may also have difficulties in guaranteeing security and covering the potentially very large liability of sabotage with their own security and financial resources (this is likely to be the case in Afghanistan under the current circumstances there, as discussed in Chapter 8).

Payment risk—the TTO is exposed to the risk of non-payment by the users of the transit service. The counterparty to this risk will depend on the commercial and contractual arrangement. It is likely that mitigation will require a sovereign guarantee to cover the financing of the transmission line.

The parties may seek to reduce payment risk by requiring collateral be posted in an independent account, such as a bank acting as settlements agent. In the case of default by one party, this collateral can be called on to maintain working capital among the other parties while the issue is resolved. The requirement for collateral will contribute to the cost of the project, and is unlikely to be sufficient in the case of serious default or ongoing payment delay.

Finance or default risk—This is borne by the party who finances the transmission assets. As with financing risk for generation this risk is related to payment risk and it may be necessary that it is underpinned by a sovereign guarantee. This additional risk can be reduced where the supplier or offtaker takes an ownership or financing participation in the TTO, although most countries will not permit this.

Planning risk—The construction of a transmission line is a large project that requires planning permission along its corridor. Commitment of all parties to the overall project is likely to require prior planning approval for new transmission as well as generation.

Construction risk—The need for new-build transmission for transit creates additional construction completion risk and the risk of delay to the start of energy trade.

The timing and completion deadline for construction will be determined by the planned start date for trade. The supporting agreements can include penalties for failing to meet deadlines. Construction must be coordinated among generation, transmission and connecting transmission in the supplier and offtake countries.

Coordination risk—The complexity of a project of this type requires coordination among the parties through the common coordinating body. In the absence of a history of successful trade projects, construction is unlikely to begin until the planning phase of the project is completed. This will include gaining planning permissions to minimize planning risk, conducting feasibility and design studies, and reaching agreement on the power purchase and transmission agreements.

Transmission losses—The risk allocation and mitigation framework needs to account for transmission losses in the transit country. Responsibility for minimizing this risk is best assigned to the TTO and is best achieved by aligning the incentives of the transmission operator with the goal of minimizing losses.

TTO Provides Transfer Service Only

In the case where the TTO takes a transfer role, the transit country transmission utility is TTO with responsibility for building and operating the transmission line and providing a transit service to either the supplier or offtaker or both jointly.

Supporting Framework

The PPA contractual arrangement in this case is as follows:

- **PPA:** Between the supplier and offtaker

Transmission access and use of system agreements are also needed (the precise arrangement of agreements will depend on the point of delivery for transfer of title in the electricity):

- **TA1:** between the supplier and the TTO, in which the TTO agrees to provide the supplier access to its transmission line (or system)
- **TA2:** between the TTO and offtaker, in which the TTO agrees to provide the offtaker access to its transmission line (or system) and to transmit and supply a specified quantity to the offtaker's network

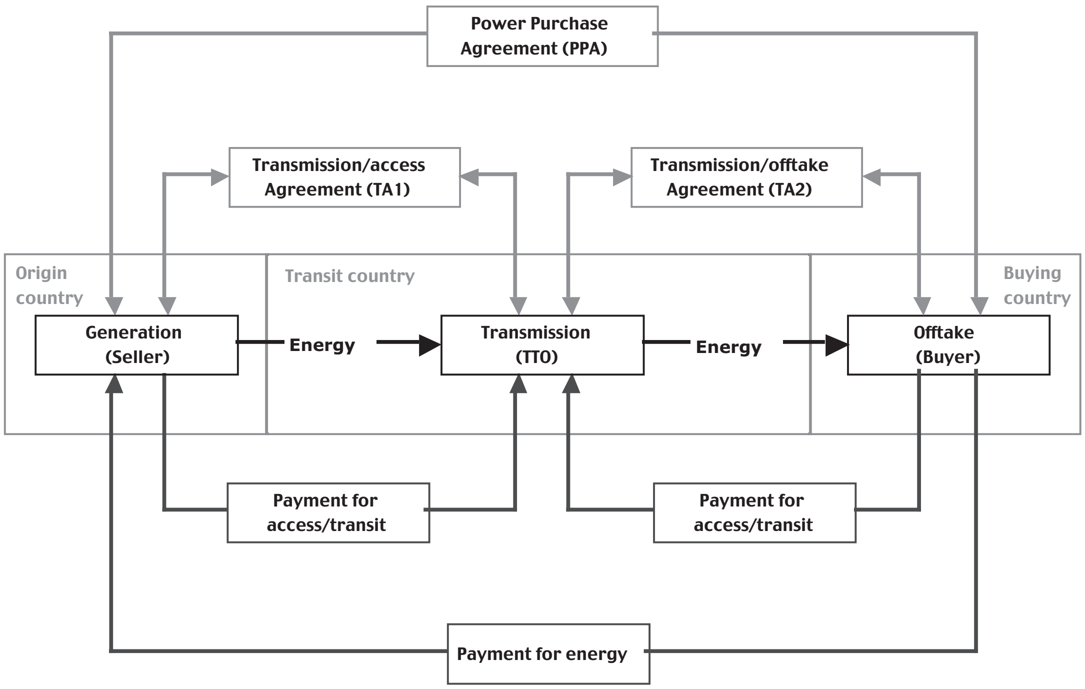
The access capacity and delivered volumes in the transmission agreements will be set in relation to the traded volumes specified in the PPA. Each TA will also cover operating and quality standards, metering, maintenance scheduling, and agreed tariffs.

The tariff for energy delivered to the offtaker will be the sum of the total energy tariff and the transmission tariff. The PPA will specify a tariff for electricity to be paid by the offtaker to the supplier. The tariff for the transmission service may be treated in a number of ways in the transmission agreement, depending on who is assigned the payment responsibility (i.e., whether it is the supplier, offtaker or both that is deemed to be the customer of the transmission service). This will depend on the delivery location specified in the PPA, which may be at the supplier/transit border or at the transit/offtaker border.

In the case where the offtaker is contracted to pay the TTO to transport the energy, the PPA delivery point is at the supplier's border with the transit country. Where the supplier is responsible for paying the TTO, the PPA delivery point is at the offtaker's border with the transit country. Alternatively, the transmission charge can be shared in an agreed split between the supplier and offtaker at a virtual delivery point specified somewhere along the transit line.

The contracting relationships and payment flow options are summarized in Figure 6.2.

Figure 6.2 Contracting and Payment Links (TTO Provides Transfer Service)



Source: ECA (2006).

Specific Risk Characteristics

The general risks already listed cover many of the risks related to the TTO acting as provider of the transfer role: in particular, planning, construction, financing, and security risk.

Among the most significant risks is payment risk, and finance risk is closely dependent on this. Under the transfer role, the TTO faces payment risk from whichever party is specified in the transmission agreement and is likely to require a sovereign guarantee.

A specified standard for transmission losses will be included in the transmission agreement. The TTO will face penalties for exceeding the agreed level.

TTO Is a Trader

In the case where the transit country is TTO and acts as a trader, the commercial arrangements and supporting contractual framework are more complex. In this case, the TTO takes a position in the trade itself, purchasing the electricity from the supplier, having ownership while it transits its transmission system and on-selling it to the offtaker at the exit point from the system.

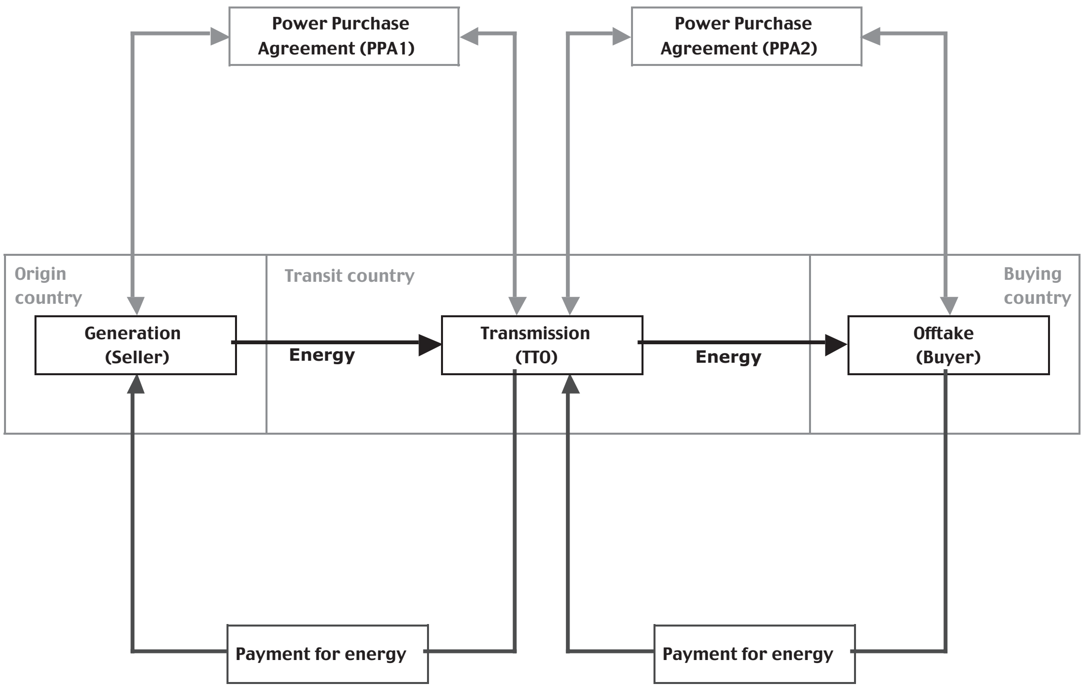
Supporting Framework

Two PPAs are now required, with back-to-back provisions:

- PPA1: Between the supplier and the TTO, in which the supplier agrees to sell a specified volume to the TTO at the entry to the transit transmission system.
- PPA2: Between the TTO and the offtaker, in which the TTO agrees to sell a specified volume to the offtaker at the exit from the transit transmission system.

No transmission agreement is required since the TTO takes the responsibility for transmission and the terms of connection to the transmission system and conditions of supply are contained in the PPAs.

Figure 6.3 Contracting and Payment Links (TTO Is a Trader)



Source: ECA (2006).

The supplier is likely to require a sovereign guarantee to cover the payment risk in PPA1. This will be most readily available where the TTO is the transit country utility (or other government agent).

The contracting relationships and payment flow options where the TTO acts as a trader are summarized in Figure 6.3.

Specific Risk Characteristics

By taking ownership of the electricity for delivery through the trading role, the TTO internalizes the performance risks related to transmission. Failure to deliver or substandard delivered quality will be penalized through the PPA with the offtaker, with nondelivery potentially met with nonpayment and the resultant significant financial exposure for the TTO through its liability to the supplier.

In paying and receiving set tariffs for the electricity it trades, the TTO has incentives to reduce transmission losses as much as possible in order to maximize its margin. This arrangement creates effective incentives for loss minimization.

The parties to payment risk under the two-PPA structure are shifted. A payment chain is created from the offtaker to the TTO to the supplier. The supplier is now concerned with the TTO's creditworthiness, rather than the offtaker's, as under the single PPA arrangement. The supplier's preference for the single or two-PPA arrangement will be influenced in part by the relative creditworthiness of the alternative counterparties.

Where nonfirm energy is traded, the TTO is also a party to volume risk, which for the transmission line creates load factor risk. As discussed elsewhere, nonfirm energy is likely to be a relatively small volume under this trading arrangement, as a dedicated transmission line will be sized for firm contracted energy.

A variant case is where the two energy trades are treated as an energy swap. In this case there is no specific allocation of the physical transit risk (and indeed the transmission capacity need not exist); the transit TTO's obligation is to purchase at one border and sell at the other. This will then be firm energy.

Concession Arrangement

Where the transit country involvement is limited to granting a concession and does not get directly involved in the construction or operation of the line, the framework agreement will contain the outline of the minimum construction and operation standards and agreed tariff structure. These will then be reflected in the concession contract.

A significant difference in this case is that financing for the project does not come from the state-owned utility in the transit country. It may be provided by a private party or by one or both of the trading utilities. In any case, it is less likely that the transit country government will be willing to provide a sovereign guarantee without having recourse to the transmission assets. The other countries may be willing to guarantee the transmission project with the exception of specific country-related risks over which they have little control.

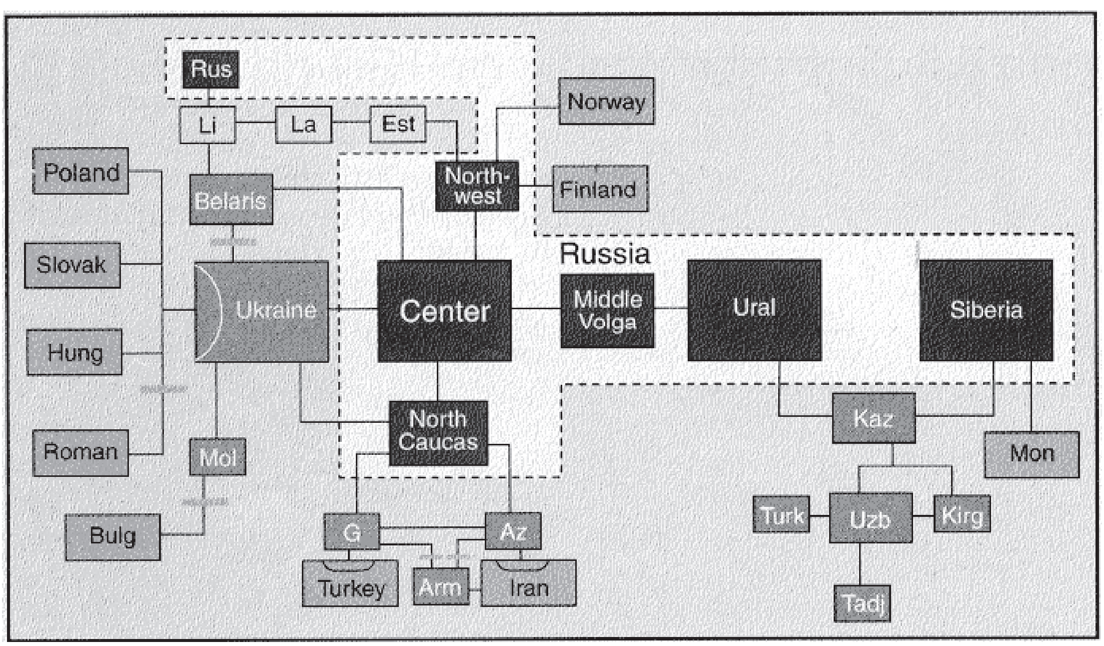
Trade among Synchronized Systems (Typology 3)

Key Characteristics

Under this trading type, the member system operators agree to synchronize their electricity systems in a common operating environment. This closely coordinated arrangement supports energy swaps and other trades (of energy and capacity) between multiple system operators or among markets and market traders. Synchronization can be an important step toward the more advanced arrangements embodied in multilateral markets or pools.

The former Soviet CIS operated in this fashion in a number of synchronized control blocks (see Figure 6.4). Included among these was the synchronized United Power System in Central Asia (discussed further below).

Figure 6.4 Electricity Interconnection among CIS and Bordering States



Source: Transmission and Distribution World (2003).

Synchronized interconnected electricity systems are operated as a common electrically interdependent system with a central control center. Electrical conditions in one part of the system affect conditions elsewhere in the system. Unnecessary transmission or generation investment can be reduced through coordinated investment planning at the interconnected system level. It is the conceptual extension across international borders of the centrally controlled national grid within a country.

Synchronized systems are usually governed by technical rules and standards agreed through a common coordinating body. The governing body facilitates the intimate cooperation required among the participating system operators and interconnected parties. The commonly agreed rules include the following:

- Rules governing energy exchange (balance rules).
- Procedures and standards for maintaining system security throughout the synchronized area, including reserve requirements and black start.
- Settlement rules.
- Procedures for maintaining and expanding the system, including some coordination of planning.
- Governance rules for the coordinating body itself.

The system security standards are likely to include reserve requirements, frequency regulation and voltage control.

An example of a very large area of synchronized systems is the Union for the Co-ordination of Transmission of Electricity (UCTE) in Europe (see Box 6.4). A summary of the UCTE definitions and use of reserves is given in Annex 3.

As a trade arrangement, synchronization represents an advanced stage of evolution. The organizational and institutional requirements lend themselves to being established out of existing cooperative bodies. The associated costs mean that realizing net benefits of synchronization requires a relatively high base level of trade. The technical and settlements requirements are also likely to develop from established trading arrangements.

Advantages of Synchronization

The main advantage of synchronization is that it can enable more efficient system operation and energy resource use within the synchronized area.

Synchronously operated areas can more effectively support a high level of intersystem trade and the purpose of synchronization is usually to enable and facilitate trade. In areas with fast-growing trade, the centralized coordination also minimizes reserves, protects system reliability and can identify transmission bottlenecks and investment requirements to facilitate coordinated system expansion planning. Each of these factors can have associated benefits in terms of overall cost reduction.

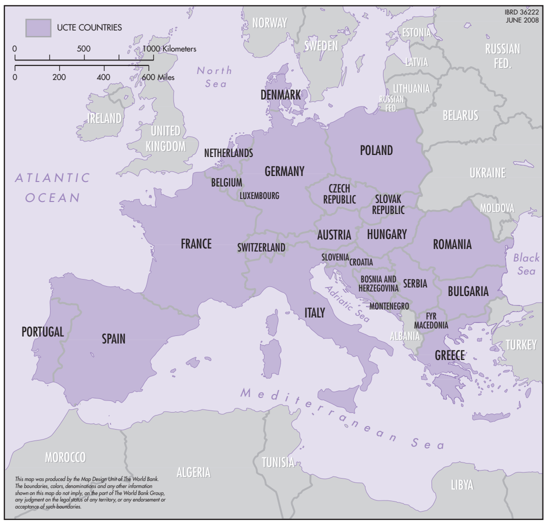
Synchronization and the improved SO coordination it brings will assist cross-border trade in long-term contracts sold well in advance of the dispatch time. The degree of sophistication of the market mechanisms required to support this sort of trade would be relatively low (more advanced trade tends toward the pooling arrangements discussed under typology 4). This may be the case in the early stages of regional market development.

Long-term contracts can be traded bilaterally or through an organized exchange, perhaps facilitating an auction. It will still be necessary to allocate transmission capacity and to provide scheduling information to the system operators in the trading areas.

At real-time there will need to be some arrangement between system operators for managing imbalance. At the simplest level SOs may settle imbalances between themselves in kind or by netting them off over time with some relatively informal pricing and payment process for residuals. Alternatively, SOs may make arrangements to provide balancing energy and collect payment from the generators or customers. Increased balancing sophistication also tends toward the pooling arrangements under typology 4.

Box 6.4 UCTE Synchronous Area

The Union for the Co-ordination of Transmission of Electricity (UCTE) is an association of synchronized transmission system operators of 23 countries in Europe (see map below). In 2004, international exchanges within the UCTE area were almost 300 TWh.



Source: www.ucte.org. The Operation Handbook may be downloaded from http://www.ucte.org/ohb/cur_status.asp

The stated aim of UCTE is to maintain system control and quality and security of supply in the interconnected area, and relatedly, to provide a sound platform for the operation and development of the single European electricity market envisaged by the European Union. Among its goals are the provision of non-discriminatory access to transmission networks to facilitate trade and the encouragement of trade to increase technical and economic efficiency. It also seeks to speed the process of planning and authorising new transmission investment.

UCTE carries out the following functions:

- Coordinates system planning and operation
- Issues technical rules and procedures, including detailed system security standards (e.g., Reserve requirements, frequency keeping, voltage control)
- Oversees the development and expansion of the synchronized area
- Monitors the supply/demand balance and publishes statistics

The very large UCTE synchronized system is operated through a number of decentralized, but interrelated, regional control blocks. Two coordination centers handle metering and accounting for balancing energy.

The UCTE is governed by a set of operational standards that are enforced by a legally binding Multilateral Agreement (MLA) among the member TSOs.

The main bodies in UCTE are:

- Steering committee, made up of a representative from each member country, is the executive body.
- Assembly, containing representatives of all member countries, has final decision making authority on organizational matters.
- Secretariat and UCTE Bureau, performing administrative and managerial roles.
- A number of working groups, technical committees and task forces.

Significantly for the ECO region, in 2005 UCTE began studying the possible future inclusion of Turkey and hopes to achieve synchronization in 2007. There is also an ongoing expansion project to include the Russian unified system.

Source: ECA (2006).

Supporting Framework

Achieving system synchronization is a large task requiring significant resources. Investment in technical facilities and system strengthening is required to reliably allow common operation to the agreed standard. Additionally, developing, agreeing and implementing the technical rules require a high level of technical and project management capacity among staff in the participating system operators. If this capacity is not available, external experts are required and skills training or new staff will be needed. Furthermore, the ongoing operation of the synchronized area also requires a high level of organizational capacity.

Direct costs are associated with all of these requirements. Indirect costs are also significant in terms of staff time diverted to a synchronization project.

Specific Risk Characteristics

Among the disadvantages of synchronization is the risk of cascading failure, which results from an outage in one part of the system causing overload and subsequent failure in the remaining parts, which, in turn, leads to further overload, and so on. Cascading outages are a risk even in advanced systems, as was shown by the 2003 outages in the interconnected systems of eastern Canada and northeastern United States that affected some 50 million customers and the outages in Italy and parts of Switzerland in the same year.[30]

Synchronized areas such as UCTE have extensive technical standards and procedures to protect system security. UCTE has a good record of managing this risk in a very large synchronized area without failure or fault.

Some system operators may be concerned about the loss of independence implied by joining a synchronized and centrally coordinated area. Proposals for synchronizing the systems of Nepal and India to facilitate larger-scale export to India have been resisted by the Nepalese side. Among the concerns has been the high cost of implementing synchronization and concerns about the loss of system sovereignty.

However, as in many parts of ECO, there are often strong economic arguments in favor of increased trade. Synchronization facilitates mutually beneficial trade and, when the conditions for this level of integration are provided, carefully designed arrangements that share benefits and risk among all parties can help safeguard benefits that must be weighed against any potential security concerns.

Credit and volume risk will also be present in trade of this sort, as it is with bilateral trade between nonsynchronous systems. Agreements are needed to enable system operators to cover imbalances caused by deviations from contracted cross-border supply. The cost of balancing energy needs to be recovered from the party causing the imbalance, and sufficient compensation paid to SOs.

History of Synchronization within CAPS

The electricity systems in Central Asia were operated synchronously during the Soviet era under the umbrella of the United Power System (UPS) of Central Asia. Developed in the 1960s, UPS was designed to be operated as a single system with coordinated energy transfers closely related to water releases from the major irrigation reservoirs in the region.

The UPS was centrally operated from the United Dispatch Center (UDC) for the region based in Tashkent, Uzbekistan. Following the dissolution of the Soviet Union, the UPS member countries remained interconnected but operated as separate systems, with utilities forming on national lines. Trade is greatly reduced from the Soviet period.

Figure 6.5 shows the high voltage transmission interconnections among the five states. The high voltage system is concentrated on the population and hydropower centers through the South East of the region. The UDC at Tashkent is physically located at the center of the network.

The centralized control and coordination necessary to maintain synchronization was provided within the framework of the Soviet political system, with the Central Dispatching Office in Moscow. The countries of the region have since formed the Power Council of Central Asia to coordinate efforts toward rebuilding cooperation within the electricity sector. The Power Council is represented by energy ministers from each country.

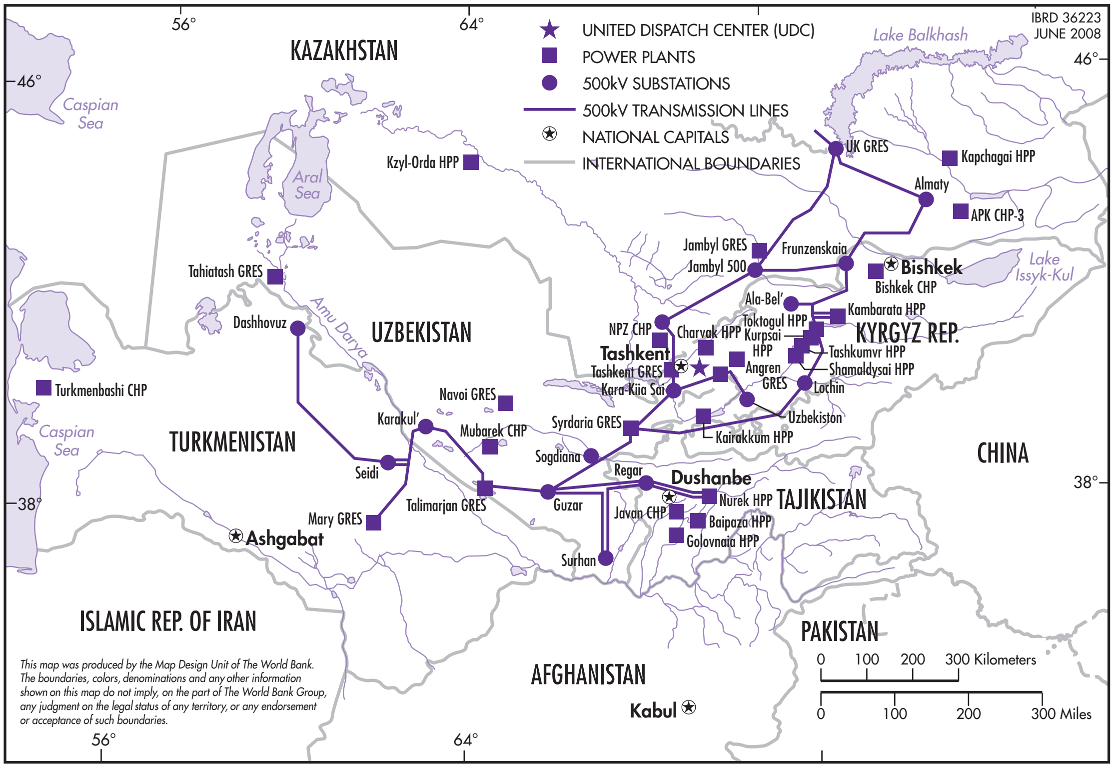
The UDC is still operational but with a reduced role. The staff in the national dispatch and control centers continues to communicate with each other to maintain security of supply and support the remaining trade.

In 1999 the leaders of four Central Asian countries (not including Turkmenistan) signed an agreement on the Parallel Operation of the Energy Systems of Central Asia.

This history among the Central Asian power systems suggests there is a potential for re-synchronization to facilitate trade. However, the power systems in the region are in need of

[30] It is important to note, however, that in both of these cases the cascade was limited within a broader synchronized area (UCTE in the case of Italy) where there was sufficient transmission and generation capacity and action was taken to control the spread.

Figure 6.5 High-voltage Interconnection in the Central Asian Republics



Source: Asian Development Bank and ECA graphics.

investment to achieve standards of the metering, communications, staff capacity and system control sufficient for synchronous operation. The ADB, World Bank, and other donors are providing ongoing assistance to Central Asian countries in such areas as transmission line rehabilitation and installing modern SCADA systems.

Multilateral Trade within a Pool Mechanism (Typology 4)

Key Characteristics

Overview

A regional trading system with a pool mechanism is the highest level of multiplayer and multicountry integration for competitive electricity trade. This trading arrangement can include market-based mechanisms for more efficient pricing and allocation of generation capacity and energy, ancillary services, and transmission capacity. The prices also provide signals for investment in new generation and transmission capacity and can be location specific.

A multilateral regional pool based trading structure allows participants to buy and sell electricity domestically within their home countries (i.e., the country of physical offtake or injection) and in international markets via the regional trading arrangements.

Pools are usually categorized as one of two types:[31]

- **Gross pool:** Most energy is physically scheduled and dispatched centrally according to a merit order determined by a common

[31] Many different names have been used to describe these main pool types. What we refer to as gross and net pools have, for example, also been called mandatory and voluntary pools. The net pool type is also very frequently referred to as a balancing market or as a bilateral contract market with balancing mechanism. The gross pool type may be one-sided, involving only generators in a generator pool and the pool acting as a single buyer for distributors and other consumers (e.g., as in the current arrangement in the Ukraine); or two-sided, involving both generators and consumers, sometimes also allowing demand-side bids.

stack of pooled bid and offer prices. All generators and suppliers face a common reference price and the system operator balances the system in real time using bids and offers from the stack. A secondary market in financial bilateral contracts usually develops alongside a gross pool, in order to allow participants to hedge their price risks.

- **Net pool (or balancing market):** Most energy is traded through physical bilateral contracts and generators self-schedule to meet their contracted volumes. The system operator covers real-time deviations from contracted volumes using pooled bids and offers in a balancing mechanism (BM).

In a multilateral trading structure, participants are legally or contractually bound together through a set of commonly agreed and accepted market rules. This may be in the form of a multilateral contract among the parties and a central market organizer (the approach taken in New Zealand) or through requirements specified in the licensing conditions.

A number of factors have a bearing on which pooling mechanism is appropriate in a given context, and on the various market design issues that flow from this such as the system for pricing.[32]

However, the choice of market design must come after the broader questions of how to establish a market have been addressed. These questions relate to scope of the planned market and the barriers to market implementation. Each of these is addressed below. Box 6.5 briefly describes the initiatives toward implementing regional markets in North America.

Primary Implementation Issues: Market Scope

The primary questions of market scope that determine the required type and complexity of the market and the implementation or transition process include the following:

- What is the degree of market opening (the percentage of demand that is allowed to freely contract for energy with its chosen supplier), and who are the participants in the market?
- What is the degree of cross-border integration?
- What are the characteristics of the product(s) being traded?

Clearly, a competitive market requires competition among buyers and/or sellers. A degree of liberalization and competition in generation and supply is likely to be a requirement for meaningful competition and market-based exchange at the regional level. Although it is possible for a pool-based market to be created at the regional level without first having established similar market structures in the constituent countries, this would be an onerous task for any region of the world. The experience in SE Europe suggests that the principle of reciprocal access is widely applied by countries—if country A's generators are not allowed to sell freely to consumers in country B, then country B's generators and not allowed to compete to sell to country A's consumers.

The implementation of a regional net or gross pool market would most often proceed from the base provided by the individual country markets. It is assumed in the following discussion that such a market in ECO would proceed from competitive market reform in at least some of the participating countries (and indeed, such reform is underway in several ECO countries such as Pakistan, Kazakhstan, and Turkey).

It is useful to note that it is not necessary to have fully open and competitive markets (i.e., Type 4 markets) in place in all participating countries. This is illustrated by the SIEPAC regional market in Central America, where the individual country markets are at varying stages of liberalization (see Chapter 7).

[32] A common criticism of the gross pool market structure is that they enable market manipulation by having predictable marginal plants at each hour of the day. By contrast, cash out prices and positive/negative imbalances in the balancing market will be relatively volatile at any hour of the day. This is a deliberate feature of the BM design to encourage participants to contract ahead to the best of their ability in order to avoid this price volatility. This feature of the BM makes it more difficult for participants to manipulate the market price.

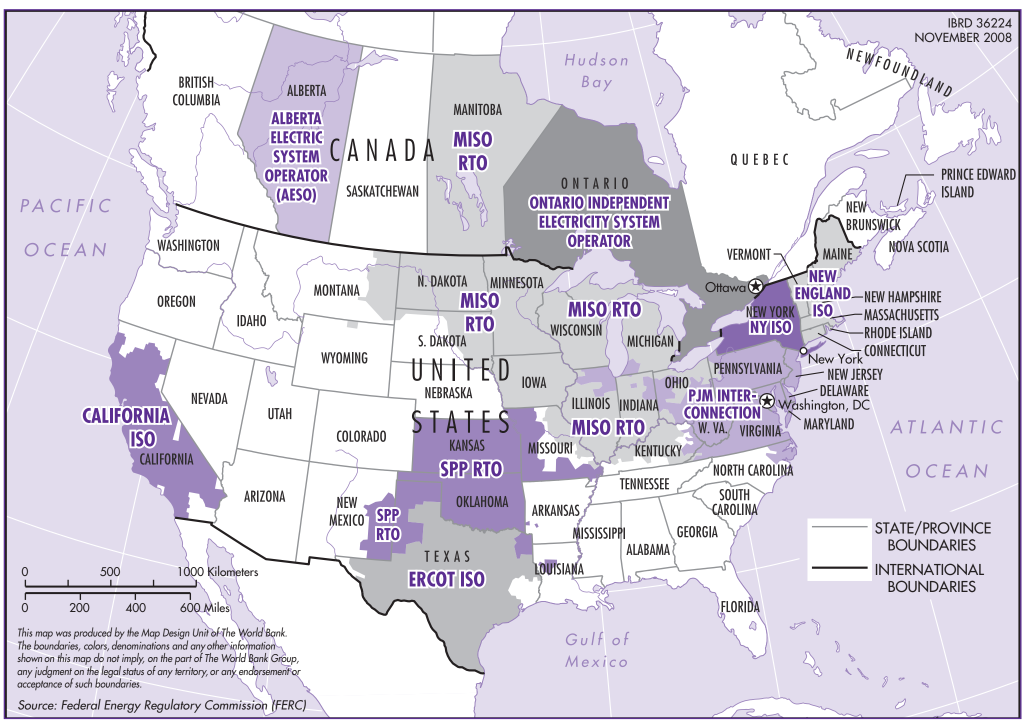
Box 6.5 Regional Transmission Organizations in North America

In the United States efforts to create competitive electricity markets were being hindered by restrictions on open access to transmission systems. In response, the formation of Regional Transmission Organizations (RTOs) has been encouraged by Regulatory Order. RTOs act as system operators to groups of interconnected networks, with trade coordinated also between RTOs.

The required characteristics of an RTO include independence of other market participants and operational authority for the transmission system under its control. Their functions must include responsibility for planning transmission maintenance and expansion, acting as a provider of last resort of ancillary services, and calculating the available network capacity. RTOs are also given the tasks of setting transmission tariffs, monitoring the market, providing an information system, and managing congestion.

While the Order calling for the establishment of RTOs defines these minimum characteristics and functions, it is deliberately designed to be light handed, leaving the flexibility to decide the form that satisfies these to the RTO members. Although transmission owners are not forced to form RTOs, they are encouraged to do so. There are currently seven separate RTOs operating in the United States, and there are ongoing plans in the northwestern states to create an organization based on a hybrid of the RTO and other approaches. The map in Figure 6.6 shows existing and proposed RTOs and ISOs in the United States (and interconnected Canadian systems).

Figure 6.6 Current RTO Development in North America



Source: Federal Energy Regulatory Commission (FERC).

Degree of Market Opening

It has been common in many countries for the process of electricity market opening to proceed in stages. In this process, the proportion of the total traded energy that is eligible to participate in the competitive market is increased systematically, usually beginning with the largest customers by volume and connection voltage. The customers in a partially open market who are not yet eligible remain captive to the incumbent supplier.

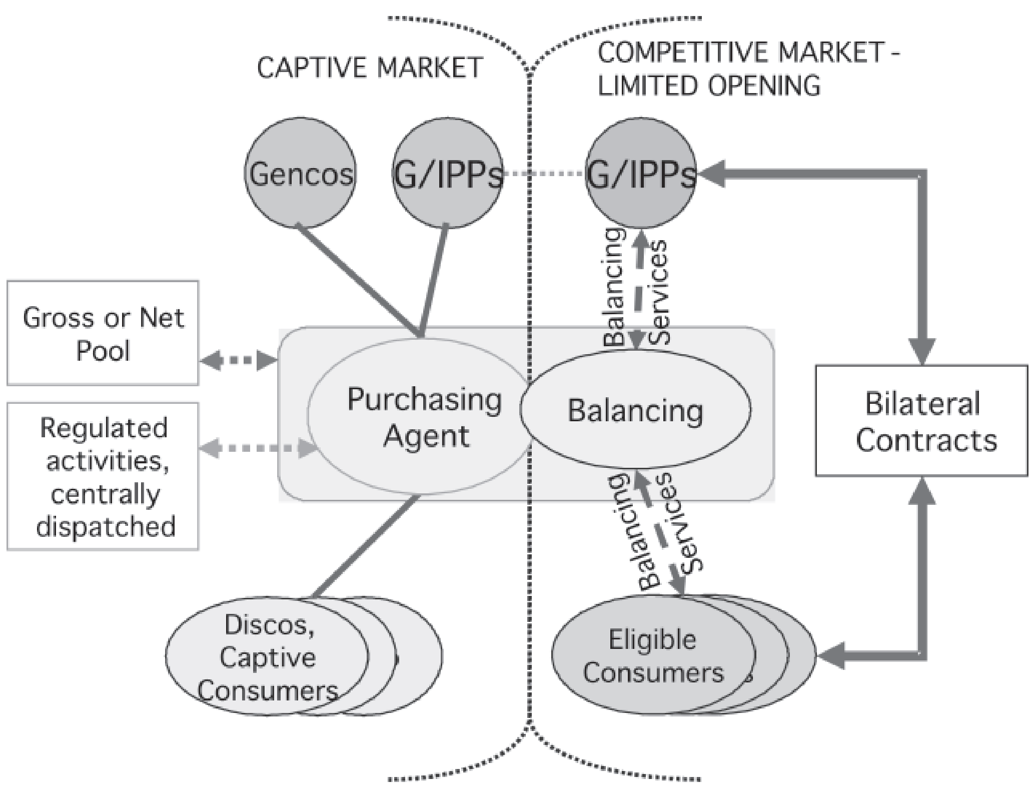
In a partially open market, it is necessary to consider how the eligible and captive parts of the market will interact. This has important implications for the market implementation and design, both nationally and regionally.

The monopoly part of the market can be operated as a centrally dispatched pool, which also provides balancing services to the competitive part of the market (Figure 6.7). If, at the time of partial market opening, no long-term contracts existed between the generators and suppliers providing supply to the captive (noncompetitive) market, the price in this market segment would be fully exposed to the pool price largely determined by the bids from the competitive market. It therefore seems necessary that a purchasing agent (or agents) would be in place to carry out the contracting[33] for the captive market and aim to submit balanced demand and supply positions to the SO. As a dominant and regulated purchasing entity, the purchasing agent could be restricted to trade less freely than participants in the competitive market, including taking account of policies toward preference for domestic producers and fuel sources, security of supply and other requirements arising from public service obligations.

A purchasing agent carrying out the long-term contracting for the captive market would be a regulated entity with the possibility of specific rules governing its behavior as a market participant. A centralized purchasing agent would be a dominant player with a potentially restricting effect on competition; an alternative is that each distributor has a separate supply function carrying out the purchasing activity on behalf of its captive customers. At the time of market opening, the existing long-term contracts would need to be allocated to these supply businesses.

The situation of a hybrid market of this sort is being implemented in Turkey and has been recommended for the transition to a competitive market in Pakistan; it is also the market transition

Figure 6.7 Partially Open Market



Source: ECA (2006).

[33] The purchasing agent would more likely initially take over existing long-term contract obligations.

model recommended for the Ukraine electricity market. Many of the transition economies in Europe have been following a similar approach to staged market opening with a parallel market for the captive consumers and a net pool for the competitive market. Examples include Romania, Hungary, Bulgaria, and Kosovo.

Cross-Border Integration

Under a pool (net or gross) market model varying degrees of cross-border integration are possible between the individual national markets. Provided that the choices are made rationally and that no artificial barriers are put in place, the choices may not significantly affect the overall economic outcome.

Starting from the assumption that national SOs will maintain the existing levels of system control over their own networks, meaning that they each need access to real-time balancing energy, there are still many options for the degree of integration of the markets. The main choices as to whether particular market elements are dealt with on a local country basis or on an overall regional basis relate to the following:

- **Number of settlement areas** (each market participant settles their imbalance payments in only a single regional settlement area or separate settlement areas in each country).
- **Number of prices** (single reference price (gross pool) or imbalance cash out price (net pool) for the whole region or separate reference and imbalance prices for all participating countries).
- **Number of bid-offer price stacks** (generators place their bids on only one price stack—their country—simultaneously on several countries' price stacks, or on one regional price stack).

It may be appropriate to have separate settlement areas where there are separate currencies and the payment systems in the countries are independent.

Provided a generator can offer its bid price increments and decrements directly into the other countries (i.e., multiple price stacks) there should be little longterm difference between the effects of a single-price-environment and a multi-price-environment.

If a single pool or balancing market price is chosen for a region such as ECO, this would need to be converted into a local currency price (probably on a daily basis). This could be a dominant or stable currency from within the region or a common external currency (such as U.S. dollar). In the Southern Africa Power Pool (SAPP), both approaches are taken: Trades are denominated in a stable and openly traded local currency (Botswana) and U.S. dollars.

Where there is a single price the key difference is that actions in one country will affect the price outcome in the other countries. With separate prices each country would be at least partly insulated from the price effects of changes in market conditions in other countries.

There may be low, intermediate, or full bid-offer stack integration:

- At a low level of net pool integration there might be **a separate balancing market in each country,** with bids and offers for each country restricted to participants in that country (i.e., each country balances and sets price within their own boundaries). This case does not apply to the gross pool.[34] This is the main situation in the transition markets of the non-EU members of SE Europe.
- An intermediate situation is where energy is dispatched or balanced separately in each country but participants (generators) are free to make bids and offers into the gross pool or balancing mechanism of any one of the countries. In this case, although there would still be separate bid/offer stacks and prices for each country, the efficiency of each pool mechanism would be expected to be improved over the low integration case as liquidity would be higher, and portfolio generation participants would have greater

[34] Fully separated mandatory gross pools imply no market integration whereas separated balancing markets still allow for an integrated physical bilateral contracts market.

flexibility to hedge their imbalances by participating in export country BM. This is the situation among a number of the well-interconnected markets of the EU countries.

- A fuller level of integration would see a **single regional gross pool or balancing market** with a region-wide price and bid and offer stack.[35] This would require a single regional market operator and coordinated SO action. Prices would be adjusted to account for transmission costs and losses (and possibly exchange rate conversion). This is the direction in which the Nordic markets, one of the longest established and best-known regional markets, have moved (see Box 6.6).

The choice of the level of integration may depend on the following:

- The communication and coordination problems involved with running multiple separate bid stacks if generators are allowed to place bids on all stacks simultaneously
- The complications for generators if they can only place bids on one of the stacks
- Whether the countries prefer to maintain separate system operators or merge the function

Characteristics of the Product Being Traded

Electricity can be "packaged" for sale in a number of different ways, depending on supply timings and duration. The length of the contract (short- or long-term) and the time to delivery has an impact on the type of market that will develop.

As the length of contract duration shortens and the range of different contracts increases more sophisticated trading, balancing and settlement arrangements will be necessary.

The shortest term of traded electricity is for balancing at real time, requiring a coordinated centralized pool mechanism. At the other

Box 6.6 Nordic Power Exchange (Nord Pool)

The Nordic Power Exchange (Nord Pool) facilitates international power trading among four Nordic countries. Nord Pool is a voluntary market and electricity is also traded outside of it in direct bilateral contracts. Around 40 percent of electricity traded in the Nordic region passes through the Nord Pool spot markets.

Nord Pool and its subsidiary companies (carrying out functions such as spot market operation and market clearing) are owned by the Nordic Transmission System Operators. In addition to boards of directors, governance includes a Market Council, which advises on market issues.

Nord Pool's physical market is for day-ahead (Elspot market), up to hour-ahead (Elbas market) and balancing power. Prices are determined through a pooling mechanism that matches demand and supply to find a common reference price while taking account of available transmission capacity.

Nord Pool acts as the counterparty to all trades, so that participants do not face a credit risk from the trading partner. Nord Pool also provides a trading platform and clearing house for financial hedging contracts. The prices on the physical spot market are used as the reference price in the financial contract markets.

Nord Pool also manages constraints on the interconnectors between the countries and within the transmission systems. When a constraint occurs the market splits and prices diverge on either side of the constraint according to the demand and supply conditions within each constrained area, with higher prices on the deficit side. Participants can physically deliver on financial contracts by trading on either side of the constraint through the Elbas intra-day market.

Nord Pool uses a postage-stamp approach to charging for transmission system usage. This means that transmission system users within an unconstrained transmission area all pay common transmission tariffs. This system differs from the one used in the PJM pool where nodal prices are set according to conditions on each specific transmission line.

Nord Pool's activities are regulated by the Norwegian Water Resources and Energy Directorate.

Further information: http://www.nordpool.no/

Source: ECA and Nord Pool (2006).

[35] Prices would still vary by location due to the costs of transmission and congestion.

extreme, long-term contracts can be traded directly between market participants or through intermediaries without needing formalized exchanges. Relatively simple auctions may be arranged to trade standardized contracts. From there, more sophisticated and liquid power exchanges can be developed.

One of the most advanced markets trading multiple products is the PJM regional market in the USA (see Box 6.7). PJM combines the three former state-based utility areas and trades a range of energy, capacity and ancillary services products over a number of time frames.

Preconditions for Market Implementation

As this is the most advanced form of trade being considered, it is not surprising that it is the most demanding in the supporting conditions it requires. Where these conditions are not met, it raises barriers to the process of market implementation and the level of implementation that can be achieved.

The conditions needed to support the development of advanced trading mechanisms include the following:

- **Market liquidity—**Market liquidity provides improved price signals and market efficiency. A certain level of trade is necessary for the market to be economically viable in the face of development and operation costs. Where liquidity is low, a lower level of trading arrangement may be more appropriate.
- **Congestion management and availability of transmission capacity—**clearly, cross-border trade cannot take place without sufficient interconnecting capacity. Efficient competitive markets will be aided by market mechanisms to allocate transmission capacity among trading participants. Market-based transmission allocation will also signal investment needs in new cross-border capacity and provide a funding source from operating cash flows.
- **Sufficient inter-SO compensation mechanisms—**system operators and transmission owners in a regional market must be sufficiently compensated for energy flows within and through their systems. Where pricing for transit and loop flows is not cost reflective the incentives for efficient market behavior and operation will be distorted.
- **Open access to the transmission systems and the role of SOs and TOs in the market—**just as at the country level a fundamental requirement for competition at the regional

Box 6.7 World's Largest Regional Market: The PJM Interconnection

The PJM Interconnection is the largest competitive regional electricity market and centrally dispatched grid in the world. It has over 400 participating members serving an area of the Eastern US with a population of 51 million and peak demand of nearly 145 GW. As an RTO, PJM also facilitates regional generation and transmission expansion planning.

PJM is owned by its members and governed by an independent board. Part of the board's role is to ensure that no participant has market power, and a Market Monitoring Unit provides this regulatory function and recommends changes to the market if necessary. A second governance tier is provided by the Members Committee, on which all members have a representative who is able to vote on rule changes.

Energy in PJM is traded in a combination of bilateral contracts and pool markets. PJM operates three pool markets: day-ahead, hour-ahead, and real-time balancing. Trades determined in the day-ahead market are binding on the participants who settle them at that time. In the hour-ahead market new bids and offers are accepted to account for expected deviations from the day-ahead schedule. The real-time balancing market then ensures actual demand matches actual supply.

PJM's pool markets use locational marginal pricing, a complex methodology that calculates a price at each point of the network taking account of transmission losses and constraints. The cost of transmission constraints is priced into the pool prices in order to manage congestion. Risk management contracts called Financial Transmission Rights are available to participants to control the risk of price deviations due to congestion.

PJM also operates capacity markets and ancillary services markets.

Source: ECA and PJM (2006).

level is open and nondiscriminatory access to transmission systems. The transmission and system operator(s) should be indifferent to users and should grant system access on objective (preferably market-based) grounds. This means there should be separation between the SO and TO role and trading participants (i.e., generation and supply) in the market. Unbundling is usually considered a precondition to enable open access to the transmission network.[36]

- **Degree of market power within the national markets—**competition will be stifled where national utilities or other dominant utilities retain market power through vertical integration or long-term supply contracts.
- **Coordination of market rules in individual countries—**differences in the individual market rules can inhibit trade between them. An example is different gate-closures between national markets where a long gate-closure in one (e.g., longer than day-ahead) prohibits trade in a short-term (e.g., day-ahead) market.[37]
- **Noncost reflective tariffs—**if tariffs remain subsidized it will be difficult for price competition to develop. If countries wish to provide price support to selected customer groups, it would be better at the aggregate economic level to do so with targeted mechanisms that do not distort prices.
- **Harmonization of licensing regimes—**differences among licensing rules, definitions, and procedures will inhibit entry by cross-border traders to the regional market.

Many of these are also supporting conditions for the development of competitive trade more generally.

A key issue for the operation of regional markets is the development of effective and nondiscriminatory mechanisms to allocate cross-border capacity. Congestion pricing provides a means for allocating scarce transmission capacity. In the early stages of development, **congestion management** on cross-border transmission capacity may be by relatively simple auctions. These may be for a range of periods, such as monthly or yearly, and for small divisions of capacity that can be flexibly combined into larger blocks. More sophisticated market mechanisms can be implemented as the level of trade and capacity develops.

The principles for a market-based congestion management mechanism include the following:

- Capacity availability should be measured in a transparent way and published.
- Access to cross-border and other transmission capacity must be nondiscriminatory for licensed participants.
- Curtailment should only be for emergencies and participants should be compensated.
- Capacity rights should be transferable, to allow a secondary market to develop.
- Surplus capacity should be offered into the market (subject to system security).
- Capacity allowances should be subject to controls to protect against market power by dominant players.
- The use-it-or-lose-it principle should be applied so that capacity that is unused or not resold is returned to the market. This also protects against anti-competitive practices and avoids hoarding of capacity.
- Regional integration will be facilitated by common capacity allocation procedures at each border.

Careful verification procedures are necessary to be sure capacity is exclusively allocated and to protect the property rights especially when traded in secondary markets. Where capacity has already been allocated in long-term contracts, this will limit the development of competition, and these should be phased out.

[36] Unbundling may be at the ownership, management, or accounting level. Management and accounting separation with a retained common ownership is likely to require regulatory oversight to ensure against discrimination. This is generally a second-best solution to full ownership unbundling but may be a transitional step during the liberalization process.

[37] *Gate-closure* refers to the final time before dispatch when offers and bids can be accepted into the market.

Supporting Framework

The institutional framework to support multilateral cross-border trade will include the following:

- System operator
- Market operator
- Regulatory authorities

An organized power exchange may also develop for trading contracts.

The trading arrangements will be embodied in a number of agreements, rules, and systems, which typically include the following:

- Market rules
- Metering arrangements
- Payments and settlements systems

The market rules will also be designed to operate in a consistent manner with the local and/or regional grid codes, especially those parts of the codes that deal with meters, scheduling and dispatch, and communications.

Institutions

The system operator or operators are central institutions to the technical functioning of the market. SOs have a central position in the market with access to privileged information, and as such they often also act as independent market operator (MO). The combined entity is called the independent system and market operator (ISMO).[38]

In a market covering multiple transmission systems the roles and relationships among the SOs will depend on the number of control and settlement areas:

- If only one, need a single common market administrator (including settlements) and operator and set of governance rules to which all participants are party, to provide coordination among SOs.
- If more than one, then require rules/agreements among SOs to enable market transactions to take place and to allow balancing.

Where there are separate pools, settlement can be through inter-SO payments or through a centralized settlements administrator. The centralized case is a greater level of unification in the regional market. Trading between separate pools must be subject to constraint management and interpool trade will only be possible where sufficient interconnecting transmission capacity exists.

Provided the market structures are properly designed, the different choices could lead to similar economic outcomes. The choice may depend on the following:

- Whether the countries prefer to maintain separate system operators or merge the function.
- The communication and coordination problems involved with running multiple separate bid stacks if generators are allowed to place bids on all stacks simultaneously.
- The complications for generators if they can only place bids on one of the stacks.

Regulatory institutions at the country level or at a regional level will issue licenses (preferably harmonized across jurisdictions), ensure that the market rules are adhered to, and carry out market monitoring exercises of dominant players and safeguard against abuse of market power. The SIEPAC regional market provides an example of where a regional regulator and regional system and market operator have been created to oversee trading between integrated national markets. Within Europe, coordination is done formally through a set of EU Directives and less formally through a number of coordination bodies holding regular meetings of regulators, SOs and MOs.

In a bilateral contracts markets, contracts may be traded directly between buyer and seller, through an intermediary (a broker or trader) or through a power exchange. The liquidity in an exchange will provide more efficient price signals. A higher level of trading will be required to support a commercially operated power

[38] Another common structure is to combine the SO with the transmission network owner, into a so-called transmission system operator, TSO.

exchange. Power exchanges are sometimes developed on a noncommercial basis until sufficient liquidity has been built to support commercial operation.

The proposed approach to the evolutionary development of the regional market for South East Europe is outlined in Box 6.8.

Trading Agreements and Systems

The market rules are often divided into Chapters containing the following:

- Contractual or legal terms, binding participants to act in accordance with the rules. They may be enforced through contract law or administrative law.
- Commercial trading rules, including the rules for entry and exit, credit requirements, submitting bids and offers and price setting in the gross pool or BM.
- Technical rules, including security of supply and customer protection (with reference to the grid code).
- Dispute resolution procedures.

Verifiable metering systems, including at the border points, are essential to market operation. A payments and settlements system must be developed and is likely to be underpinned by credit posting requirements.

Specific Risk Characteristics

The risk characteristics of the multilateral regional market are in addition to the underlying country, technical and investment risks identified for other trading arrangements. The risks specific to the multilateral case include the following.

Risks during Transition and Market Integration

During this period there is a lot of uncertainty in the regulatory and operational environment. New untested processes and systems introduce risks of error in coordinating the technical and commercial market operations.

Technical risk during transition and integration can be reduced by careful planning, operating new systems in parallel for a testing period before going live with them, and ensuring there

Box 6.8 Proposed Development of South East Europe Regional Market

The design concept for the Regional Electricity Market / Energy Community in South East Europe (REM / ECSEE, now simply referred to as the Energy Community, EC) started with a study for nine countries, called the Balkan Electricity Market study. The key market design proposals developed the concept of the evolution from coordinated bilateral contracts to integrated power exchanges.

The evolution of market institutions should both anticipate and also follow the growth of trading volume and the shortening of trading interval. In the initial SE Europe design, the evolution was seen to follow three broad stages:

- **Stage 1:** bilateral trade between integrated (state-owned) utilities. A Regional Market Coordinator (RMC) facilitates trade.
- **Stage 2:** trade between unbundled generators and distributors, some eligible consumers.
- **Stage 3:** short-term exchanges through Regional Market Brokers (RMB).

The first step was seen as creating an institutional structure, including information exchanges and a RMC to facilitate the development of long-term and medium-term bilateral trades with a minimum of necessary changes to internal national market rules.

The next step was proposed to be the increasing trading of short-term electricity. The increased volume of trade and complexity of settlement requires further regional institutional structures. The first step would be the establishment of one or more Regional Market Brokers able to facilitate liquid short-term trading. This could be an over-the-counter (OTC) market, probably facilitated by an electronic bulletin board. Later, a fully automated exchange (cleared exchange) could be developed, though this requires a much more complex market infrastructure for settlement (currency and credit risk) and contract enforcement/dispute resolution.

Source: ECA (2006).

is redundancy and backup for market-dependent systems in case something goes wrong.

Regulatory uncertainty can be managed with careful information sharing and stakeholder consultation. Weaknesses in the underlying regulatory capacity and commitment to the process must be addressed as a prerequisite to controlling regulatory risk.

Market integration is also made difficult by differences in the institutional, commercial, legal, financial, and technical environments in the participating countries. The experience of regional electricity market integration in Europe and the United States shows that even among developed markets with relatively similar conditions, the process can be slow. Perhaps the only means of easing integration is through persistent commitment to the project and a willingness to take a long-term view.

Risk of Abuse of Monopoly Power: Market Price Manipulation

Any market with dominant players[39] is potentially vulnerable to price manipulation, irrespective of the type of market rules. However, the risks may be greater in gross pools than net pools, as the dominant generator is usually able to predict which plant will be setting the price in a gross pool and bid accordingly.

Vertically integrated utilities may try to manipulate the price in either direction:

- Raise prices, if they are long on generation and want to discourage new suppliers from entering the market.
- Lower prices, if they are long on supply/distribution and want to discourage new generators from entering the market.

Their behavior may switch in different time periods, creating high uncertainty in future prices which raises the risks for any new entrant.

Strong regulators are required to firstly, monitor and detect abusive market behavior; and secondly, to impose penalties which would usually require the dominant utility to divest itself of some of its assets to reduce its market power. However, the detection and remedy of market abuse is a lengthy process, and in the meantime the smaller market players may be severely damaged or driven out of the market.

Counterparty Risk and Defaulting Market Member

This is the risk that the counterparty to a trade may default on payment or delivery. The cause of this risk may be independent of the market structure, such as poor collection rates or poorly capitalized or financially weak market participants. Complex markets usually require participants to post some form of credit guarantee with a central authority. This may be an actual cash deposit or, less onerous for smaller participants, a letter of credit with a bank, covering one or two months average bill.

The failure of a market member through bankruptcy or administration can cause financial problems to all market members, not just their immediate counterparties to bilateral trades. The UK market has seen the failure of a number of small suppliers but the administration of TXU Europe caused major disruption to trading and market prices for a short period. If a defaulting party does not settle its payments to the pool, all other parties may have to share in covering the losses.

Operational Risk

In addition to risk during market development, there is technical risk during the operation of the market. Emergency backup procedures must be in place to protect against failure of market systems.

Risk of Market Failure

Following the intensive period of initial development, market rules usually undergo a continuous evolutionary process of update and improvement. New requirements and

[39] A dominant player is defined as one having monopoly power within a market, and the ability to influence prices. In electricity as well as other markets, monopoly power tends to be considered a potential problem when one player controls more than 25 to 30 percent of the market or an important segment of the market (e.g., peaking power or mid-merit power).

weaknesses in the arrangements are discovered through actual operational experience. In some cases, unforeseen consequences of market design have been significant and have even resulted in fundamental redesign of the market. Examples include the England and Wales gross pool, which was redesigned as a net pool to overcome concerns about market manipulation, and the California market, which failed as a result of design flaws.

However, there is a growing body of international experience with pool-based markets including at the regional level. The lessons and experience from these markets should aid in avoiding many of the mistakes made elsewhere.

Risk of Failing to Get the Initial Conditions Right

As discussed in the Chapter on supporting conditions, if the required initial conditions are not met it will be difficult to overcome the barriers to successful market implementation. Where markets have failed it has not been the concept of traded electricity that has been at fault. Rather, it is the market design and the environment in which trade takes place whose weaknesses prevented the benefits of trade from being realized. California is a case in point.

Conclusions on International Trading Types

International (as well as national) electricity trading tends to evolve from simple bilateral trades to more complex forms of multiparty and multicountry trading. In the ECO region, and in particular within Central Asia and between it and its neighbors, trading arrangements in the short to medium term are likely to take the form of bilateral exchanges and long-term PPAs.

This Chapter has identified and described four main types of trading arrangements that characterize the principal stages in the evolution from bilateral cross-border trades to a more integrated regional market:

1. Bilateral trade between neighbors: (a) state-to-state utility transfers; (b) dedicated trade from new facilities; (c) trade with private sector involvement.
2. Bilateral trade via a transit country.
3. Trade among synchronized national power systems.
4. Multilateral trade within a regional pool mechanism.

Each type of trading arrangement has been described in terms of its key characteristics, the required supporting framework, and its specific risk characteristics.

Multi-party trading can involve both multiple buyers and sellers, including independent suppliers and traders, and pooling arrangements. These generally evolve from national electricity markets to regional markets and require detailed rules for competitive cross-border trading and access to networks. The full evolution will typically take many years, during which time the various elements of the supporting institutional framework can be gradually developed both nationally and internationally.

The last two trade types (synchronization and multi-country regional pools) have taken many years to develop in the more advanced regions in Europe and America. These models can be studied (e.g., UCTE, SIEPAC, NordPool and the U.S. markets, see also Chapter 7) to assess the steps that would be necessary within ECO to meet the many preconditions for regional market integration, such as high liquidity of trading, efficient congestion management, access to networks, cross-border capacity allocation, transmission operator compensation mechanisms, cost-reflective tariffs, and coordination of regulations and licensing across the member countries.

7 Case Studies of International Energy Trade

Summary of Selected Cases

The TOR requires a review of international experience and alternative trading arrangements. Our approach to this task is to provide short studies of four selected cases. A number of examples of international trading arrangements in highly advanced markets have been given in various earlier Chapters of this report (e.g., NordPool, PJM market in the United States), but in selecting the cases we have sought to find examples that are more similar to the conditions in ECO or that the ECO region might face in the medium term. Thus, cases have been selected that involve the investment in both generation and dedicated transmission, that involve some of the ECO countries, that provide relevant examples of regional institutional arrangements, and that involve countries with national markets facing similar challenges to some of those in ECO.

The international trading arrangements that we have chosen for our main case studies are:

- **NT2.** The Nam Theun 2 hydropower, interconnection and trade project between Laos and Thailand, part of the GMS subregion initiative.
- **SIEPAC.** The SIEPAC electricity transmission, regional transmission, and trade project among six countries of Central America.
- **SAPP.** The Southern Africa Power Pool arrangement to promote electricity trade among 12 countries in southern Africa.
- **SCP.** South Caucasus Pipeline built to transport natural gas from Azerbaijan to Turkey via Georgia.

The characteristics of the four cases are summarized in Table 7.1 and described more fully later in the subsequent Chapters.

Table 7.1 Case Study Summary

	NT2	SIEPAC	SAPP	SCP
Number of countries	2	6	12*	3
Post conflict countries	8	4	4	4
New-build transit infrastructure	4	4	4	4
Trade types	1c (Bilateral, new build, with private sector)	2 (Transit trade, new build, private sector), 4 (regional market)	1 (Bilateral, transit), 3 (synchronized)	2 (transit)
Foundation agreements	Intergovernmental MOU	Framework agreement, IGA	Intergovernmental MOU	IGAs, HGAs between governments and developer

Table 7.1 *continued*

	NT2	SIEPAC	SAPP	SCP
Supporting institutions	None	Independent regional regulator, regional system and market operator, regional transmission operator	Regional cooperation body, SAPP committees, Coordination Center	None
Dispute resolution	Specific internal procedures, UNCITRAL	Specific internal procedures, International Court	Under regional trade structure, specific rules being drafted	Energy Charter Treaty (for IGA disputes), ICSID (for HGA disputes)
Sovereign guarantee(s)	4	4	–	4
Other risk coverage	IFI and donor guarantees, financial guarantee from seller to buyer	–	–	–
Private sector participation	Developer, operator, financiers	Transmission company, developers, traders	Some private sector (IPP, transmission)	Sellers, developers and operators (largely private sector project)
Development period	1992 feasibility study; 2005 financing finalized and construction start	1996 Framework Agreement; 2000 regulator established; 2002 market operation; 2006 construction start	Formed 1995. By 2006, trade remained modest	1996 PSA; 2001 all agreements with governments, private sector; 2003 construction start, 2006 expected operation

Source: ECA (2006).

Note: *The SAPP interconnected grid currently covers nine Operating Member' countries.

These detailed case studies are in addition to the other examples from international best practice that are used throughout this report to illustrate specific points in the study.

Three of our main case studies include post-conflict countries, and all have private sector participation to varying degrees. The SCP project differs from the other three in that it is a natural gas project. It is specifically a transmission project but includes offtake and gas sales agreements.

We consider each case study against a range of issues that are of direct relevance to developing trade in Central and South Asia. These are:

- Evolution of the trade arrangement.
- Supporting legal and institutional framework.
- Dispute resolution mechanisms.
- Assessment of risks.

Finally, for each we consider the lessons for trade in the ECO region. Each of the case studies is discussed and expanded next.

Nam Theun 2 project (Laos–Thailand)

Introduction and Background

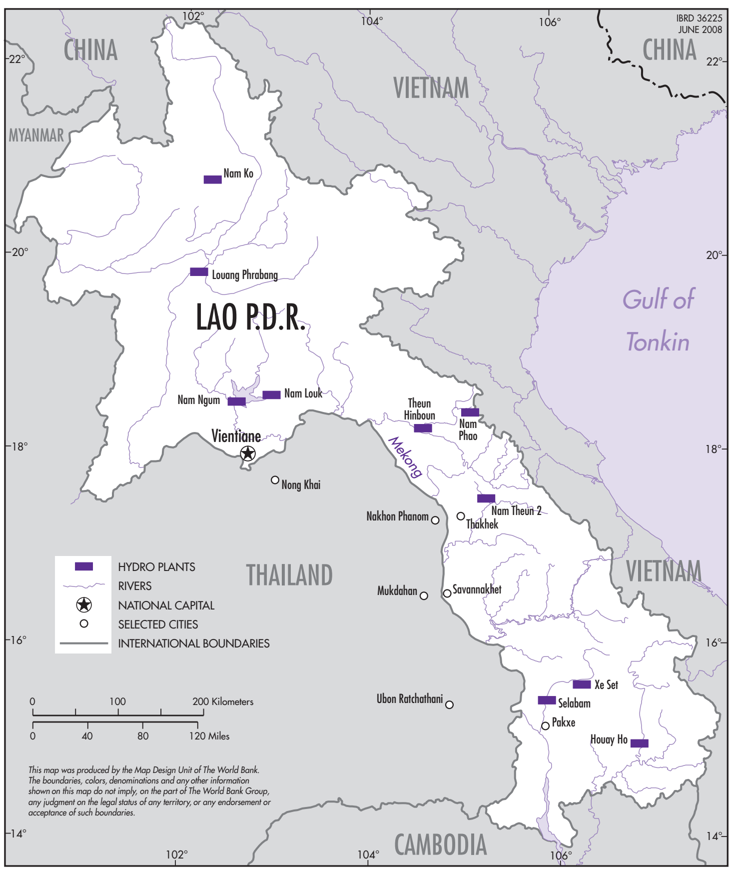
Laos PDR is a low-income country in South East Asia that is estimated to have total hydropower development potential of 23,000 MW. The Nam Theun 2 project (NT2) involves the development of hydroelectric potential in Laos for export via high voltage transmission interconnection to Thailand.

The project involves the construction of a 1,070 MW hydroelectric storage project with the capacity to deliver an annual average of 5,636 GWh of electricity to Thailand via a double circuit 500 kV transmission line. A 115 kV line will also be built to supply a small portion of production to customers in Laos. The location of the project is shown in Figure 7.1.

An important part of the technical design is the segregation of the turbines and switchyards: that part of the plant serving Laos (2 x 43 MW) is served by a separate penstock and a separate switchyard, necessary because the Laotian and Thai systems are not synchronized.[40]

The project will divert water from the Nam Theun river (a tributary of the Mekong) at a site

Figure 7.1 Location of Laos Hydro Projects



Source: Lao National Committee for Energy (2006).

[40] Lack of grid synchronization has complicated a number of potential cross-border hydro export projects in Asia. For example, the case of Nepal, whose power sector planners are very reluctant to synchronise with the Northern or Eastern Indian grids, which they claim would export their instability to Nepal. However, India has made great strides in improving grid discipline over the past few years, so this may become less of an issue in the future.

in central Laos (see map in Figure 7.1) and flood the Nakai Plateau to create the 450 km² storage lake. The full construction phase began in June 2005 and the facility is planned to be in operation from late 2009.

Key characteristics of the project include the following:

- The project is being developed specifically to transport output from a large new hydroelectric facility.
- It involves new-build generation and new-build transmission.
- Compared with the exporting country (Laos), the importing country (Thailand) is a more developed economy, has high electricity growth and limits (due to fuel availability and planning restrictions) to generating capacity that can be developed domestically, and is at a more advanced stage of electricity sector development and reform.
- The project is being carried out by a consortium of private and public-sector companies and financiers with IFI backing.

The project's technical design is shown schematically in Figure 7.2.

Other Electricity Trade Projects in the Region

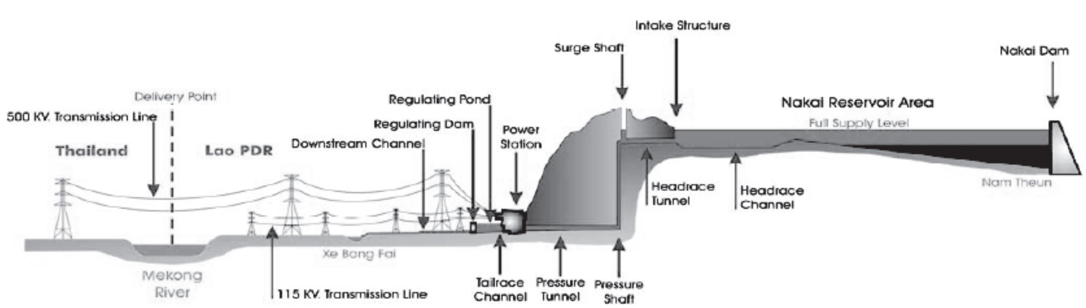
Projects to continue the development of Laos's hydropower potential for export to Thailand are ongoing under a memorandum of understanding between the two governments. In September 2006, a 27-year concession to construct and operate the planned US$700 million 523 MW Nam Theun 1 plant was awarded to a public-private consortium including EGCO of Thailand (40 percent), which is a partner in the Nam Thuen 2 Power Company. The government of Laos (20 percent) and a Malaysian engineering company (40 percent). As with NT2, the primary customer of NT1 will be EGAT under a PPA. Construction is planned to begin in 2008.

The Nam Theun 2 project is part of the Greater Mekong Subregion (GMS) initiative to increase electricity interconnection and trade among the countries in the region. As in Central Asia, broader GMS trade is expected to develop in a step-by-step fashion, beginning with bilateral arrangements and building toward a long-term goal of a regional market. In addition to the existing and expanding Laos–Thailand trade, bilateral arrangements are expected in the coming four to five years between Laos–Vietnam and Cambodia–Vietnam.

Nam Theun 2 in the Context of Thai Electricity Demand and Supply

EGAT's PPA under the NT2 project anticipates that by 2010 supply from NT2 will represent 3 percent of the Thai electricity system total annual energy requirement, and 3 percent of the peak capacity on the system. The country currently relies on thermal generation capacity for approximately 80 percent of its fuel mix (close to 50 percent is in CCGT plants). The northeast region, which can be served by imports from Laos, has been facing supply shortages.

Figure 7.2 Nam Theun 2 Project Schematic



Source: NTPC (2006).

The 2004 Thailand Load Forecast Subcommittee forecasts of electricity demand were for 7.5 percent growth in 2004 to 2008, 6.8 percent in 2009 to 2013, and 6.4 percent in 2014 to 2015 (Medium Economic Growth case).[41] The World Bank's economic analysis of the NT2 project used an earlier, more conservative, estimate of 6.17 percent per year for 2003 to 2016.

Although there are potential hydroelectric development sites within Thailand, objections to new large hydro projects on environmental and social grounds create barriers to their development. Although the country has coal reserves and can import coal for electricity production there are also planning restrictions, primarily on environmental grounds, on new-build coal-fired generation. Finally, Thailand's domestic natural gas reserves are limited, and although there are alternative natural gas supply options in the region there are associated security of supply issues, particularly given its already high dependence on this fuel.

Electricity imports from neighboring Laos enables the Thai electricity sector to avoid the planning restrictions on new domestic projects. Thailand is also in a strong position to negotiate a favorable price for purchases from Laos.

NT2 Project within the Trade Typologies Framework

The Nam Theun 2 (NT2) project falls within trade typology 1c: It is a large dedicated new-build project for trade between two neighboring countries and involves the private sector.

Laos and Thailand have had an electricity trade relationship since transfers were first made from Laos to Thailand in 1971. This trade has been of all three subcategories under trade typology 1, including small cross-border trade (Laotian customers near the border are currently supplied by low voltage connections with Thailand), and sales under PPAs from dedicated new-build plant involving both the state-owned utilities from each country and private-sector partners (such as the NT2 project).

The broader GMS subregion electricity trade initiative is a more ambitious project involving all the riparian countries[42] of the Mekong. In addition to each of the subcategories under typology 1, the GMS initiative seeks to include international trade through transit countries (typology 2), and the longer-term vision is for more closely integrated trade of the sort covered in typologies 3 and 4.

Project Evolution

The NT2 project has undergone a long period of evolution and development. The hydroelectric potential of the site was identified in the 1970s, but serious consideration of its development did not begin until the early 1990s.

Following a feasibility study carried out with World Bank funding in 1992, extensive economic and technical viability studies and environmental and social impact assessments were conducted over the course of more than a decade.[43] The project generated extensive public debate, which extended the development period.

Finalization of the financing agreements was reached in June 2005 following the receipt of World Bank project approval in March of that year, with construction beginning soon after (although preliminary site preparation work had been ongoing since the middle of 2004).

Confidence Building Projects

In addition to NT2, Laos has implemented three other hydro projects to serve Thailand as an export market under PPAs. These are much smaller in scale, with the largest being the Theun-Hinboun IPP that was put into operation in 1998 (see Box 6.3). These projects served as test cases for development of hydropower in Laos and for the technical and economic arrangements for export to Thailand.

[41] Thailand Power Development Plan, 2004.

[42] Cambodia, China, Laos PDR, Myanmar, Thailand, and Vietnam.

[43] Some delay was caused by the Asian financial crisis of 1997.

Economic Appraisal

A World Bank benefit–cost analysis found that at capacity utilization rates above 30 percent NT2 was the least-cost investment option for Thailand[44] (the plant is expected to operate with a capacity utilization of around 60 percent). The analysis also found NT2 to be least-cost for Laos.

Concerns for Environmental and Social Impacts

The project involves the creation of a large storage reservoir, as well as major civil works in relation to the dam and river diversion. Several international advocacy NGOs (such as the International River Network, Probe International) lodged strong objections to the project on environmental grounds. The international publicity given to these environmental concerns greatly influenced some of the problems in firming up the consortium (e.g., EDF announced its intention to withdraw from the project in July 2003, only to rejoin again in October 2003).

One of the key steps to resolving these concerns was to constitute an international Panel of Environmental and Social Experts. The Panel's reports played a significant role in establishing the necessary environmental safeguards to the satisfaction of the World Bank's Board. This was a precondition to the World Bank providing the financial guarantees that were essential to the project's viability.

Key Players in Project Implementation

The key participants in the project implementation (the project design, construction, and operation) are:

- NTPC—the project company specially created to execute the project.
- Government of Laos (GoL).
- EGAT—the key customer for the output of the project.
- Head contractor—EdF, which is contracted by NTPC to oversee the design and construction of the project.

The IFIs have also had an important role in the project design and facilitating financing, and will provide further technical support assistance related to the project.

Nam Theun 2 Power Company (NTPC)

The Nam Theun 2 Power Company is a joint venture between four partners:

1. Electricité de France International (EdFI): 35 percent.
2. Lao Holding State Enterprise (LHSE): 25 percent.
3. Electricity Generating Public Company (EGCO): 25 percent.
4. Italian-Thai Development Public Company Ltd (ITD): 15 percent.

The NTPC is incorporated in Laos under Laotian law as a foreign investment company.

The partners in NTPC are a mix of public and private companies. Lao Holding State Enterprise (LHSE) is a publicly owned investment vehicle created by the government of Laos in 2005 to represent its investment in the project. Electricité de France (EdF), the parent company of EdFI, remains majority owned by the government of France. The remaining two partners are publicly traded companies listed on the stock exchange of Thailand.[45]

IFI Role in Project Support

In addition to financial guarantees and grants, the World Bank is providing technical assistance to the GoL in relation to:

- Revenue and expenditure management.
- Environmental and social impact management.

[44] Project Economic Analysis, March 14, 2005

[45] Electricity Generating Public Company (EGCO) was created in 1992 from the partial privatization of EGAT (although EGAT, and thereby the Thai government, continues to be the largest single shareholder with a 25% share). Its core business is supplying electricity to EGAT. The Italian-Thai Development Public Company Ltd (ITD) is a Thailand-based construction and civil engineering firm.

Laos is one of the least developed countries in East Asia, and there was concern that it would not have the required **institutional capacity** to manage the revenues from the project transparently and accountably. The revenue and expenditure management component is designed to build capacity within GoL to better enable it to direct the revenues from the project through its public spending program and to account for those revenues.

Importantly, this assistance recognizes the need to begin building capacity before the revenue stream begins.

The World Bank is supporting the GoL in the creation of a Poverty Reduction Fund that will be used to channel revenue from the project to priority programs.

A significant amount of attention has been focused on managing the **environmental impacts** and on resettling villages in the affected area. The IFIs are supporting the development and monitoring of various programs in relation to the project impacts. A condition for World Bank support to the project was that the government of Laos prepare an environmental and social management policy.

As well as these programs directly related to the project, the IFI and bilateral development agencies are using their support to the project to leverage broader development and poverty reduction and governmental capacity-building programs in Laos.

Legal Supporting Structure and Institutional Framework

The key legal and contractual agreements supporting the project are as follows:

- MOU between the governments of Laos and Thailand.
- Concession agreement between the Government of Laos and the project company.
- PPAs between the project company and both of the offtakers.
- Risk guarantees from international institutions.
- Financing agreements between the project company and the financiers.
- Head construction contract issued by the project company.

In addition there is a sponsors' agreement among the partners in NTPC and the GoL, and the shareholders' agreement among the four owners of NTPC. There are also agreements between the GoL and the IFIs and bilateral institutions.

The contractual and institutional structure supporting the project is summarized in Figure 7.3.

Each of the key agreements is summarized in turn.

Thai–Laos Governmental Agreement

In 1996 the Thai and Laos government signed a memorandum of understanding (MOU) for the development of up to 3,000 MW of hydropower resources in Laos for export to Thailand. This replaced and extended an earlier MOU that had formalized the electricity trade relationship between the two countries. NT2 is the single most significant project to be pursued under this agreement.

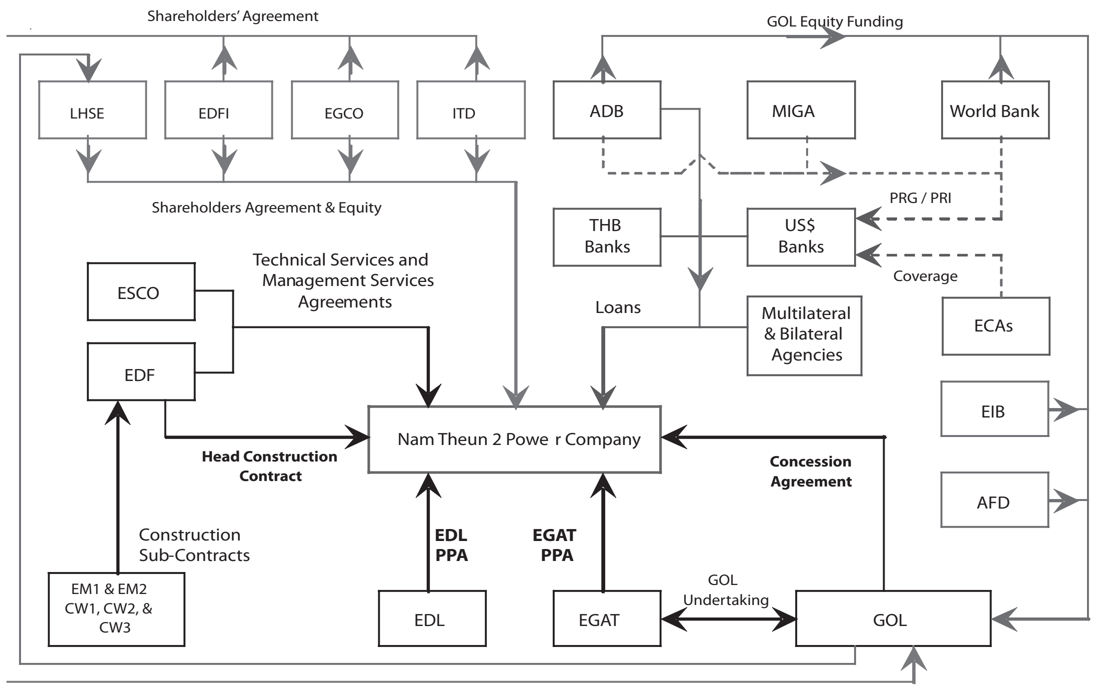
Concession Agreement

The project is structured on a *build, own, operate, transfer* (BOOT) basis according to a concession agreement between a special purpose vehicle created for the project, the Nam Theun 2 Power Company Ltd (NTPC), and the government of Laos (GoL). The agreement grants a 25-year concession to NTDC after which the project assets, which include the dam and power generation facilities and transmission lines to the EGAT delivery point, are to be transferred to GoL. The concession period begins with sales under the PPA with EGAT.

The concession agreement between the GoL and NTPC is governed by Laos Law.[46] Although the concession agreement is between GoL and

[46] English law is to be used in the case of any particular issue where Laos law is found to be silent on the issue in question or wholly inadequate.

Figure 7.3 NT2 Institutional and Contractual Structure



Source: World Bank (2006).

NTPC, it makes explicit reference to the other project agreements, in particular the EGAT PPA, and references EGAT's rights as a stakeholder in the concession agreement.

Power Purchase Agreements

The two offtakers from the project are the state-owned utilities in each country: the Electricity Generating Authority of Thailand (EGAT) and Electricité du Laos (EdL). In 2003, EGAT and EdL each entered into a PPA between themselves and NTPC. The EGAT PPP, accounting for 95 percent of NT2's design capacity (995 MW), is the core demand driving agreement for the project. The remaining 5 percent (75 MW) is for delivery to EdL under a separate PPA.[47] As such, the following discussion provides a brief overview of the terms of the EGAT PPA.

The contracted energy and associated tariffs in the EGAT PPA are categorized according to three types:

- Primary Energy (PE), of 4,406 GWh/year on average. The tariff and payment are set half in Thai baht and half in U.S. dollars.
- Secondary Energy 1 (SE1), of 948 GWh/year on average. The tariff is set half in Thai baht and half in U.S. dollars while payment is all in baht.
- Secondary Energy 2 (SE2), of 282 GWh/year on average. Both tariff and payment is in baht.

The first two of these relate to two time of day periods and are subject to take-or-pay (TOP) conditions with annual tariff escalation.

[47] The powerhouse contains 4 x 250 MW turbines to supply the EGAT component, and 2 x 43 MW turbines to supply EdL.

Table 7.2 Tariffs in the Nam Theun 2 EGAT PPA

	2009 (tariff year 1)		Escalation	2034 (tariff year 26)	
	USc/kWh	Baht/kWh		USc/kWh	Baht/kWh
PE	2.118	0.805	1.4%	2.948	1.120
SE1	0.975	0.370	1.4%	1.358	0.516
SE2	0.000	0.570	-	0.000	0.570

Source: ADB loan document and NTPC. The concession period is 25 years. The 2009 tariff year contains only one month, while 2034 contains 11 months.
Note: The US$ Thai Bhat rate applicable to this table is 1:40.

The third, which accounts for 5 percent of the contracted volume, is reserve or excess energy that has a fixed tariff and is not TOP.

The per kWh tariffs are formed of U.S. dollar and Thai baht components. Using the starting exchange rate of 40 baht to the US dollar, the currency split in the tariffs is 51 percent US dollar and 49 percent baht. This closely matches to the currency split in the project's debt financing.

The tariff for PE and SE1 escalate at a rate of 1.4 percent per year until the end of the concession in 2034. The SE2 tariff is constant in all years of the concession. The tariffs under the EGAT PPA are summarized in Table 7.2.

Energy sold under the EdL PPA is all PE escalated at the same annual rate as for EGAT of 1.4 percent. The EdL tariff begins at 1.765 USc/kWh and 0.698 baht/kWh in 2009 and reaches 2.457 USc/kWh and 0.961 baht/kWh in 2034.

Most (95 percent) of the average annual total available energy contracted to EGAT is on a take-or-pay basis. Although EGAT is contractually required to pay NTPC for the full amount of TOP energy that NTPC declares available in any month, it is not required to dispatch the full declared amount. If it dispatches less, EGAT is able to receive an equivalent amount of energy at a later date to make up the dispatch shortfall.[48] EGAT may also dispatch more when there is sufficient water available.

The PPA specifies the delivery point at the center of the Mekong River at a location on the border between the two countries. EGAT is required to build a 166 km double circuit 500 kV transmission line from Roi Et in Thailand to the border to meet the transmission line being built by NTPC.

The PPA states that the power station will be operated automatically by remote dispatch controlled by EGAT, subject to certain operating restrictions such as NTPC's water management obligations. NTPC uses its energy declarations to carry out its water management responsibilities.

The EGAT PPA is governed by English law. Dispute resolution under the PPA is discussed in this Chapter.

Head Construction Contract

The Head Construction Contract is between NTPC and the lead construction contractor, EdF. It is a turnkey contract for engineering, procurement, construction (EPC) and management of the project. EdF will in turn subcontract many of the contract roles. Through the Head Construction Contract NTPC passes many of the development and construction phase project risks to EdF.

[48] The shortfall amount that EGAT may claim is subject to limits to protect NTPC from being forced to spill valuable water in order to retain the water related to the dispatch shortfall.

Water Rights and Watershed Management

The Concession Agreement grants NTPC water rights to the rivers associated with the project for the period of the concession. Accordingly, NTPC is made the responsible party for managing the water catchment and release.

NTPC's water rights include commitments from GoL not to make changes that would affect NTPC's operation of the hydro scheme and its ability to generate electricity from it. NTPC is required to make minimum water releases to support other riparian uses and to accommodate water use for irrigation in the project design. The agreement also allows for future changes in the water release regime to enable other parties to generate electricity.

The watershed is to be monitored by the Watershed Management and Protection Authority (WMPA) within GoL. WMPA will be supported by technical advice from NTPC.

Project Financing and Financial Risk Coverage

The total project base investment is US$1.25 billion, with a further US$200 million contingency funding. Finance is 28 percent equity and 72 percent international loans from a mixture of the private and public sector investors, IFIs, bilateral agencies, commercial banks, and export credit agencies.

Crucially for the viability of the large private-sector participation in the project, the World Bank Group, and Asian Development Bank are providing debt guarantees of around US$185 million to cover commercial lenders' political and financial risk.

The project's financing structure is summarized in Table 7.3.

Equity Financing

Equity financing in the project is US$350 million. The partners in NTPC each make an equity contribution to the project in proportion to their shareholding. Public-sector investors directly account for 60 percent of NTPC equity through the inclusion of the Laos government-owned LHSE and the French government-owed EdF, and slightly more indirectly through ownership of the private sector partners (i.e., EGCO). The LHSE equity component is US$87.5 million. The GoL's equity contribution through LHSE is being funded by grants and loans from several of the IFIs and Agence Française de Développement (AfD).

Debt Financing

The project's US$900 million of base senior debt financing is denominated equally between U.S. dollars and Thai baht. The U.S. dollar financing participants include:

- A syndicate of nine international commercial banks
- IFIs: Asian Development Bank (US$50 million private sector loan to NTPC, and US$20 million public sector loan to the GoL to assist its equity contribution to NTPC), the European Investment Bank (EIB) (US$55

Table 7.3 Summary of NT2 Financing Structure

	Equity	Debt	Total
NTPC shareholders	350		
U.S. dollar debt		450	
Thai baht debt		450	
Total base financing	**350**	**900**	**1,250**
Contingency	100	100	200
Total financing	450	1,000	**1,450**

Source: ADB/WB project update, March 2006.

million loan to NTPC), and the Nordic Investment Bank[49]

- Two French bilateral agencies (AfD and PROPARCO), and the Export-Import Bank of Thailand

The baht-denominated component is financed by a further syndicate of seven Thai commercial banks (some of which are owned by the Thai State).

Risk Guarantees

The large private-sector commercial lending component of the project is enabled in part by the protection of political risk guarantees and insurance from the IFIs, bilateral institutions, and by the export credit agencies.[50] The main IFI contributions to political risk coverage are as follows:

- The World Bank Group is providing partial risk guarantees (US$42 million) and MIGA guarantees (US$91 million)
- The Asian Development Bank is providing a political risk guarantee to NTPC (US$50 million)

The MIGA guarantee is provided to cover all of the political risks within MIGA's ambit.[51] The guarantee applies mostly (US$86 million) to the U.S. dollar commercial debt, with a small component to cover EdFI against currency transfer restriction in Laos.

The GoL provides a counterguarantee to the ADB partial risk guarantee.

Additionally, the EGAT PPA requires NTPC to provide several forms of financial security guaranteeing its obligations to EGAT. These are in the form of bank guarantees, cash deposits, and a mortgage over NTPC's physical assets. The security guarantees were due at the time NTPC was able to draw down its debt financing.

Risk Assessment and Mitigation

Political Risk

Political risk coverage is provided to the financiers and suppliers as well as to EGAT by the financial risk coverage facilities and export credits mentioned above.

In the EGAT PPA each party agrees to waive sovereign immunity. The Force Majeure clauses in the EGAT PPA include cases of both Laos and Thai political Force Majeure, which refer to certain acts of either government. In the event of a Force Majeure the length of the PPA is extended for a one day for every day of the Force Majeure, and if it continues for specified long periods the contract can be terminated by either party.

Financial Management Risk

The NTPC is required, under its concession agreement, to keep accounting records denominated in U.S. dollars, to follow International Accounting Standards and to have its records audited by international auditors.

Requirements on GoL for prudent financial management are a condition of the World Bank backing for the project.

Legal and Regulatory Risk

The concession agreement provides the NTPC compensation if changes in local law have a material effect (outside of specified financial thresholds) on the project's operation and return to the company. There is a complementary protection for the GoL against changes that results in increases in the company's revenues, in which case the company must pay compensation to GoL.

The GoL agrees in the concession agreement to waive any immunity it may otherwise have with respect to any legal or arbitral proceeding, award or enforcement, not to take any actions to impede or restrain the agreed dispute resolution

[49] The World Bank is also providing a grant to cover social and environmental impact management.

[50] The participating export credit agencies are those of France, Sweden, and Norway.

[51] These are risk of currency convertibility and transfer restriction, expropriation, war and civil disturbance, and breach of contract.

process, and that Laos courts will recognize and enforce awards made in accordance with the agreed dispute resolution process. It also reaffirms its obligations and commitments under the New York Convention.[52]

The EGAT PPA includes protection for both companies against changes in the laws in either country (except in relation to taxes) that affect either party's financial position. The company in the country whose law has changed is required to compensate the other company.

The PPA also accounts for the possibility of electricity market reform in Thailand during the first 13 years of the PPA. EGAT has the option of incorporating the NTPC purchases into a power pool or other mechanism subject to certain conditions.

Exchange Rate and Interest Rate Risk

As noted previously, the PPAs underpinning the project specify tariffs in both U.S. dollar and Thai baht with a split that matches the currency proportions in the debt financing. This provides a natural hedge to NTPC against exposure to fluctuations in the currencies of the debt during the lifetime of the PPA.

Interest rate risk on the floating-rate U.S. dollar–denominated debt would be hedged through an interest rate swap whereby the debt would effectively be converted to a fixed rate.

Foreign Exchange Convertibility

The concession agreement includes clauses to entitle the NTPC to use bank accounts in the project currencies in Laos and a number of other countries. It also requires the GoL to direct the Bank of Laos to enable foreign exchange transactions.

Design, Construction and Completion Risk

The concession agreement places requirements on the NTPC to meet good design, engineering, and construction standards. It also divides the project implementation into four distinct phases and assigns the risk that they will not be completed within a specified time frame to NTPC. The agreement specifies maximum periods within which each phase must be completed and penalties to NTPC for failing to meet this time frame.

NTPC has, in turn, passed the risk of construction delay and cost overrun onto EdF through the head construction contract, which is structured on a turnkey basis (i.e., fixed price and completion date).

The EGAT PPA further places requirements on EGAT and NTPC to complete their facilities under the project within specified periods. A period is also specified for EGAT to obtain the necessary access rights for its transmission component.

The project financing arrangements include incentives for NTPC to protect against overruns in development costs, which are effectively capped. The project is budgeted to incur development costs of US$74.2 million. These costs are to be paid by the shareholders of NTPC, who are then entitled to reclaim them. According to the agreement with the lenders, the development costs will be returned to the NTPC shareholders as base equity, following an independent financial audit. The result is that the NTPC shareholders cover the development costs through their equity contributions, but they will not receive compensation if those costs exceed the budgeted level.

Operation and Maintenance and Performance Risk

The EGAT PPA makes NTPC responsible for maintaining and operating the NT2 facilities in Laos, while EGAT is given responsibility for ensuring that the transmission system in Thailand is able to receive the electricity output from the project. The operating and maintenance costs are paid by each party, except where they are responsible for costs incurred by the other party.

[52] Laos PDR ratified the Convention in 1998.

If NTPC defaults on specific performance obligations under its EGAT PPA, EGAT is entitled to take over the operation and maintenance functions that are in default in order to remedy the situation.

Dispatch Risk

EGAT's TOP liability to NTPC is calculated on the basis of the declared available energy, rather than the energy actually dispatched. In this sense, NTPC is not at risk from outages in the Thai transmission system, since an inability to deliver the energy does not affect the payment it receives.

Hydrological Risk

Since NTPC is assigned responsibility for managing the water catchment and releases, it bears the risk that variation in hydrological conditions will affect the energy availability. A simulation of the average annual outcome of the terms in the EGAT PPA was carried out using actual hydrological data for the period 1950 to 2002. The simulation showed that the storage reservoir and operational flexibility of the project allowed hydrological risk to be smoothed between years to provide reduced risk of fluctuations in average available energy.

The simulation was also used to model the impact of hydrological fluctuations on payments under the PPA. This showed that the primary energy, which makes up the bulk (nearly 80 percent) of contracted energy under the PPA, is relatively stable over time. The secondary energy component of the PPA was expected to be more variable as it followed the hydrological cycle.

Environmental and Social Impacts

The construction activities, river diversions, and the creation of the storage lake will have significant impacts on the environment and communities in the area, and the project has attracted interest and scrutiny from academics, NGOs, and individuals around the world. The international public institutions, in particular, have shown high-profile concern for these issues. A number of safeguard requirements have been incorporated into the agreements between the IFIs and GOL and in the concession agreement.

Under the concession agreement, the NTPC is responsible for managing the environmental and social impacts of the project in accordance with standards agreed with GoL. The environmental and social plans developed to monitor, plan for, and mitigate these impacts include the following:

- Environmental Assessment and Management Plan.
- Resettlement Action Plan.
- Social and Environmental Management Framework and Operational Plan.

The concession agreement includes provision for unanticipated (at the time of signing) project impacts, which the company is required to cover up to a specified limit. The concession agreement also provides for a panel of experts to provide independent review of the project impact mitigation measures.

Other Risks

There is a risk in Laos of injury or damage due to unexploded ordinances (UXO) that are left from periods of conflict. The concession agreement makes NTPC responsible for finding and removing or destroying UXOs in the project area.

Dispute Resolution

The arrangements for dispute resolution between GoL and NTPC are set out in the concession agreement. This provides three avenues:

1. The Consultation and Dispute Committee.
2. An expert.
3. Arbitration in Singapore according to the UNCITRAL Arbitration rules.

For disputes between EGAT and NTPC, the PPA also stipulates three avenues for resolution:

1. In the first instance, a standing committee of two representatives from each party will consider billing and payment disputes, while an attempt should be made to resolve other disputes through direct negotiation.
2. If the matter remains unresolved, it is referred to a panel of three experts, whose decision is final and binding.
3. If, however, the referral of the dispute to experts is not required or is not agreed to by the parties, or if the experts fail to determine the dispute within the required time period, the dispute will be referred to arbitration in Singapore under the UNCITRAL arbitration rules.

Lessons for ECO

The NT2 project illustrates that it is possible to bring to market a large, complex international electricity project including new-build hydro generation and transmission that:

- is located in a low income and institutionally poorly developed country.
- uses international financing and project development, management, and operation expertise, and includes the private sector.

Two components of this project were key to making it commercially viable with private sector financing:

1. The creditworthiness of the main buyer (EGAT), which reduces the payment risk to the project and thereby the financing risk.
2. The reduction of political risk through the involvement of international development institutions and their provision of risk guarantees.

As with the other case studies considered here, this project suggests that for large-scale investments in developing countries, a sovereign guarantee from a participating government is a necessary risk-reduction measure. Like the others it is also underpinned in the first instance by an intergovernmental agreement between the two state parties to the trade. In this case, the agreement is a memorandum of understanding.

The project development and structuring also includes other aspects that contribute to risk reduction. Among these is the coordination of the currencies in the tariff structure with the currency mix in the debt financing. This contributes to the financial risk reduction by mitigating exchange rate risk. The construction contracts assign the implementation risks to the contractor and limit cost overrun through the use of a turnkey structure.

The project development process itself should contribute to risk reduction. The project spent more than a decade passing through several study and design iterations, including considerable scrutiny and opportunity for response from interested parties not associated with the project sponsors and partners. Among the outcomes of this process was a focus within the project design on environmental and social impact monitoring and mitigation. The degree of transparency and public scrutiny also required that the sponsors provide good justification in economic terms (although there remain some criticisms of the analysis).

The long lead-time also indicates that a project of this scale and complexity is likely to require several years before construction can begin.

Another important aspect of the project design is the capacity-building support provided by the World Bank to the Government of Laos for the management of the project revenues. This support was intended to ensure that the revenues from the project would be used to benefit the people of Laos through poverty-reducing programs and reflected a concern about the potential for corruption and waste. Importantly, this support recognizes the need to begin building institutional capacity at the earliest possible opportunity and with as much lead time as possible before the project begins operation.

It is hard to see how the project could have been implemented without the MIGA guarantees, and, in turn, without the World

Bank (and ADB) having been satisfied that adequate environmental safeguards were in place. While many of these concerns are unique to hydro projects, the role of the IFIs in resolving environmental controversies is critical.

Central America Transmission and Regional Market (SIEPAC)

Overview of SIEPAC

The SIEPAC[53] project among six countries in Central America[54] is a useful example of the following:

- A regional international trading system that has been developed in a way that allows for differences in the stage of development of the underlying markets in the member countries.
- Cooperation among a number of countries to build a new transmission line to allow the benefits of trade to be captured.

SIEPAC illustrates the importance of an underlying framework agreement to facilitate the development of a regional market.

SIEPAC seeks to enable regional electricity supply projects to take advantage of economies of scale and maximise the use of hydro resources in the region. Regional projects will serve customers within the through firm contracts backed up by firm transmission rights to capacity on the regional transmission network.

SIEPAC is at a stage of market development in advance of anything in the ECO region. The initiative began over 10 years ago and was formalized in a framework agreement (known as the Marco Treaty) among the country governments in 1996. Construction of the new transmission line linking all six countries began 10 years after this foundation event, in 2006. This illustrates the complexity of the key steps required to create a system of this sort:

- Reaching agreement among the participating governments
- Developing the market design, securing financing
- Establishing the necessary institutional and regulatory structure (further details of the structure are given in Annex 1)

Background

The SIEPAC project in Central America is part of a regional initiative to create an electricity market and promote private sector involvement in transmission infrastructure and generation capacity. At its core are two projects:

1. The development of a regional electricity market (MER) based on a standard set of trading rules at the regional level. The MER initiative includes the creation of a regional regulator and a regional transmission operator.
2. The development and completion of a 1,830 km international transmission system, including new-build lines, to provide sufficient interconnection among the six countries in the region to enable increased trade.

Construction of the transmission line, which began in Panama in July 2006 and runs north to Guatemala, is expected to be completed in the second half of 2008. The line will operate at 230 kV, with transfer capacity of 300 MW. It will complete and reinforce the integration of the transmission systems of the six countries.

[53] Sistema de Interconexión Eléctrica para los Países de América Central.

[54] The member countries are Guatemala, El Salvador, Honduras, Costa Rica, Nicaragua, and Panama. In addition, Colombia has expressed interest in interconnecting its system with SIEPAC, and Mexico, Belize, and the Dominican Republic have participated as observers.

Existing Market and Supply Situation in the Region

Peak electricity demand in the region is relatively low. In 2003, the highest peak demand was 1290 MW in Costa Rica. Since the individual markets (and the participants within each) are small, it is difficult to both develop competition and take advantage of economies of scale within individual countries. By enabling generation projects to be developed to serve a regional market, the SIEPAC project aims to overcome these restrictions.

The region's electricity generation fuel mix is dominated by hydroelectricity, although the relative importance of hydro has been falling in favor of thermal generation since the early 1990s. There remain large quantities of undeveloped hydroelectric potential. The SIEPAC transmission line will contribute to more optimal usage of the region's hydropower.

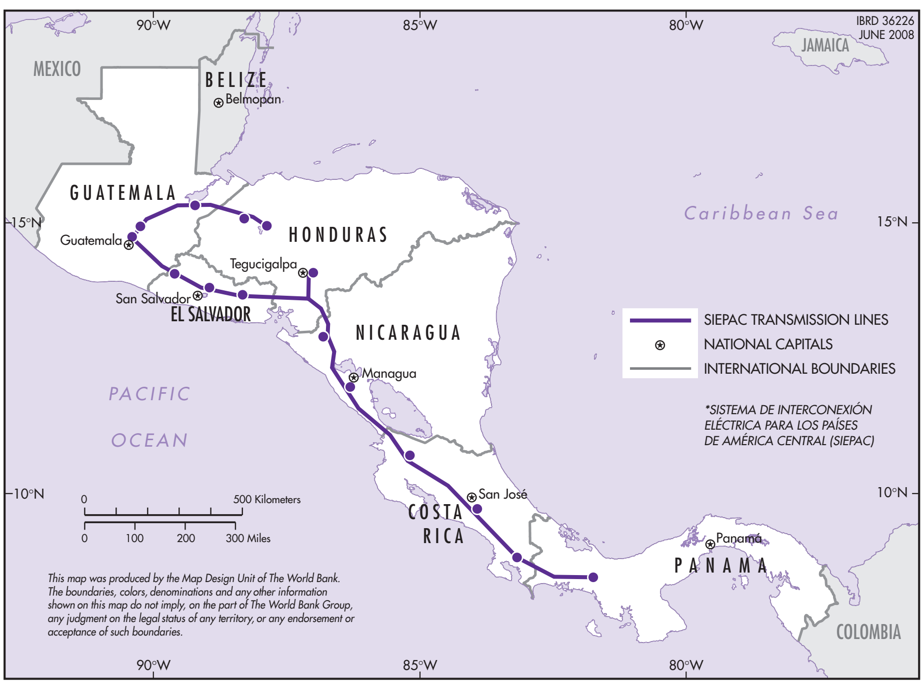
Until April 2002, the region was divided into two interconnected areas, with Guatemala and El Salvador connected to each other but electrically isolated from the other four countries. The connection of El Salvador to Honduras in 2002 linked all countries. However, the tie-line interconnections between neighboring countries are insufficient to support the planned regional market. The SIEPAC line is intended to strengthen the interconnections and increase transfer capacity in both directions. The route of the line is shown in Figure 7.4.

The six countries have reached varying levels of market reform and development. This ranges from moves to implement retail competition in El Salvador and a regulated wholesale pool in Guatemala, to centrally planned single buyer markets in Costa Rica and Honduras.

As in the ECO region, Central America includes a number of countries in a post-conflict environment. The region is recovering from several protracted conflicts during the final decades of last century:

- Guatemala: internal conflict, which began in 1960, ceased with the signing of the Peace Accords in 1996.
- El Salvador: civil war began in 1979 and was officially ended in 1992.
- Nicaragua: internal conflict from 1982 to 1988.

Figure 7.4 Route of SIEPAC Transmission Line



Source: Energy Information Agency (EIA) (2006).

Cross-border conflicts in the region include a short war between El Salvador and Honduras (1969).

SIEPAC Project Financing

The transmission line has a project cost of US$320 million, to be financed by equity and concessionary and ordinary loans in a 25 percent/75 percent split. The debt component consists of loans from the InterAmerican Development Bank's Special Fund for Operations (US$50M; 16 percent), ordinary capital of the IADB (US$120M; 37 percent) and loans from the Spanish Quincentennial Fund (US$70M; 22 percent).

The equity component consists of 10.8 percent of the total project cost contributed by the participating countries and 14.2 percent from Endesa (the Spanish utility), the main private-sector partner in the project.

The loans to the national utilities are guaranteed by sovereign guarantees of the respective governments.

The regional electricity market (MER) design and implementation is supported by technical assistance of US$16.4 million, financed mostly (90 percent) by the IADB, of which US$5 million was a grant with the rest funded through loans, and the remainder from the six countries.

Critically, donor funding for the transmission line was made contingent on the parties reaching agreement on the market and regulatory structures.

Private-Sector Participation

A transmission line company, Empresa Propietaria de la Red (EPR), was formed in 1998 to own the transmission line. It is a joint venture between the governments of the six countries (through their state-owned utilities) and two private-sector companies, Endesa of Spain and Interconexión Eléctrica S.A. (ISA) of Colombia. The public–private partnership grants Endesa, which has a 12.5 percent ownership, responsibility for managing the company. EPR has its head office in Costa Rica and branches in each country.

Construction and supervision of the line was contracted to Canadian company Dessau-Soprin.

Supporting Legal and Institutional Framework

The Marco Treaty of the Electrical Market of Central America, which forms the framework agreement for the SIEPAC project, was signed on December 29, 1996, ratified in 1998, and entered into effect from January 1999. According to the Marco Treaty, the six countries agree to the formation of a Regional Electricity Market (MER), including a regional system and market operator (EOR) and a regional regulatory agency (CRIE). The Treaty also makes provision for dispute resolution, primarily through CRIE.

CRIE began functioning in 2000, EOR was established in 2001, and MER began operating under a transition market code in 2002. The development of the market and transmission codes and the organization of CRIE and EOR have been ongoing since 2002.

The Marco Treaty also grants a concession to EPR to develop the SIEPAC line on a build, own and operate (BOO) basis.

Institutional Structure

The SIEPAC project necessitated the creation at the regional level of the capacity to design and implement the regional market and the transmission line. Prior to the Marco Treaty there were no regional organizations able to carry out these functions. The treaty facilitated the creation of a number of organizations, including both temporary design and implementing organizations and permanent regulating and operating institutions.

Three permanent organizations were created as legal entities under the Marco Treaty:

1. The Regional Commission on Electrical Interconnection (CRIE), which acts as regional regulator and resolves disputes in the regional market.
2. The regional system operator and MER administrator (EOR).
3. The transmission line company (EPR).

The Marco Treaty establishes CRIE as an entity with its own juridical identity and powers under public international law. Therefore, CRIE is subject to and governed by international law and is not a national entity. CRIE is headed by a six-person board of commissioners, one representing each member country.

EOR has a 12-person board of directors; two per country.

The role of CRIE is to regulate the MER. Its responsibilities include approving regulations for the market and coordinating these with the country-level regulators, setting tariffs for use of the transmission system, progressing the market through increasing stages of competition and to guard against the exercise of a dominant position, imposing penalties for non-compliance with market rules, and settling disputes among participants. CRIE also approves extensions to the regional transmission network. CRIE is based in Guatemala. CRIE's legal status and dispute resolution powers are discussed in more detail in this Chapter.

EOR's role includes proposing rules for MER and transmission system use for approval by CRIE, ensure quality and security of supply in the electricity system, to carry out the market operation function in an efficient manner, and to settle market transactions among participants. EOR is also responsible for providing information on market conditions as well as developing and publishing generation and transmission expansion studies and centrally planning extension of the regional transmission grid (RTR). EOR is based in El Salvador.

The administrative costs of CRIE and EOR are met through contributions from the governments, fees paid by market participants, and penalties imposed for noncompliance with the rules.

A number of temporary organizations were formed for the design and implementation phase of the MER project. It is intended that these will be reduced over time as the project moves into its operation phase and the permanent organizations take up their roles.

Regional Electricity Market (MER)

The general design of the MER designates it as a seventh market, sitting on top of the country level markets. It consists of a firm and non-firm contracts market and a day ahead and real time spot market for short-term trades with prices set at specified physical trading points (nodes) in the regional transmission grid (RTR). Access and use of the RTR is auctioned in the form of financial and physical transmission rights by EOR. The RTR is made up of the new SIEPAC line, the tie-in lines, and designated parts of the national grids.

The general design of the MER allows for day-ahead spot market and real-time balancing. Transmission use of system charges will incorporate a variable charge for losses and congestion, a charge based on volumes transmitted across the lines, and a top-up charge to meet the regulated revenue requirement of the transmission companies.

Each country retains its domestic market and regulations with the necessary changes to ensure compliance with MER and that it is able to interact with the regional market. Firm contracts for international trade must be approved by regulators in both the buyer and seller countries to ensure there is a corresponding firm transmission right. The terms (e.g., duration and capacity) are freely decided by the buyers and sellers.

In addition to the new SIEPAC line, third parties are allowed to develop and construct new transmission lines. The owners of these lines will then be granted the associated transmission rights.

Evolution of the MER

The general design of the MER, based on principles in the Marco Treaty, underwent a two-year development period before receiving approval by the six governments in 2000.

The Transitional Regulations of MER were finalized by CRIE and signed by the governments in 2002. More detailed market design followed, with the development of transmission codes, market rules, and further organization of CRIE and EOR. The transitional regulations were replaced in December 2005 with the approval by CRIE of updated regulations. The regulations govern the actions and responsibilities of the system operators in the SIEPAC member countries in regard to dispatch, tariffs, and transmission services, and clarify the role of CRIE in relation to MER. The Transitional Regulations established border (nodal) prices.

Dispute Resolution in MER

The Marco Treaty provides for two levels of disputes and binding resolution:

- Binding resolution by CRIE—In relation to disputes between agents operating in the market.
- Resolution by the Central-American Court of International Justice—In relation to disputes between States party to the Treaty, in relation to interpretation of the Treaty, or the obligations imposed directly on the states under the treaty.[55]

In either case, parties must first try to settle disputes through conciliation. Under the rules of the MER, states may also choose to submit the dispute to CRIE for resolution on a binding basis, or such other forum as the parties agree to.

Role of CRIE in Dispute Resolution

The provisions for resolution of disputes are set out in more detail in the MER regulations.[56] These provisions provide for a three-step process of negotiation, conciliation, and binding arbitration. CRIE is responsible for both the conciliation and arbitration processes. This process is subject to the rules and regulations established within the SEIPAC structure, and is not governed by a domestic law.

The general provisions apply to all disputes arising in the MER under the Regional Regulation,[57] where the dispute is between the following parties:

- Between national system operators, between national regulators.
- Between agents in the market.
- Between the EOR and an agent in the market.
- Between the EOR and a national system operator.

The *Rules of MER* set out the procedure for arbitrations, and do not incorporate external rules or procedures. A three-person tribunal, appointed from the board of the commissioners, acts as the arbitration tribunal of nationals that are not of the nationality of either party to the dispute.

The procedures do provide for only one, limited form of appeal of a decision, by appealing to CRIE on the basis that it acted outside its legal powers or the decision contravenes overriding norms and principles.

Risk Assessment and Mitigation

All six countries have successfully attracted major international energy investors to their electricity sectors. However, the economies of the SIEPAC members are in transition, and some bear the scars of recent conflict. In the case of the large investments needed for the SIEPAC line and to provide a creditworthy basis for the new market to reduce finance and payment risk, the donors/IFIs required sovereign guarantees from each of the participating governments.

Planning risk and the risk that project financing would be stranded due to market and regulatory mechanisms not having been sufficiently developed in time for physical completion were mitigated through pressure being applied by IFIs providing financing. Construction of the physical transmission infrastructure could not begin until after the finalization of the supporting institutional structures and agreements.

As already discussed, the project includes a strong legal basis for clear dispute resolution procedures and establishes a supra-national institution to arbitrate and provide binding resolutions on disputes.

[55] Including, for example, obligations to ensure freedom of transit and in relation to tariffs.

[56] Reglamento del Mercado Electrico Regional.

[57] Unless the rules provides other specific dispute resolution procedures.

Lessons for Trade in ECO

SIEPAC is a more advanced trading arrangement than anything existing currently within ECO. Development of the legal and institutional structure that will underpin SIEPAC took *10 years after the signing of the intergovernmental treaty*. The concept of international electricity trade had been in development for some time before this.

Central America has a history of cooperation and initiatives aimed at developing closer regional economic and political integration and SIEPAC was built on a **favorable history of intergovernmental cooperation.** Even allowing for the added complexity, the time taken to reach the initiative's current developmental stage is indicative of the challenge of implementing regional trade agreements.

One of the interesting aspects of SIEPAC was the strict terms on which donor and IFI financing was released. The involvement of and pressure by external financing agencies probably contributed to delay in the transmission project, but it helped ensure that disagreements at the highest level had been worked through and that a supporting structure that could support viable trade had been settled before serious investment was sunk.

At its foundation this project rests on **legally enforceable agreements between governments,** as provided in the Treaty. The central regulatory institution, CRIE, is granted high legal status in international law including autonomy from national courts. This provides a unified legal structure for the multicountry market that should contribute to its independence. It also creates a potentially **powerful institution at the regional level** that indicates a serious commitment on the part of the national governments that have ceded authority to it.

As with many of the other international trade examples we have reviewed the financing for the project is underpinned by **sovereign guarantees.** These are important for limiting the financial risk of projects, such as this that contain various other political and investment risks and for encouraging private sector participation.

The project seeks to take advantage of **private-sector expertise** with the inclusion of a major international investor-owned utility that also has a stake in the region. It is a mark of confidence in the project that a private-sector partner could be found. Increased private-sector trade in the regional market is a stated objective.

SIEPAC illustrates that it is possible to create a relatively advanced regional electricity trading arrangement between **countries that are at differing stages of internal market development.** This is an encouraging example for ECO, which contains an even broader span of market complexities than the SIEPAC region. It also shows that **post-conflict environments are not necessarily a barrier to trade,** although each should be considered on the basis of its own situation and capacities.

Southern Africa Power Pool (SAPP)

Introduction and Background

Regional cooperation in the electricity sector has the potential to deliver substantial development benefits to the countries of Southern Africa. The interconnection of national electricity systems has a long history, but until recently most developments were bilateral in character. Systematic electricity sector cooperation across several countries was facilitated by the formation of the Southern Africa Power Pool (SAPP) in 1995. Operating under the rubric of the broader regional integration institution, the Southern Africa Development Community (SADC), SAPP is currently a *loose pool*, but seeks eventually to provide a fully competitive electricity market for the region.

At present, SAPP has 12 member countries, with 97 percent of energy being carried over the interconnected grid, which covers 9 countries. The utilities of the interconnected countries are operating members of SAPP. There are plans for the remaining three non-operating members to become connected to the shared grid, with the interconnector projects for Tanzania and Malawi currently being implemented and a transmission company, WESTCOR, being formed in 2004 to integrate transmission systems from DRC through Angola to Namibia, Botswana, and South Africa.

The SAPP member countries and the interconnected grid are shown in Figure 7.5.

The members of SAPP and their basic operating data are summarized in Table 7.4.

As can be seen from Table 7.4, the interconnected system is dominated by South Africa, which has approximately 85 percent of the installed capacity, maximum demand and energy consumption. The hydropower potential of the Congo and Zambezi rivers is considerable, and offers the potential for South Africa to avoid building further coal-fired or nuclear stations.

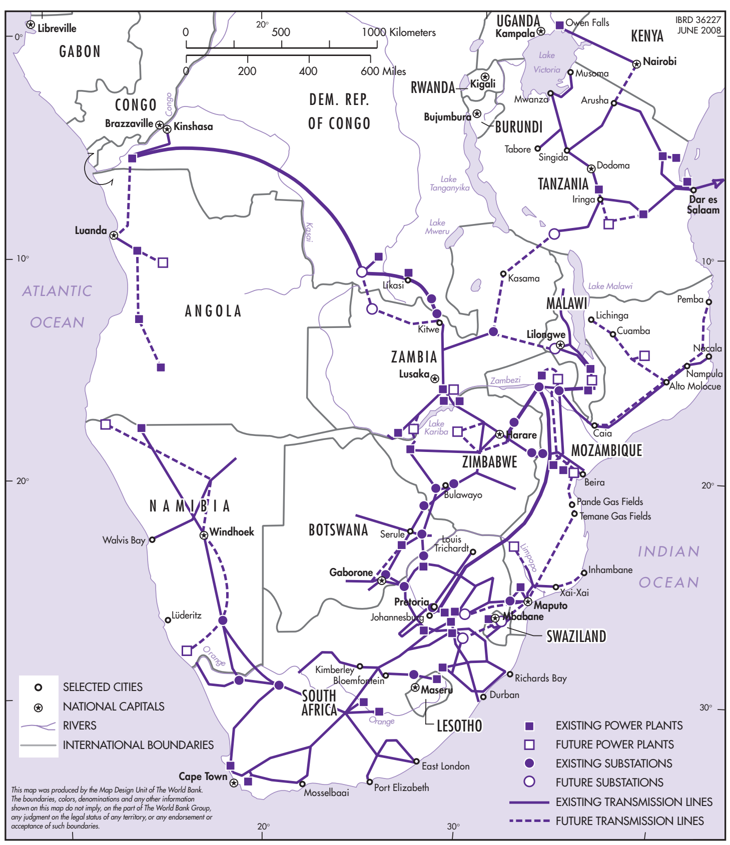
Evolution of SAPP

The driving political and economic force behind the evolution of SAPP has been South Africa's desire to meet future increases in demand by importing low cost hydropower from its northern neighbors.

In the 1980s and early 1990s, southern African countries, excluding South Africa, cooperated in energy matters via the Energy Coordination Unit of the Southern African Development Coordination Conference, the forerunner of SADC. In the electricity sector, this included various small interconnector projects.

Political will for the development of trade was enhanced by a severe drought in 1992 that had a marked effect on the production of hydroelectricity in the region. The evident economic and political costs of shortages of electricity provided an opportunity for utility planners to impress on political leaders the need for action on electricity capacity expansion plans and the benefits of regional trade as a means to cover for temporary under- and overcapacity. Zimbabwe was particularly in need of expanding electricity imports, and to facilitate this, new 400 kV transmission lines were constructed

Figure 7.5 SAPP Interconnected Grid



Source: Southern African Power Pool (SAPP) (2006).

Table 7.4 Summary of SAPP Members in 2005

Country	Utility	Membership Status	Installed Capacity (MW)	Max Demand (MW)	Energy Sent Out (GWh)
South Africa	Eskom	operating	42,011	33,461	21,985
Zimbabwe	ZESA	operating	1,975	2,066	9,391
Zambia	ZESCO	operating	1,732	1,330	8,884
DRC	SNEL	operating	2,442	1,012	6,904
Mozambique	HCB	IPP	2,075		4,515
Namibia	NamPower	operating	393	491	1,660
Swaziland	SEB	operating	51	172	1,001
Botswana	BPC	operating	132	434	977
Lesotho	LEC	operating	72	90	446
Mozambique	EDM	operating	233	285	147
Tanzania	TANESCO	non-op	839	531	3,674
Angola	ENE	non-op	745	397	2,649
Malawi	Escom	non-op	285	242	1,177
Total interconnected			51,116	39,341	255,910
Total SAPP			52,985	40,511	263,410
Interconnected % SAPP			96%	97%	97%
S Africa % interconnected			82%	85%	87%

Source: SAPP Coordination Center. Mozambique demand figure excludes MOZAL.
Note: See Box 8 on the Cahora Bassa project for further details of the HCB IPP.

from Cahora Bassa (500 MW) and from the Mathimba Power Station in South Africa, via Botswana (300 MW). The commissioning of the Mathimba line meant the interconnection of two large systems into a single synchronous system covering the bulk of Southern Africa.[58] The South African system, due to its size, dominates SAPP and essentially imposes its operational characteristics on the other systems.

Even before it was politically acceptable to deal with South Africa, the state-owned South African utility Eskom was actively trying to foster interest in hydroelectricity projects in neighboring countries. This paved the way for SAPP to be formed within a year of South Africa's first democratic elections, which took place in 1994. SAPP itself was created in August 1995 at the SADC summit held in South Africa.

Supporting Structure and Institutional Framework

At the 1995 SADC summit, the member governments signed an intergovernmental memorandum of understanding (MOU) for the formation of a power pool in the region. Three other key documents which were agreed and signed subsequently follow:

- 1. Interutility memorandum of understanding, which established SAPP's basic management and operating principles.
- 2. Agreement between operating members, which established the specific rules of operation and pricing.
- 3. Operating guidelines, which provide standards and operating procedures.

[58] There had been significant synchronization problems in 1990 when a low-capacity link had been installed between Botswana and Zimbabwe. The higher-capacity Mathimba link locked in the synchronism.

The founding MOU has recently been updated, and a revised SAPP intergovernmental memorandum of understanding was signed by the Ministry of Energy in February 2006. The other three main legal documents are also in the process of revision. The need to revise the founding agreements is prompted by four factors:[59]

1. The restructuring of the umbrella regional integration body, SADC.
2. Electricity sector reform in several SADC Member Countries including the creation of Electricity Regulators.[60]
3. The expansion of SAPP membership.
4. The need to expand SAPP participation beyond the national power utilities, to include commercial parties such as Independent Power Producers.

The redrafting exercise is to include the formulation of an agreement on **dispute resolution** that is specific to the electricity sector. SAPP had been able to do without such an agreement because reference was made to the Dispute Resolution provisions in the 1992 SADC Treaty.[61] In this regard, it is notable that the existence of a regional body with a broad cooperative or integrative mandate may well make it easier to initiate and sustain cooperation in a particular sector, such as electricity.

From the initiation of SAPP in 1995, the **institutional structure** has had three tiers:

1. Executive Committee.
2. Management Committee.
3. Three technical subcommittees (planning, operating and environmental subcommittees).

Chairing of each of the committees has rotated between representatives of the national utilities.

While maintaining the rotating chair principle, in 2000 a permanent SAPP **Co-ordination Center** was established in Harare. The principal initial objective of the Coordination Center was to establish the Short-Term Electricity Market (STEM) (see below). The success of STEM has helped to make the Coordination Center a credible and respected organization. This is evident from the fact that the Coordination Center is consulted on up-coming negotiations by new players (for example providing capacity building to Malawi prior to the national utility Escom negotiating its first power purchase agreement with HCB). The Coordination Center has also been turned to for assistance in the resolution of disputes (for example, the dispute over reactive power between MOTRACO and Eskom).

Electricity Trade in SAPP

To date, SAPP has made creditable strides in establishing mechanisms to encourage short-term trade, although these are still far from optimal, and the amounts involved are a small proportion of total energy consumption, as shown in Table 7.5. There have also been benefits in the area of auxiliary services for example, the decision to share spinning reserve resulted in a reduction on a national basis of reserve requirements from 20 to 15 percent of peak demand, resulting in considerable savings.

Where SAPP has completely failed to make progress is in the implementation of a co-ordinated investment strategy. No new capacity expansion project of any significant size was implemented anywhere in SADC in the first 10 years of SAPP's existence. The failure to plan ahead for the long project lead times, which are inevitable in the electricity sector, is analyzed further in this Chapter.

Short-term Energy Market (STEM)

The Short-term Energy Market (STEM, see also Annex 1), operated by the Coordination Center, is a market for hourly day-ahead and longer-term contracts. STEM also organizes secondary trading of contracts that have been cleared

[59] SAPP Annual Report 2006, pg. 5.

[60] Electricity regulators have been established in recent years in Angola, Lesotho, Malawi, South Africa, Zambia, and Zimbabwe. A regional institution, the Regional Electricity Regulators Association of Southern Africa, was formed in 2006.

[61] Article 16-4.

Table 7.5 SAPP Electricity Trade in 2005

Country	Utility	Bilateral Contracts (MW)	Energy Traded 2005 (GWh)
South Africa	Eskom	1,706	10,417
Mozambique	HCB	1,620	4,515
DRC	SNEL	260	1,470
Zambia	ZESCO	80	280
STEM	5 utilities		178
Trade		3,666	16,860
Total on intercon system		39,341	255,910
Trade % total		9%	7%
STEM % total trade			1%

Source: South African Power Pool (SAAP) (2006).

Note: Maximum STEM trade 842 GWh in 2002 at an average price of around 0.4 USc/kWh. Price rose to 1.2 USc/kWh in 2005.

through the market. The operation of STEM is governed by a framework laid out in its *Book of Rules*. Total energy traded in STEM peaked at 842 GWh in 2002.[62]

The three controlling SAPP system operators monitor and report on whether the STEM contracts have in fact been adhered to by the contracting parties. Non-compliance results in fines which are subtracted from the notional bank balances held by the participating utilities in a shared bank account in Botswana maintained by SAPP.

Real-time trade that optimizes short-term supply-demand balancing and wheeling opportunities would allow for a significant increase in the level of trade. Two major studies are being undertaken that will consider how real-time trading could be introduced (part of the SAPP Pool Plan Review) and how to improve on transmission pricing to encourage expansion of trade. It has been agreed that wheeling charges, which are currently calculated using a MW-km approach, should in future be based on a nodal pricing methodology. The transmission study will also make recommendations on the development of auxiliary services markets.

Electricity Trade Typologies within SAPP

In respect of the four typologies described in Chapter 4, trade within SAPP at present fits into all three subcategories of typology 1 (bilateral trade amongst neighbors), with much of the trade also fitting into typology 2 (bilateral trade via transit countries) and typology 3 (trade within a synchronized system). Examples of SAPP trading arrangements that fit the different typologies are given in Table 7.6.

The bedrock of SAPP trade is typology 1, mostly 1a, and there have also been new (transmission) facilities (notably MOTRACO, see Annex 1) that fall within the 1b framework. HCB's role in the Cahora Bassa project fits typology 1c.

A large portion of trade is wheeled through transit countries, in accordance with typology 2. All of the transit countries are SAPP members, and this means that even for the short-term trades being arranged under STEM, there is preagreement on allowing the transit country's transmission network to be used and on the level and sharing of wheeling charges.

[62] This dropped to 178 GWh in 2005, partly due to generation being removed from the market to enable rehabilitation.

Table 7.6 Trade Typologies within SAPP

	Typology	SAPP Examples
1	**Bilateral trade amongst neighbors**	
1a	Transfers between state utilities	Eskom to LEC, EDM, NamPower, BPC, SEB
1b	New facilities	MOTRACO (wheeling Eskom & HCB power to MOZAL)
1c	Private involvement	HCB-Eskom, HCB-ZESA
2	**Bilateral trade via a transit country**	Eskom-ZESA, SNEL-Eskom, ZESCO-Eskom etc
3	**Inter-SO trade in synchronized system**	SAPP contains three SO control areas
4	**Power pool**	Long-term objective (expanding Eskom's internal pool)

Source: ECA (2006).

Note: For utility acronyms, see Table 7.4.

In respect of typology 3, there are three synchronized control areas in SAPP, managed by ZESCO (Zambia), ZESA (Zimbabwe), and Eskom (South Africa). The operating guidelines describe how the three SOs are to manage the synchronized system and deal with problems (such as isolating certain sections and resynchronizing).

SAPP's long-term vision is to become a *tight pool*, with a fully integrated, competitive electricity market and centralized control (typology 4). Although SAPP as a whole is a long way from this at the current time, the establishment of an internal pool in South Africa is being viewed with interest as a possible nucleus of a future SAPP-wide pool.

Barriers to Project Development in the Region

A major barrier to the development of the significant hydro resources in the northern areas of the SAPP region has been political instability. A number of important potential projects are located in countries that have either been at war or have had, and often still have, weak administrations, poor security arrangements, and very high risk profiles from the viewpoint of any outside investor (including other SAPP utilities). This applies in particular to the development of the Inga site on the Congo River in the Democratic Republic of Congo, which with 40,000 MW of hydropower potential is a prime focus for future electricity supplies for the region.

While projects in the countries with large hydropower resources may be least cost in the absence of these factors, the increase in the cost of capital brought about by local instability can be sufficient to turn project economics away from regional trade in favor of self-sufficiency. Current studies suggest that a higher cost of capital for hydro projects in countries such as DRC leads to the elimination of the cost advantage of the hydro projects. With most of the new demand being in South Africa, the least cost solution appears to involve increased thermal power investments there.[63]

Another factor that dilutes the benefits of regional cooperation is continued public-sector subsidization of new investment, particularly in South Africa. South Africa is continuing to invest in its electricity sector through Eskom, a quasi-public enterprise, while other countries look to foreign private investors to provide capital for major investment projects. This can result in a distorted cost of capital in favor of domestic projects in the south rather than potential export-oriented hydro plants in the north. In this case, where South African government policy favors

[63] This analysis fails to take formally into account environmental costs and broader economic benefits.

Eskom investment domestically, private-sector involvement would actually result in a lower degree of regional integration than would otherwise be the case.

To maintain the momentum of regional cooperation in electricity, a practical response is for utilities and emerging electricity companies in SADC countries to participate in developing projects in other SAPP countries, including taking an equity stake in the project and raising finance on the basis of home country risk premiums and capital costs. However, offshore projects of this kind are yet to happen to any significant extent. The utility best able to pursue this route is Eskom, which is clearly keen to develop projects elsewhere in the region. The potential dominance of Eskom is not always welcome in other countries in the region, however, and local utilities will tend to want to take a large stake themselves.

The key parameter that emerges is the weighted average cost of capital between Eskom, private sector and national utility investors.

One of the barriers to increased trade through STEM has been capacity constraints on the tie-lines interconnecting the three control areas. This issue is directly related to the ability of the interconnected systems to coordinate investment planning and attract financing. It also relates to the capacity allocation methodology, under which bilateral contracts are given precedence over market trades.

Risk Assessment and Mitigation

The principal risks that have impinged on the achievement of the potential for electricity coordination in southern Africa have been associated with economic and political instability (taking its most egregious form in civil war in Angola, DRC, and Mozambique) and the lack of real political commitment to regional integration. This is evident despite the rhetorical commitments to the achievement of a single economic community that are made by political leaders at summits of the regional body, SADC.

Physical Security Risk to Infrastructure

The prime example here is the sabotage of the DC transmission line from Cahora Bassa to Pretoria during the Mozambique civil war. The line was put out of service in 1981 and made totally inoperable in a sophisticated single attack in 1985 that destroyed 514 pylons. The line remained out of service for 17 years, with power flows only being restored in 1998 (see Box 6.2).

The threat of interruption of supply due to destruction of transmission lines arises not just from political instability but also from poverty. For example, power exports from SNEL in the DRC have been interrupted during 2006 due to the removal of copper cable and cross-struts from the transmission towers in a remote part of the country. The motivation in this case appears to be purely economic: sale of the copper at high world prices and use of the cross-struts to make ploughs for subsistence agriculture.

It is difficult to mitigate poverty motives within the context of electricity sector development alone. However, it is important to make sure the local community benefits form increased access to (and lower cost) electricity.

Planning Risk

The fact that no significant capacity expansion has occurred since the formation of SAPP, and that the regional balance has now turned from a surplus to a deficit, is testimony to the poorly developed planning procedures in member countries, compounded by cautious and incomplete electricity sector reforms. At a deeper level, these problems arise from the persistence of preferences for state control of the electricity industry and for self-sufficiency in generation capacity, but an unwillingness to take the steps necessary to match these orientations, not least because of the prohibitive costs.

Political instability and weak governance within member countries are another major set of risks inhibiting effective planning of supply expansion (as well as financing, construction, and operation).

Financial Risks

Political instability in the region contributes to financial risk. Combined with economic mismanagement, it also raises the risk of exchange rate variability. This has been a major issue in bilateral contracts, the most salient example again being from Cahora Bassa.

In the STEM, the exchange rate risks are carried over short periods. The STEM operates in two currencies—rand and U.S. dollars—with settlements being made on a monthly basis. The bank accounts were set up in the SADC country with the strongest balance of payments and reserves position, and the most open foreign currency arrangements—Botswana.

Security of Supply Risk

The risk of interruptions of supply arising in another country is used to justify expensive investments on home soil. However, experience in the country currently the largest beneficiary of growing interdependence in SAPP, Zimbabwe, is that the risk of supply interruptions can be much higher from domestic sources than from imported electricity.

Other Risks Affecting the Region

These major risks have been linked to specific historical circumstances in southern Africa. SAPP has also had experience in confronting less dramatic risks, which would affect any nascent power pool, but which can nonetheless be important in retarding the deepening of electricity cooperation.

Technical Risks on Large Interconnected Networks

There is always a risk of instability on a large interconnected system resulting in a major system failure that might have been obviated on a smaller system. In 2005, there were 20 faults on the SAPP network, 16 of which were considered serious and one of which led to a total blackout in the affected region. The obvious approach to mitigating risks of this sort is the ongoing development of technical operating arrangements and capacity, through a process such as that taken in UCTE in Europe.

Risk of Failing to Agree on Contract Details

In the few regional construction projects that have been implemented, project delays have arisen less from risks associated with construction per se, but with agreeing the details on contractual arrangements to use the new infrastructure. It may be that the infrastructure has to be in place before contentious issues can really be confronted, but ideally, to mitigate the risk of project delays, the negotiations to agree the contractual details should take place well in advance of the completion of construction. In the case of SIEPAC, this risk was avoided by the IFIs effectively applying pressure to finalize contractual details, after which the IFI financing could be released.

However, it is notable that the problem of agreeing the details was much more severe before the establishment of SAPP—for example, in the Botswana-Zimbabwe interconnector project that was completed in 1990.

Risk of Simple Arrangements Suppressing Economic Opportunities

The simplistic wheeling charge adopted by SAPP is based on formulae that have in effect precluded some favorable trading arrangements that would have delivered significant benefits. Different approaches to wheeling charges were the subject of a technical study in 1999. Sophisticated approaches were rejected by SAPP in favor initially of a fixed fee for wheeling (shared equally by transit utilities) and subsequently by the MW-km method. This can disadvantage projects located long distances from demand that could otherwise use alternative approaches such as offset arrangements.

The simplistic wheeling charge formulae were beneficial in allowing SAPP trading arrangements to get going, but such initial pragmatism can result in significant costs being incurred subsequently. Arrangements that run counter to the underlying economics play into the hands of those seeking for political or other reasons to promote autarchy over cheaper, more reliable regional strategies for electricity supply.

Conclusions on SAPP

The notable but very modest achievements of the Southern African Power Pool need to be assessed in relation to the context of southern Africa's regional ambitions. On the one hand, it is acknowledged that regional cooperation and regional integration are not short-term processes. They require time for confidence to be gradually built and the next regional steps to be taken. On the other hand, in southern Africa the electricity sector offered by far the biggest immediate benefits of competing regional cooperation sectors.[64] Purposeful action in the electricity sector would have contributed most to building the momentum for broader regional cooperation.

What was hoped for when the regional economic power, South Africa, became a legitimate member of the region and SAPP was formed was a rapid movement toward an integrated, regionally least-cost electricity investment strategy. The reality instead has been the development of a short-term market for electricity, providing limited trade gains for the participants. What is perhaps more important about STEM is that it has maintained a sense of purpose about cooperation in electricity and has given considerable stature to the Coordination Center.

SAPP provides an example of how a regional cooperation organization (in this case SADC) can provide the framework within which regional electricity trade can develop. At the highest level, SADC offered a forum in which there was established interaction among political decision makers from across the region. SAPP is also an example of where multilateral trade is underpinned by an intergovernmental agreement.

The ongoing tendency toward policies of energy self-sufficiency continues to hinder the development of trade and investment in the needed transmission infrastructure. As a result, a region with large energy resources now finds itself facing localized electricity deficits.

The significant challenges for SAPP still lie ahead. As the regional electricity surplus has now been taken up, the pressure to accelerate long-contemplated generation and transmission projects is growing. With the exception of Zimbabwe, this fortunately comes at a time when there is an unprecedented level of political and economic stability in the SAPP countries.

However, there are still important risks in the SAPP environment. The real political commitment to regional solutions to electricity supplies remains in doubt. High levels of country risk and factors such as inexperienced regulatory structures will raise the costs of project financing and put pressure on the accuracy of demand forecasts and cost recovery strategies. At the operational level, past experience has shown that sophisticated approaches to issues such as wheeling are not easily accepted by all members, so there is also the risk that the results of the major studies currently underway to iron out technical details will not be accepted and implemented in ways most conducive to regional objectives.

Lessons for ECO

Although SAPP has successfully implemented some short-term trade mechanisms and has proven the benefits of trade, it is an example of an international trade initiative that has not lived up to initial expectations and has taken a long time to develop. In this sense, it provides useful lessons for ECO on pitfalls to avoid as it develops its own trade. There are also some positive characteristics that might provide useful suggestions for ECO.

[64] Conclusion from study for African Development Bank (1992) *Economic Integration in Southern Africa*, Oxford.

Positive lessons from SAPP include the following:

- SAPP was founded on intergovernmental agreements (consistent with other examples of international trade), as well as other multiparty coordinating agreements.
- Early development of trade among SAPP countries was for small interconnections under the institutional wing of the regional association. ECO, or other regional body, could provide this role for the ECO countries.
- The creation of a respected coordinating entity (the SAPP Coordination Center) can serve to strengthen technical cooperation, act as a driver for integration, and provide a neutral forum for resolving disputes.
- The multicountry nature of SAPP potentially provides the necessary institutional support to multisystem transit for contractual and short-term market trades (however, there are currently weaknesses as discussed later).
- Financial and exchange rate risk can be reduced by specifying a common currency for trading, using short settlement periods and locating financial transactions in the participating country with the strongest banking sector and macroeconomic environment.
- As in many ECO countries, electricity sector reform is ongoing in the SAPP countries. As the underlying environment in the national electricity sectors has changed, so SAPP has begun to adapt.
- In the early stages, a dedicated dispute resolution procedure is not necessarily required if procedures are available within a regional agreement.
- The previous bullet point suggests that early trading arrangements in ECO could take advantage of existing dispute resolution procedures in agreements such as the ECO Trade Agreement and the Energy Charter Treaty. Dedicated procedures could then be developed incrementally as trade grows and becomes more sophisticated.

Several key lessons for ECO from the less-successful aspects of the SAPP experience are as follows:

- Political instability and direct physical security risks have limited trade and investment and resulted in severe supply interruptions.
- Lack of political commitment has slowed the process of integration.
- More than 10 years after the IGA signing (1995), trade within SAPP is a relatively small proportion of the potential. This partly illustrates the long-term view required of the time frame for these projects.
- The failure to further develop trade is due in part to a continued focus on self-sufficiency policies in some governments despite clear evidence of the benefits of trade. This is of direct relevance in ECO, where self-sufficiency policies have restricted trade for the past 15 years.
- Protectionist positions have also restricted cross-border investment in new facilities.
- SAPP has had no coordinated investment strategy and this has created uncertainty and restricted much needed new investment in transmission capacity.
- Weaknesses in transmission pricing have also restricted trade by discouraging wheeling over large distances from supply sources to demand centers.

These lessons stress the importance of establishing a collaborative institutional structure but also show that this requires real political commitment toward trade. The development of SAPP has suffered from the failure to convince the political leaders of the magnitude of the benefits from regional cooperation in electricity.

The lessons also highlight the serious difficulties in successfully establishing and sustaining trade projects (be they large or modest) in politically weak and unstable environments where there are significant security risks. In the case of SAPP at least, trade has not been able to happen before political stability.

South Caucasus Pipeline (SCP) Project

Project Overview and Background

The South Caucasus Pipeline (SCP) project is, as indicated by the name, a gas pipeline, not an electricity transmission project. It is designed to export gas from the Shah Deniz field in Azerbaijan's sector of the Caspian Sea to Turkey and eventually SE Europe. The inclusion of a gas pipeline in a study of electricity trade is considered worthwhile as it is of interest to the ECO region for a number of reasons:

- It is an example of a major energy export project involving two ECO country members as principals.
- The project involves the construction of major new transport infrastructure and was developed and funded mainly by private sector partners (with some IFI support).
- The pipeline crosses three countries, including Georgia as a transit country; the region has experienced serious conflicts in recent times.
- The project involves state-owned companies (SOCAR, BOTAS) as sellers and buyers of the gas (both ECO member country utilities), but private sector companies are the pipeline developers and operators.
  - There is separation of the energy trading and transit activities.
- Most of the set of contractual documents are in the public domain, so they can be referred to as a successful example of risk allocation:
  - The project became operational at the end of 2006 and the success of the contractual and institutional framework will be tested in practice in the near future.
- Gas export projects are also of growing interest to the ECO region, especially the gas-rich CAR countries.

For these reasons it was considered that interesting lessons for ECO could be learned from SCP for electricity trade projects.

Using our typology, this project involves bilateral trade via a third-party transit country (typology 2). Apart from the obvious difference that it is gas trade rather than electricity, it differs from simpler trades of this type in two main ways:

1. The seller is not a single state-owned entity but a joint venture of public and private enterprises.
2. The transport infrastructure, the SCP pipeline, has been built and financed by private companies.

The 690 km pipeline route is shown in Figure 7.6; the gas is landed at the Sangachal terminal near Baku in Azerbaijan, transits through Azerbaijan and Georgia via Tbilisi,[65] and crosses into Turkey to join the main transmission system at Erzurum, hence the alternate acronym for the pipeline of BTE.

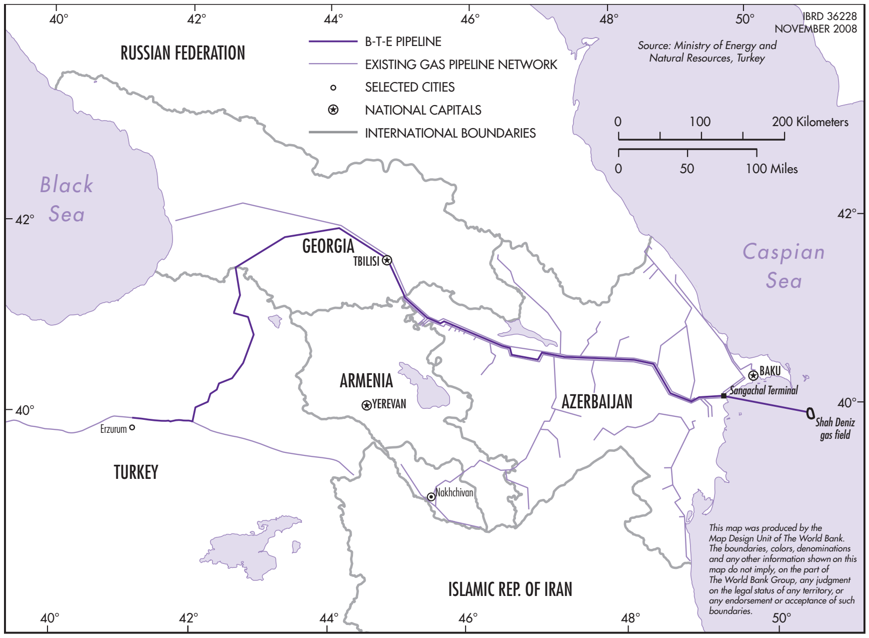
These are the main components of the project:[66]

- Gas production from the Shah Deniz fields in the Caspian Sea will be exported to Turkey.
  - The gas sellers (partners in the gas production sharing agreement—PSA) are a consortium of the Shah Deniz developers including:
    SOCAR, the Azerbaijan state-owned company
    BP
    Statoil
    Lukoil
    Elf (now Total)
    Turkish Petroleum Overseas Company (TPAO)
- The gas buyer is BOTAS, the Turkish state-owned gas import, wholesale and transmission enterprise.
- The gas pipeline (route BTE) is being constructed by a consortium (the SCP

[65] This route avoids the shorter but more risky and politically problematic route through Armenia.

[66] Further details can be found on: www.bp.com/caspian.

Figure 7.6 Baku-Tbilisi-Erzurum Pipeline Route



Source: Ministry of Energy and Natural Resources, Turkey.

partners), including some of the Shah Deniz partners, notably BP, SOCAR, Statoil and Total. The pipeline operator will be Statoil.

Construction of the pipeline is roughly on schedule, and Turkey started receiving initial Shah Deniz gas at the end of 2006.

The initial contracted volume of gas will rise in three annual steps from 2 bcm in the first year to 3.5, 5 and 6.6 bcm pa, with a maximum of a little under 8 bcm pa. The pipeline is thought to be able to support a maximum flow with additional compression investment of about 20 bcm. The proven gas reserves in Shah Deniz are over 660 bcm supporting production of, say, 20 bcm for over 30 years.

Turkey is a major importer of gas, now importing a total of over 27 bcm in 2005, of which the majority (about 16 bcm) came from Russia and the rest from Iran, Nigeria, and Algeria. BOTAS was thus an established and creditworthy partner to sign the major offtake contract necessary to provide funding for the project. However, Turkey at the time was oversupplied with gas and overcontracted for the future. It did not really need any more gas, so the Azeri gas contract was agreed on favorable terms, including a price discount to Russian gas, a cap on price rises,[67] and flexibility in the other terms such as allowing the gas to be reexported to third parties (something that is not allowed in the Russian Gazprom contracts). Other reasons this contract went ahead include:

- Turkey was also willing to assist Azerbaijan, with whom it has long-established strong relationships, to start its gas export industry development.
- Turkey was keen to diversify its sources of supply and reduce dependence on Russian gas.
- There was strong pressure from Europe and particularly the United States to establish an export corridor for Caspian oil and gas (also to diversify risks away from Russia).
- Georgia was also keen to reduce its energy dependence on Russia and strengthen its security position by hosting a project of strategic international importance.

[67] Most gas sales contract prices are indexed to oil prices, and are thus now very high, but sometimes a cap is put on how high they can rise.

Development of the Project

The project will have taken over 10 years to develop from the initial key contracts to first deliveries.[68] The major steps in the development of the SCP project were:

1996	Shah Deniz PSA signed, exploration commences
2001	All agreements between governments and SCP private partners signed
2003	Shah Deniz stage 1 gas development project sanctioned
2003	Pipeline construction begins
2006	Completion of pipeline expected end 2006
	Exploration for Shah Deniz stage 2 begins
2007–	Commercial deliveries of gas to Turkey and Georgia

Azerbaijan was not able to develop its gas resources on its own, through lack of financing and insufficient domestic demand to justify major costs in Caspian exploration. The prospect of sales to Turkey's growing gas market was a key factor in initiating the funding of Shah Deniz.

It should be noted that gas projects are frequently very profitable, as the market price of gas is usually well above the marginal supply cost. For this reason, gas development and trade projects have a lot of momentum behind them, as the sponsors have large incentives to capture the economic rent. In this respect, they may differ from electricity trade projects where the economic benefits may be much thinner.

Turkey was able to finance the transmission pipeline development and reinforcement inside its own border, as well as providing the major financial guarantees through its gas purchase contract. However, Georgia could not finance or guarantee the transit pipeline through its territory, and the upstream partners in the PSA therefore formed a consortium (with slightly different participation) to finance, construct, and operate the pipeline from Azerbaijan to Turkey's border.

The project therefore had, from the start, a very strong element of public-private partnership in both the upstream gas development and the midstream gas transportation and transit.

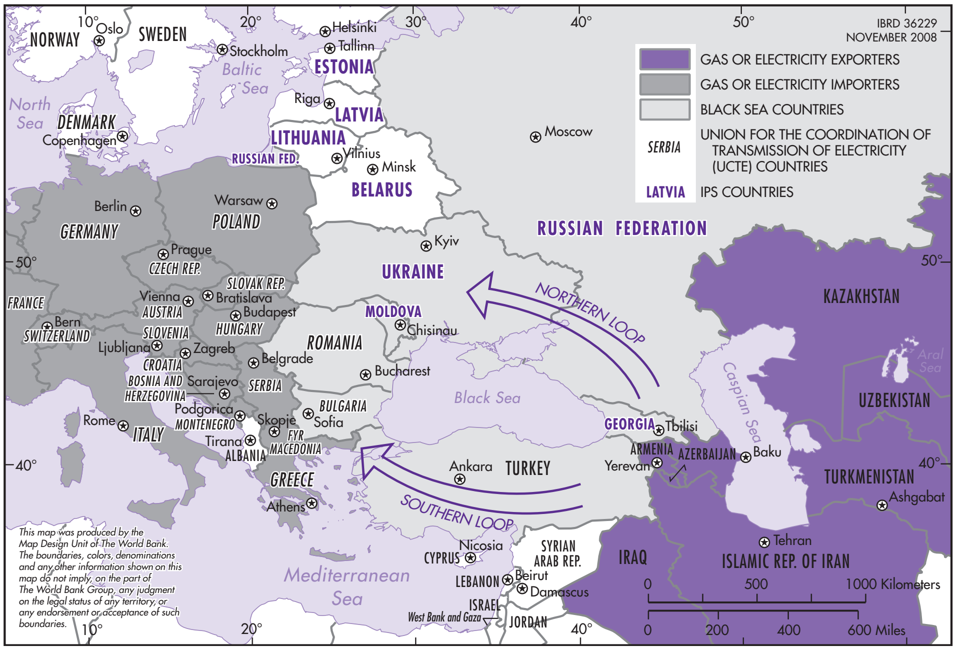
Georgia is a highly strategic energy corridor and transit route. Caspian energy can reach Europe going round the Black Sea via the northern loop (see Figure 7.7), but that has to transit through Russia, which significantly reduces the diversity benefit. The southern loop goes through Georgia to Turkey. Georgia is also on a North-South corridor for Russia to transport energy to Armenia. On the one hand, Russia has been trying to gain control of the energy assets in Georgia, in order to control the transit along both corridors; on the other hand, the U.S. government has been very keen to assist Georgia to remain independent of Russia and to facilitate the development of the east–west energy corridor.[69] This political backing has provided significant comfort to the private investors in SCP and pressure on the governments to reach agreement.

It should be noted that U.S. pressure (with European support) was also instrumental in initiating and progressing the Baku-Supsa oil pipeline (Azerbaijan-Georgia) and the Baku-Tbilisi-Ceyhan (BTC) oil pipeline (Azerbaijan-Georgia-Turkey). These forerunners to the SCP project established many of the principles of the project's construction and operating framework of agreements, including the political risk mitigation measures.

[68] In this respect it is similar to the SIEPAC and SAPP projects, which also took of the order of 10 years to develop.

[69] The peaceful 2003 Rose Revolution in Georgia, and its general inclination to be aligned with Europe as well as Asia, are further factors that lead to strategic U.S. support to maintain and strengthen Georgia's independence.

Figure 7.7 Caspian Energy Export Routes to Europe



Source: Ministry of Energy and Natural Resources, Turkey.

Supporting Framework

Contracts based on public-private partnerships and risk-sharing are well-known in the upstream oil and gas industry. In this case, a fairly typical contract, the production sharing agreement (PSA), governs the investment by the development consortium (all privately funded) and the sharing of gas production between the investors and the government of Azerbaijan.

At the political level, the project was facilitated by strong relationships and historical ties between Turkey and Azerbaijan, friendly relations between Georgia and the other two countries, an orientation by Georgia (and Turkey) to exercise their independence and to sit on the crossroads between Asia and Europe, and strong political support from the United States and Europe. Beyond this, there were no major international or bilateral agreements or institutions between the countries, although all are signatories of the Energy Charter Treaty and this was incorporated into the IGA dispute resolution mechanisms.

Contracts and Agreements Supporting the Trade

The framework of agreements that were put in place follow a clear and reasonably well-established pattern in the industry. The main agreements, with their principal functions, are shown in Table 7.7.

Risk Assessment and Mitigation

The agreements listed previously were generally negotiated simultaneously over a period of about 2 years and attempts were made to coordinate back-to-back provisions in key terms such as liability, force majeure, and dispute resolution. The main areas of risk are briefly identified and the principles applied to their mitigation are summarized here.

Political Risk

The absence of complete and consistent legal and regulatory frameworks for gas in general and large transportation and transit projects in particular, as well as the absence of

Table 7.7 Framework of Agreements for SCP

	Agreement and Parties	Function
1	Production sharing agreement (PSA) between the government of Azerbaijan (represented by the state oil company) and the 7 Shah Deniz consortium partners	Covering the terms for the exploration, development, and production of Shah Deniz stage 1, including sole rights in the concession area for up to 38 years, exploration, development, and production minimum investment obligations, cost recovery, production sharing percentages, liabilities, and disputes. BP and Statoil shared a majority 51 percent interest and the other 5 parties shared 49 percent.
2	Host government agreements (HGA) between a) SCP and Georgia and b) SCP and Azerbaijan	The HGA between Georgia and the SCP partners provides a framework for the government of Georgia to grant rights and special conditions for the construction and operation of the pipeline and the transiting of gas. It is similar to a concession agreement, providing exclusive rights, protection to property, special terms for tax, import, export, access to foreign currency, and repatriation of profits. It establishes a framework for dispute resolution and guarantees the security of the pipeline. The Azerbaijan HGA is similar in scope and content, though with less need for guarantees of performance as there is leverage on Azerbaijan as the major financial beneficiary of the export trade.
3	Inter-governmental Agreements (IGA) between (a) Azerbaijan and Turkey and (b) Azerbaijan and Georgia	The IGAs provide in effect a form of cross-guarantees between the governments to safeguard the provisions of the HGAs and to avoid unforeseen complications due to the operations across multiple countries, such as the need for one operating company to function in all countries, avoidance of double taxation, and mechanisms for cooperation and coordination. Azerbaijan has different issues with each country, leading to two separate IGAs. For Turkey, the IGA provides a high-level guarantee to the GSPA and also mentions the Trans-Caspian Pipeline project. For Georgia, the IGA provides a high-level guarantee to implement the more complex GSPAs for Georgia's transit royalty and purchased gas. The IGA also provides guarantees by Georgia to implement and not to hinder the transit of gas to Turkey.
4	Pipeline construction and operation agreements between SCP and contractors	An EPC contract for the construction of the pipeline, on commercial terms An O&M contract for the operation of the pipeline (Statoil as the operator)

Table 7.7 *continued*

	Agreement and Parties	Function
5	Transportation agreement between SCP as pipeline owners/operators and the Shah Deniz partners (as gas shippers)	Each of the SCP Shah Deniz participants is an owner of a share of the gas and enters into an agreement with the SCP pipeline owners and the operator (Statoil) to transport the gas and to pay transportation charges. The transportation agreement also deals with all liabilities in respect of failures in transportation relating to quantity or quality of gas delivered.
6	Gas Purchase and Sale Agreements (GSPA) between the SCP/Shah Deniz gas shippers and (a) Georgia, (b) Turkey	Georgia receives 5 percent of the transit gas as royalty payment and can also buy an additional similar amount at very favorable price terms. The GPSA deals with quantities, payment, minimum take obligations, and other commercial matters. Turkey is the main offtaker and has entered into a standard long-term take-or-pay contract, with a price cap and price discount to Russian gas. The terms of this contract are confidential.

Source: ECA (2006).

Note: Agreements 1, 2 and 3 are in the public domain. They are available in English on BP's Web site, see: *http://www.bp.com/genericarticle.do?categoryId=9006654&contentId=7013494, and for an example of an HGA see: http://subsites.bp.com/caspian/SHA/Eng/HGA/Host* Government Agreement Azerbaijan (English).pdf.

any existing relevant institutional framework, meant that an overarching framework needed to be put in place to cover political risk specifically for the project. This was done through the IGAs (direct agreements between the pairs of governments) and the HGAs (agreements between the governments and the SCP parties).

The HGAs attempt to provide assurances that would protect the financial viability of the project, and insulate the project from changes in internal national rules such as tax rates, excise duties, foreign exchange controls, employment legislation, and expropriation of assets. A broad guarantee was provided to restore the economic equilibrium of the project (economic stabilization) if there were changes in the country's laws or regulations.

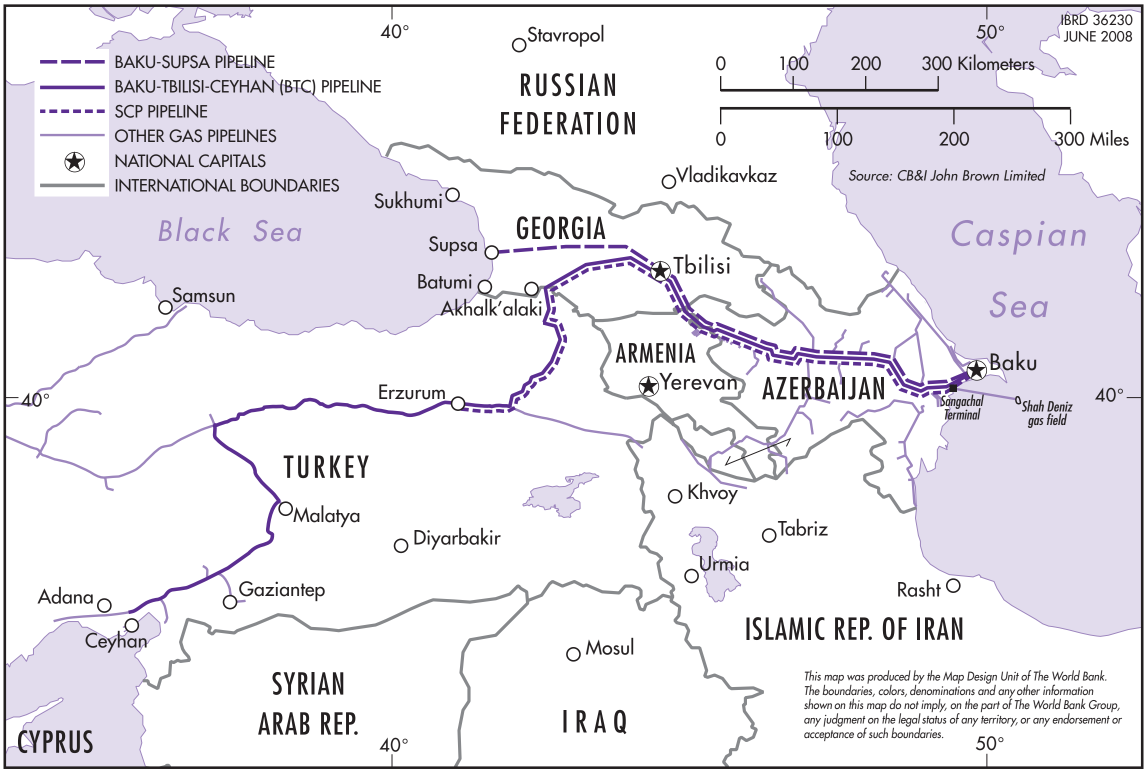
It should be recalled that the U.S. government had applied political pressure to complete the set of transactions and continues to take an active interest in supporting the implementation of the project. A similarity exists with the external political pressure applied by the EU that has been instrumental in bringing the countries of Central and South East Europe into the Energy Community (for electricity and gas) that aims to create a single energy market between all the countries of Europe.

Planning and Construction Risk

The pipeline passes through some difficult mountainous terrain, and in Georgia the winter conditions also added to the construction difficulties and risks of delays and cost overruns.

The project schedule was carefully planned and coordinated with the work for the BTC oil pipeline. A very important feature was the sharing of the pipeline corridor with BTC, as can be seen in Figure 7.8. This reduced the cost and risk of delays.

Figure 7.8 BTE Pipeline



Source: NTDC, presentation to Central Asia/South Asia electricity trade conference, Islamabad, May 2006, with ECA graphic.

Another benefit of constructing SCP in the same corridor as the BTC pipeline is the ability to minimize the environmental and social impact, using the same integrated project team.

As the pipeline in the Azerbaijan and Georgia sections is owned by the international SCP partners, the construction was planned and managed by international firms.

Security Risk

The area has seen recent conflicts and is quite prone to terrorist attacks.[70] The benefits of running oil and gas pipelines through the same corridor are offset by the additional risks of explosion in one damaging the other. Adequate separation is required between the two pipelines.

Security was a major issue during the contract negotiations. The SCP parties wanted to bring in their own security forces to patrol and protect the lines, but Georgia would not permit foreign armed personnel on their territory. However, the Georgian government (and the Azerbaijan government) would be hard stretched to cover the financial liability of a major accident to the pipelines if their security forces failed to provide adequate protection.[71]

The HGAs provide wide-ranging assumption of liability by the governments and guarantees of providing secure protection by their own security forces. The success of this approach has yet to be tested, since operation has not yet started.

Operating Risk

Operation will be carried out by one of the SCP parties (Statoil). Terms in the HGAs provide for coordinated operation across the countries. Applying international operating standards and procedures will minimize the risks of accident and poor operating performance.

[70] Both electricity lines and gas pipelines have been blown up on Georgia's border with Russia/Chechnya during early 2006.

[71] The oil industry has examples of security being provided by armed personnel under the control of the energy producer. This is the case in Nigeria (where the oil companies effectively operate within protected enclaves) and in Angola where the production facilities in Cabinda province are *ring-fenced*.

Transit Risk

Georgia is receiving 5 percent of the transit gas as transit fee, and can purchase another similar amount on preferential price terms. Nevertheless, a very substantial value of gas needs to pass through Georgia and in the last two winters Georgia has been short of gas from Russia affecting the operation of power plants and heating. The IGAs and HGAs deal with guarantees by the Georgia government to allow unhindered transit. The continuing interest and influence of the U.S. government is probably another significant factor that will help to avoid interruptions to transit or reduction to gas throughput that have occasionally happened on other transit routes (e.g., through Ukraine).

Energy Supply Risk/Geological Risk

The geological risk is borne by the gas sellers, those SCP parties sharing in the PSA and consequently parties to the GSPA with Turkey. The Turkey contract is a supply contract (i.e., for defined volumes of gas); therefore, the geological risk lies entirely with the sellers.

There is ample gas (proven reserves of approximately 660 bcm, with ultimately recoverable reserves likely to be a lot higher (e.g., x 2) to make the geological risk small at these sales volumes.

The supply risk due to accident or poor performance of the upstream facilities is also a risk born by the upstream operators, under the standard terms of a GSPA.

Offtaker/Credit Risk

Until recently, Turkey had an overhang of gas-contracted volumes as growth in gas demand had not matched its high expectations. This excess supply has now largely disappeared through demand growth and renegotiation of some contracts. The main risk in Turkey is that the gas retail price has been lagging behind increases in the import price of gas. However, as the offtaker is the state-owned BOTAS, which has a good payment record, the offtaker risk is not now as high as it might have appeared at the time SCP needed to sign the GSPA with BOTAS.

The GSPA allows re-export of gas (not allowed in the Gazprom contracts), which is another measure to mitigate the nonpayment risk if it would be caused by an excess supply of gas in Turkey.[72]

The credit risk on the payment of transportation charges for the pipeline is minimal as the parties on both sides of the transportation agreement are largely the same.

Disputes and Arbitration

In the HGAs disputes should be resolved following the ICSID Convention. The SCP parties are required to take a joint position in a dispute. Arbitration will be according to the ICSID Arbitration Rules. Arbitration will be carried out in Geneva, Switzerland, or another country that is a signatory to the New York Convention on enforcement of arbitral awards. Arbitration would be in English. The state entities are required to waive state immunity to arbitration proceedings and awards.

Fast-track dispute resolution is provided by the parties being able to agree to resolve by the use of an independent expert.

Procedures would be governed by English law.

The IGAs provide for a number of voluntary dispute resolution steps between states but finally disputes should be resolved by an ad hoc tribunal/arbitration panel following the provisions of Article 27 of the Energy Charter Treaty 1994, to which all the countries are signatories.

Lessons for ECO

The South Caucasus Pipeline (SCP) project is a gas pipeline but is nevertheless relevant to this study as it faced a number of similar challenges to the CASA project and other large electricity trade opportunities in ECO. It is a major energy export

[72] New pipelines are currently being constructed to increase the connection of Turkey to SE Europe.

project involving two ECO country members as principals, and it involves the construction of major new transport infrastructure. SCP was developed and funded mainly by private-sector partners, but it is important to note that the project's commercial and financial risks were underpinned by the creditworthiness of Turkey as the main offtaker, and the private-sector parties as operators.

Although this study concerns electricity trade, gas export projects are also of major and growing interest to the ECO region, especially the gas-rich CAR countries.

The project became operational at the end of 2006, with only minor delays from the original schedule, thus demonstrating that construction risks can be managed even in the face of security concerns and difficult terrain. The pipeline crosses three countries, including Georgia as a transit country; the region has experienced serious conflicts in recent times. The success of the contractual and institutional framework will be tested in practice in the near future as operational experience is accumulated.

- Among the interesting features of this case study for ECO are the following main points: The ability to construct a complex project across three countries without any overarching institutional structure or political agreements/treaties was achieved by adopting a set of interlocking agreements with common back-to-back provisions between the private parties and the host governments. However, the political backing for the project was strongly underpinned by the cooperative relations between Turkey and Azerbaijan, and by external stakeholder support for (and pressure on) Georgia, particularly from the United States. It is doubtful that the transactions could have been concluded in the same time, or with the level of private participation, without such strong external backing. External political stakeholder pressure is also seen to be instrumental in Europe in promoting integration of the energy markets of non-EU countries within the energy community.
- The high level of private participation in the financing and operation of the project, especially the transportation system, illustrates that it is possible to structure a project to attract private investors even before there is a comprehensive institutional structure for trade. The main emphasis was on a set of internationally enforceable agreements between the three governments (IGAs) and between each government and the project developers (HGAs).
- The use of international arbitration and dispute resolution provisions was a key part of the agreements and a critical element for the private parties. It is noteworthy that the intergovernment agreements made use of the Energy Charter dispute resolution procedures.
- The security risks to the pipeline, especially in the transit country (Georgia), were a major concern during contract negotiations. The sabotage risk meant that there was a very large contingent liability. The allocation of this risk and the related costs and procedures for security measures had to be carefully negotiated between the parties. The contingent liability is very large because of the high value of the transported gas. However, this value also creates a very strong economic pressure for the project. In this respect, gas projects differ from electricity projects due to the higher potential economic benefits of trade.
- Similar to the other three cases (NT2, SIEPAC and SAPP), it took around 10 years to complete the arrangements for the project from the initial signing of the upstream gas exploration and development contracts in 1996 through the signing of the final pipeline agreements in 2001 to first deliveries of gas at the end of 2006.

Although a gas project, this case is worth careful examination as the first large multicountry energy project involving two ECO countries and significant private investment. The main agreements (IGAs, HGAs, and PSA) are publicly available and the detailed allocation of the project risks can therefore be examined in a project that has achieved a successful completion of construction and initial operation.

8 CASA Electricity Trade Project Assessment

The proposed Central Asia South Asia (CASA) project is the most ambitious electricity trade project currently being developed within ECO. It would transport electricity generated in Tajikistan, via Afghanistan, to meet the energy deficiency in Pakistan. If successfully developed, it would be a milestone project for further trade and investment within ECO. In this Chapter, we assess the proposed CASA electricity trade project from the perspective of the type of trading arrangement that is likely to be appropriate, the specific risks and options for mitigating them, and the options for finance.

Overview of the Proposed CASA Project

The Central Asia South Asia (CASA) electricity transmission project would enable the export of electricity from Tajikistan and potentially other Central Asian states such as the Kyrgyz Republic to the growing market of Pakistan (and potentially India).

The project would involve transit through Afghanistan via a new-build high-voltage transmission line over challenging terrain. Estimates of the required length of the line vary from around 650 km to 1,000 km, depending on the routing option. Afghanistan would also receive some supplies as part of the project, either directly or from other import routes from Central Asia.

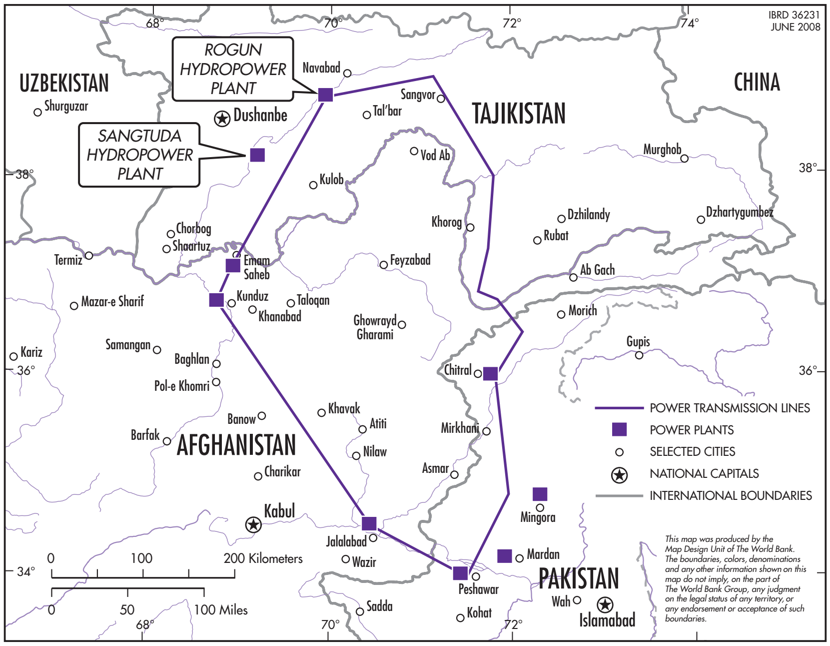
Detailed technical and economic appraisals of the potential routes have yet to be carried out.[73] Preliminary assessments suggest a possible path via Kabul (option 1) and another more northerly route that would minimize transit over Afghan territory (option 2) but pass through more difficult terrain (and therefore be more costly). This would see the new line connect to transmission assets at the Rogun hydropower project in Tajikistan and deliver near Peshawar in Pakistan. These two suggested routes are shown in Figure 8.1. Following its completion, the Sangtuda hydropower plant in Tajikistan could be connected to the CASA line directly or through the Tajik network. In addition, the ADB is financing a new 220 kV line from Sangtuda to Afghanistan.[74]

The project would be for bilateral trade through a transit country and so it fits into the second of the trade typologies described in Chapter 6. If it was implemented, it would most likely involve dedicated assets for generation, transit, and trade, although some of the generation facilities would not be new-build. The level of private participation that could be attracted would depend crucially on the ability to reduce the project risks, which currently are significant.

[73] In October 2005, the ADB announced funding for a study into the technical and economic feasibility of electricity trade between Central and South Asia. We understand that the World Bank is planning to fund a separate study into the commercial aspects of a trade project.

[74] To Pul-e-Khumri via Kunduz. Advance action on procurement for construction of this line was approved in October 2006.

Figure 8.1 Proposed CASA Transmission Route



Source: CB&I John Brown Limited.

Note: Key: black pipeline—Baku-Supsa; blue pipeline—BTC; pink pipeline—SCP.

Potential Benefits of CASA

As discussed in Chapter 2, electricity trade between Central and South Asia is supported by several positive characteristics:

- Surplus installed and partially completed capacity combined with large potential energy resources in Central Asia.
- Growing energy shortages in South Asia and large projected future demand increases.
- Seasonal complementarity in the occurrence of peaks between the two regions.

Trade offers potentially wide-ranging benefits within the region. Integrating Afghanistan economically and politically would help to stabilise the region and open up new opportunities for mutual advancement. More direct and immediate benefits to Afghanistan include the transit fees and/or electricity offtakes,[75] as well as new markets for power from the Central Asian states and additional and potentially lower-cost power sources for South Asian customers. Revenues created by the project would be important income sources for Afghanistan and the Central Asian states. If used carefully and responsibly, these could assist development and poverty reduction in these countries.

Another associated benefit could be improved cooperation and closer ties among the states. If revenues from trade outside the region were realized, it could provide new impetus among the Central Asian states to move further from their energy self-sufficiency policies and to find lasting solutions to the issues of water sharing in the region.

The CASA electricity project is not the only energy project seeking to transport energy resources through Afghanistan to Pakistan. The proposed gas pipeline project to transport gas from Turkmenistan has also been under discussion for a number of years, although no formal agreements are yet in place (see Box 8.1).

[75] The project could be structured so that Afghanistan receives payment for transmission in kind in the form of much-needed electricity imports.

Box 8.1 Turkmenistan–Afghanistan–Pakistan (TAP) Gas Pipeline Project

Turkmenistan–Afghanistan–Pakistan Natural Gas Pipeline Project
The governments of Turkmenistan, Afghanistan and Pakistan, with assistance from the Asian Development Bank, are developing the concept of a pipeline from Turkmenistan to Pakistan and India that would transit Afghanistan. India's Cabinet approved participation in the project in May 2006. The pipeline would provide an alternative market outlet for Turkmen natural gas and meet increasing energy needs in the destination countries. It would transport as much as 30 billion cubic meters annually over a distance of 1,700 km. The estimated project cost is US$3.5 billion.

The three governments formed a steering committee to coordinate the development of the project and signed a Gas Pipeline Framework Agreement in 2002. A feasibility study was financed by the ADB. There is also the potential for development of gas storage sites in Pakistan to provide coverage in the event of disruption to supply.

Although a number of international energy companies have indicated a potential interest in the project a consortium has not yet been formed and there are no financing arrangements, gas supply or transit agreements in place. Crucially, Afghanistan is yet to provide physical security guarantees along the proposed route. Another issue is the need to complete independent audits of the Turkmen gas reserves.

Source: ECA (2006).

International Support to Project Development

The development of the CASA project is being supported by a number of interested parties:

- The governments and state-owned utilities of Tajikistan, Afghanistan, Pakistan, and the Kyrgyz Republic.
- A group of donors and IFIs including the World Bank, the ADB, the IsDB, and USAID.
- Private parties, including international utility companies RAO (Russia) and AES (United States).

The Kyrgyz Republic has joined the core CASA countries as a full participant in the project. Many of the circumstances and potential contributions to trade that exist for Tajikistan are relevant also of the Kyrgyz Republic. Like Tajikistan, the Kyrgyz Republic has large export potential from hydropower, partially completed hydro capacity, low domestic demand, and seasonal complementarity with South Asia. The existing interconnections among the Central Asian countries mean that energy exports from the Kyrgyz Republic could be made relatively easily through a CASA gateway in Tajikistan.

The interested parties have had an ongoing dialogue on the project for several years. Most recently, the four participating governments, international institutions, and the interested private investors met to discuss regional trade in Dushanbe in October 2006. This followed an electricity trade conference in Islamabad in May 2006. The project also features on the agenda of broader international development cooperation initiatives for Afghanistan, such as the regional Afghan reconstruction conference held in New Delhi in November.

These meetings have included participation from high-level governmental representatives, such as deputy prime ministers and ministers of Energy, advisors to the governments, and senior management from the utilities. This suggests that one of the first steps in project development—gaining high-level political interest among the four countries—has been achieved.

Progress to Date

Some important initial institutional steps were taken at the Dushanbe conference:

- The four governments signed an MOU on project development.
- An interministerial working group was created to carry the project forward.
- IFIs announced funding for studies into the technical and economic feasibility of the project.

These are consistent with the early steps taken on large international trade projects elsewhere.

Additionally, RAO UESR, which is participating in the completion of the Sangtuda I hydropower project in Tajikistan, has indicated that it is interested in selling output from the plant to Pakistan.

Risks to Trade: Overcoming the Barriers

Identification of Risks

In principle, the net benefits to CASA trade are likely to be positive, and the project holds the potential to bring a much-needed development platform to the countries of Central and South Asia. However, as things stand currently, such a project would face significant risks and barriers, related to both developing and securing transit and arranging and operating multicountry trade.

A key consideration for the project's development will be how to structure it and create a supporting framework to mitigate the risks sufficiently to attract the project finance. Although there are various risks present throughout the region, in this case they are particularly focused on the transit through Afghanistan. Two main risks dominate:

1. **Political risk—**The fledgling government in Kabul lacks institutional capacity, suffers from corruption, and has a limited security remit over much of the country. The legal environment is poorly developed and there is no experience with a large investment project of this sort.
2. **Security risk—**Low-level but determined warfare is a continuing problem in Afghanistan (and potentially the border region in Pakistan), and major infrastructure assets would be a visible target for anyone violently opposed to the government.

The vulnerability of a transmission line to attack and damage is illustrated by the experience with Cahora Bassa (Box 8). There are also political and security risks in the Central Asian states, as well as Pakistan, but these are likely to be less severe than in Afghanistan.

Most of the other project risks identified in Chapter 3 are also likely to be present to varying degrees in the CASA project:

- **Planning risk—**This is likely to be made worse by the weakness of Afghanistan's institutions including the domestic utility. Coordination of planning across the countries, high-level political and external stakeholder support, and transparent project approval procedures will help to manage these risks.
- **Construction risk—**The terrain is particularly challenging, raising the potential for cost overruns, and construction (depending on when it takes place) could be vulnerable to security risks. However, it should be noted that the SCP gas pipeline construction has been completed with minimal delay.
- **Financial (including payment) risk—**The project would require a creditworthy buyer and guarantees to suppliers and financiers that payment would be made.
- **Legal and regulatory risk—**Afghanistan is in the process of rebuilding its institutions and establishing rule of law. The other countries are also, to varying degrees, in the process of establishing regulatory and market environments in their electricity sectors and opening to foreign investment. Nevertheless, it is likely that a major transmission line project would require to be carried out under a concession agreement (e.g., host government agreement).

Several of the second-level risks facing the project (e.g., planning, construction, timing) are directly influenced by the two main risks, while others are common to projects of this sort in new and developing markets.

Afghanistan suffers ongoing human resource and institutional capacity problems that present a barrier its ability to participate fully in projects of this scale and complexity. This problem is present at all levels of government and administration, in the national electricity utility, and in the private sector. It also affects the security forces (both army and police).

The absence of capable political and legal institutions, ongoing violent insurrection against foreign forces and the Kabul government (currently concentrated in the south and east), the weakness of indigenous law-enforcement and military capability in the face of this violence, and questions as to whether the government can develop the rule of law and credibly impose it throughout the country illustrate that Afghanistan remains a nascent nation state.

Security Situation in Afghanistan

A detailed assessment of the current security situation in Afghanistan, or of prospects for the future, are beyond the scope of this report and of the resources available to it. However, for investors or participants in an infrastructure project in the region security assessments will be essential and critical.

The security situation is complex and evolving quickly. It involves both domestic and international dimensions, and there are conflicting views as to the exact nature and roles of various parties to the conflict.

At the time of carrying out this study, an insurgency was growing in strength and violence in the eastern and southern parts of the country. The north, where a transmission line to Pakistan is likely to transit, was considered relatively calm by international observers and reconstruction efforts were able to progress there with less interference.

Options for Managing the Risks

The risks related to CASA can be divided into those directly related to the security and political situation in Afghanistan and those that are common to international trade projects more generally. Approaching the risks in this way provides a framework for considering mitigation options.

The challenge is to control the risks enough to make a trade project viable without exhausting the economic benefit that it may offer. A number of features of the approach to risk management are apparent among risk mitigation options:

- The project is viable under a long-term perspective.
- Even taking a long-term perspective, it is likely that the project will require international governmental or developmental institution sponsorship to mitigate financial risk.
- Afghanistan requires institutional support, which can be provided by the IFIs and donors.
- Support for the project in Afghanistan will be increased by ensuring inclusiveness and shared benefits locally.

These are discussed further as follows.

Security and Political Risk—Long-Term Perspective Required

The reality of the current situation with regard to security and political risk is as follows:

- The private sector may be willing to participate in the project through various different types of arrangement, but significant private equity investment is unlikely under current conditions.
- Buyers of electricity are likely to be reluctant to take the supply risk associated with transmission through Afghanistan at present.[76]
- Sellers may be unwilling to commit to contracts to supply under the current risk of interruption.

However, given time, the security situation may improve enough to support the project. In each of the case studies presented in Chapter 7, it was at least 10 years from the signing of the founding intergovernmental agreements before the projects had advanced enough to allow construction to begin or before a modest level of trade was achieved. The founding MOU for CASA was signed in October 2006. If the experience of

[76] This observation is made despite Pakistan having signed the October 2006 CASA project MOU. Whether Pakistan will take delivery of the power at the generation level or at its border remains to be agreed.

timeframes of other major international trade project developments were to be repeated for CASA, it might take several years before construction or operation of a CASA line would begin. However, given the special circumstances in Afghanistan there could equally be an international initiative, which could shorten the usual timeframe.

In the first instance security risks can be managed through the use of physical protection measures, and to a lesser extent careful physical design. However, due to the vulnerability of a transmission line, providing physical security will be costly. These costs, in addition to the cost of outages, may outweigh some of the benefits from the project—assuming finance and buyers can be mobilized under these conditions.

More lasting protection will be provided by resolving the underlying political motivations for attacks and by building greater capacity within Afghanistan to provide security. Reducing the risks and controlling the causes sufficiently to enable an electricity trade project must be approached as part of the broader development of the country. This is beyond the scope and control of a trade development project alone. It will take time, perseverance, and effort from all sides and requires a long-term perspective.

If the underlying issues are addressed then the risk of sporadic violence will fade (although it may not disappear altogether). We must also not forget that Pakistan and potentially Central Asia are also open to unrest. However, the cost of providing physical security to the line and of interruptions should reduce with time.

Financial Risk—Sovereign and IFI Guarantees

Most of the international trade projects reviewed for this study included sovereign guarantees against the financial risks. This is likely to be the case for CASA, with guarantees required from Pakistan and Afghanistan. In the case of Pakistan, this would have to be considered within the context of the well-developed policy for private power and the desire to move away from sovereign guarantees for power projects. In the case of Afghanistan, until such time as a sovereign guarantee has substantial worth, it would need to be underpinned by international political risk guarantee instruments.

Financial and political risk insurance is therefore also likely to be required, particularly to attract international and private sector investors. The IFI risk insurers, such as MIGA, can play an important role. Indeed, in the case of Nam Theun 2 their involvement was considered by many to be vital.

The involvement of IFIs can also provide a strong diplomatic tool to reduce political risk and associated financial risks.

Institutional Development

Afghanistan requires capacity building throughout its institutions, including the Ministry of Energy and Water and the national state-owned utility, Da Afghanistan Brishna Moassesa (DABM). This presents risks related to the ability of Afghan participants to manage and plan a project of this scale.

The legal and regulatory institutions also need to be strengthened. The weaknesses of the rule of law and legal institutions present stark legal and regulatory risks to developing projects in Afghanistan.

It is feasible that a project of this sort, at its simplest involving permission to build and operate a transmission line, could be carried out under a concession with little further involvement required from Afghan institutions.

However, this would miss an opportunity to leverage from the project to capitalize on the risk mitigation element that is in-built in shared ownership and to build capacity locally within Afghanistan. There is an opportunity for experience to be gained among Afghan participants, as well as for knowledge transfer from international experts to local staff. It is preferable therefore that local institutions, including DABM, be involved as project partners.

The IFIs and donors are clearly placed to provide assistance for capacity building. As was the case with Nam Theun 2, capacity building should begin as soon as possible. Capacity building to support the project could be implemented as part of broader assistance to the sector and governance in Afghanistan. Other countries, particularly those in Central Asia, would also benefit from ongoing capacity building.

The more advanced utilities, such as from Pakistan or international participants, could also provide useful support to capacity building and knowledge transfer.

Ensuring Inclusiveness and Shared Benefits

The insurgency currently building in the south of Afghanistan, which requires some support among the general population in order to be sustained, appears to be gathering wind from a sense of disillusionment with the achievements and capability of central government, and of corruption of government at all levels. Afghanistan remains among the poorest countries on earth, with development indicators in all categories among the lowest in the world, including access to electricity.

This highlights the importance to a long-term development strategy of ensuring that the local population is given a sense of inclusion and participation in initiatives that affect them or that are visible to them, that they are able to see benefits from changes and initiatives, and that promises made to local people are realistic and include a realistic timeframe. In this regard, it is important that the transit fees are used for development purposes.

It is important, then, that the benefits of the project are properly communicated to stakeholders within the broader community. People need to be appropriately compensated for way leaves, and they need to be consulted, their opinions acknowledged and respected, and they must be kept informed. Providing electricity along the route would be one approach that is likely to have long-term benefits.

The most obvious evidence of the benefits of a project as visible as a large transmission line will be improved access to electricity. This is especially true given the very low level of electricity access in Afghanistan currently. An associated electrification program, both rural and urban, could increase local-level stakeholder support.

The project might supply increased imports of electricity to Afghanistan directly from the line (for example, if the line was to pass near a relatively large demand center such as Kabul). Alternatively or in addition, since taking supply from a high voltage line to meet the low demand in many parts of Afghanistan may not be economically feasible, the project could be associated with imports via the lower voltage lines from Central Asia that are currently being rehabilitated.

The Nam Theun 2 project in Laos provides an example of broader development initiatives being incorporated into a package related to a large electricity trade project. There the IFIs played an important part in ensuring broader developmental objectives were pursued and they could provide the same role in Afghanistan.

Mitigating Other Risks

SIEPAC provides an example of how IFIs can use the leverage of their financing to improve and speed up project preparation and planning. Ideally, this will pave the way for smoother implementation during the construction and operation phases.

Conclusions on CASA

If Tajikistan and Pakistan shared a direct border, there would still be significant risks in an electricity trade project. The involvement of Afghanistan as a required transit country adds a further level of major risks. The ordinarily accepted requirements in the investment environment to support private (or even public) participation on the scale involved in a large high voltage transmission project are simply absent from Afghanistan without external support or further institutional development and security improvement. Such progress is likely to be a challenge in Afghanistan and will require considerable assistance from stakeholders outside of the country, who must be willing to bear the associated risk.

The underlying causes of risk in Afghanistan will most probably remain for some time, and addressing them exceeds the scope of a trade development project alone. However, the time that would be needed to bring the project to construction stage provides an opportunity to conduct further analysis while the broader nation building and developmental program continues and, it is hoped, the security situation improves.

Once the security situation improves, many of the other project risks would be similar to those faced by international electricity trade projects elsewhere. The success of those projects shows that these risks can be overcome. Financial risk mitigation instruments will almost certainly be required for the financing. In addition, risk management efforts should focus on institutional development with involvement of external stakeholders, and ensuring inclusiveness and sharing of benefits within a long-term development strategy that ensures that transit fess are used for development purposes and that the approach increases local population support. Providing electricity along the route would assist in this objective.

9 Roadmap for Development of Electricity Trade in ECO

Introduction

The aim of this Chapter is to draw on the analyses earlier in the report and indicate the types of trade that could develop in the ECO region in the short to medium term together with the steps required to facilitate trade in electricity. The summary of these elements, the trade opportunities and steps to bring them to fruition, together with a prioritization of the timeframe for implementation, is what is meant here by a *roadmap* covering actions that could be taken both be the countries and external stakeholders such as IFIs. The Chapter covers:

- Identification of a number of specific trade projects that are under consideration or might be developed, in each ECO country.
- Conclusions drawn for ECO from the lessons from international experience, especially the specific case studies covered in this report.
- Discussion of the likely evolution of trade, taking account of the general and specific risks, institutional arrangements, and financing options.
- Recommendations on immediate actions that the ECO states and the IFIs plus bilateral donors could take to provide a better enabling environment to stimulate electricity trade.
- A roadmap for development of trade in ECO that includes a preliminary listing of priority projects.

An underlying theme is that the significant economic benefits associated with regional trade in electricity are not sufficient in the short-term to ensure that the trade projects will go ahead. There is need for a supporting framework of institutions, legal agreements, and guarantees to be in place. These necessarily have to be built on the basis of experience in a series of projects that encourages the progressive widening and deepening of regional cooperation in electricity.

Trading Opportunities

Regional electricity trade could significantly contribute to improved energy supply and economic growth in ECO countries. The potential is likely to be realized through progressive exploitation of the options, from types 1 and 2 in our typology (bilateral trade between neighbors and via a transit country), through dedicated export projects and trade between synchronized systems (type 3), to eventually attain a regional pool (type 4).

In the ECO region, development will initially be in respect of strengthening intra-regional trade within the Central Asian Republics, where an interconnected grid already exists but much needs to be done to ensure adequate supplies of energy and security of supply throughout the region. The main strategies are loss reduction, rehabilitation programs and some key new generation and transmission investments—(Bishkek II in Kyrgyz Republic, Talimardjan I in Uzbekistan, and the North-South transmission project in Kazakhstan). By strengthening existing links with Iran, and through Iran to Azerbaijan and Turkey, the benefits of larger integrated systems can be accessed (risk sharing, reduced reserve requirements, short-term trade opportunities, and larger markets for private investors).

The main focus of this study, however, is on the major projects that can be developed to export to the large, rapidly growing electricity markets in Turkey, Iran, and Pakistan. In this regard there are broadly two clusters of countries, each composed of predominantly exporting, transit or importing countries, with a further categorization among exporting countries by fuel type:

- ***East cluster*** consists of the following countries:
  - Pakistan is an importing country with large, rapidly growing market.
  - Afghanistan, an importing and transit country, has existing interconnections with Iran, Turkmenistan, Uzbekistan, Tajikistan, the last two being strengthened, plus new 500 kV lines envisaged in CASA project).
  - Turkmenistan (transit and exporting country) is currently oriented to Iran, so also part of the west cluster, but in due course could export via Afghanistan to Pakistan.
  - Kazakhstan and Uzbekistan are exporting countries—fossil-fuel-based generation.
  - Kyrgyz Republic and Tajikistan are exporting countries with hydropower-based generation).
- ***West cluster*** consists of the following countries:
  - Turkey is an importing country.
  - Iran is an importer of electricity (e.g., from Turkmenistan), but as a country with immense petroleum and natural gas resources (e.g., gas reserves of 940 tcf). It is also a major exporter of energy, and exports will grow significantly over time. For west cluster ECO countries, Iran is also transit route to Turkey. With a multiplicity of roles, Iran may usefully be classified as a market integrating country.
  - Turkmenistan is an existing transit country, with orientation to increase exports to Iran.
  - Afghanistan is a potential major transit country when 500 kV Herat line has been built.
  - Azerbaijan and Turkmenistan are exporting countries—fossil-fuel-based generation.

The main trade opportunities are summarized in Table 9.1 and Table 9.2.[77] Turkmenistan belongs to both clusters, but currently is close to Iran and has isolated itself from the rest of the region. Kazakhstan, which has been put in the east cluster, also straddles both clusters. Kazakhstan is best placed of the ECO countries to export to major markets outside the ECO region (Russia and China), but could also participate in ECO trade projects such as CASA. Amongst the Central Asian Republics, Kazakhstan has gone furthest with electricity s ector reforms and once the north–south interconnector is in place, linking and reinforcing the two existing subnational grids, it will have a very strong electricity sector.

The tables include a color-coded presentation of the likely timeframes of different options for the evolution of trade within the ECO region. This shows that the immediate opportunities are in the west cluster, where existing mainly seasonal exports from Azerbaijan and Turkmenistan to Iran and Turkey could be expanded.

A third transmission line between Turkmenistan and Iran is planned and Azerbaijan is set to benefit from the proposed energy corridor being established between Iran and Russia, traversing Azerbaijan.

The medium- to long-term potential lies in developing the significant opportunities to produce low-cost energy, which exist principally in the east cluster in Uzbekistan (Talimardjan I

[77] Similar tables could be constructed for exports of other energy resources from the region. Gas exports in the western cluster, for example, would show the current dominance of Azebaijan with large gas resources (reserves of 1370 bcm, 660 bcm of which are in the Shah Deniz field alone), but Turkmenistan and Kazakhstan each with reserves of (probably well) over 100 tcf are also seeking new export markets. The primary gas market for Azerbaijan is Turkey, while Turkmenistan and Kazakhstan export via Russian pipelines. Future markets in Europe, Pakistan and further afield in Asia (China, Korea, Japan) are being explored.

& II) and Tajikistan (Sangtuda and Rogan I & II) and to a lesser extent in the Kyrgyz Republic (Bishkek II and Kambarara II).[78] These projects have to be classified as medium to long term, both because of their size (long lead times) and because of the need for new transmission lines to be built through Afghanistan (security concerns).

In the shorter term, these countries have the opportunity to export to the west cluster, initially to meet the summer shortfall in Iran, but later (if additional transmission capacity is installed) to contribute more generally to supply in Iran and Turkey. Iran has shown its commitment to imports by proposing to develop the Sangtuda II project jointly with Tajikistan.

Lessons from International Experience

The study has presented an analysis of four relevant cases of regional energy trade chosen to reflect similar challenges to those in the ECO region—in particular, requiring investment in new infrastructure:

- **NT2.** The Nam Theun 2 hydropower, interconnection, and trade project between Laos and Thailand, part of the GMS subregion initiative.
- **SIEPAC.** The SIEPAC electricity transmission, regional market, and trade project among six countries of Central America.

Table 9.1 Summary of Prospects for Trade in the West Cluster of ECO

			Exporting countries (fossil fuels)	
			West cluster	
			Azerbaijan	Turkmenistan
	Opportunities		Opportunities from new Iran-Russia transmission lines	Opportunities from alignment with Iran
Market integrating	Trade nexus	Iran	Transmission lines in place, some trade occurs, will expand when Iran-Russia energy corridor is built	Two transmission lines in place, third being planned, electricity already being exported to Iran. Could be increased.
Importing	West cluster	Turkey	Exports could be increased	Small exports could be increased provided elec tariff reflects gas price lower than import parity
(shaded)	Trade options with good prospects, short to medium term projects			

Source: ECA (2006).

[78] *Lesser extent* because of the project sizes. The projects in Kyrgyz Republic may well be developed sooner than those in Tajikistan and thus have a more immediate role in trade (e.g., water sharing problems are probably less in the case of the Kambarata scheme than the Rogan project, so more likely that Kambarata will be developed first).

Table 9.2 Summary of Prospects for Trade in the East Cluster of ECO

			Exporting countries (fossil fuels)			Exporting countries (hydro potential)	
			East cluster				
			Turkmenistan	Kazakhstan	Uzbekistan	Kyrgyz Rep	Tajikistan
	Project Capacity Econ cost	(most economic options)	Opportunities from alignment with Iran	(opportunities to export outside of ECO region to Russia and China)	Talimardjan I & II 3,200 MW 2.63 c/kWh	Bishkek II 400 MW 2.67 c/kWh	Sangtuda, Rogan I & II 4,270 MW 3.07 c/kWh
Imp/transit	East cluster	Afghanistan	Small imports already exist; wheeling for new export projects		Small imports already exist; wheeling for new export projects		Small imports already exist; wheeling for new export projects
Importing		Pakistan	Potential (transited through Afghanistan) but would have to overcome political constraints to trade	Potentially if can link into TAP project and compete with CA hydro	Uzbekistan well placed to export to Pakistan	Kyrgyz participant in TAP on basis of existing seasonal surpluses and Bishkek. Kambarata Project II (240 MW @ 3.95 c/kWh) could also be competitive.	TAP project to export substantial energy to Pakistan (Rogan Phases I & II, but must overcome water sharing issues)
Market integrating	Trade nexus	Iran	Two transmission lines in place, third being planned, electricity already being exported to Iran. Could be increased.	Some potential but expensive (Ekibastuz 1,000 MW at 5.05 c/kWh, project already going ahead though)	Seasonal exports to meet summer peak in Iran (1st Talimardjan project 800 MW at 1.75 c/kWh)	Potential if Kambarata projects are developed	Seasonal exports to meet summer peak in Iran (Sangtuda I project 670 MW at 1.97 c/kWh, Iran has proposed to develop Sangtuda II as a joint venture). Would need to transit Afghanistan or Turkmenistan.

Countries with greatest export potential
Trade options with good prospects, short to medium term projects
Trade options with good prospects, medium term projects
Trade possibilities with medium to long-term potential

Source: ECA (2006).

Notes: The tables exclude intra-CAR trade to meet regional demand in Central Asia (as envisaged in World Bank (2004)). They also do not elaborate opportunities for all ECO for creating larger integrated systems (risk sharing, reduced reserve requirements, short-term trade opportunities and larger markets for private investors). The tables focus on major exports to Pakistan, Iran, Turkey (and also Russia and China), which are to come predominantly from new capacity.

- **SAPP.** The Southern Africa Power Pool arrangement to promote electricity trade among 12 countries in southern Africa.
- **SCP.** South Caucasus Pipeline built to transport natural gas from Azerbaijan to Turkey via Georgia.

Each case presents a different but overlapping set of lessons fro ECO. Among the most relevant follow (with the cases that best illustrate the point in brackets):

- It is possible to bring to market a large complex international energy project including new-build hydro generation and transmission (NT2, SIEPAC, SCP).
- The creditworthiness of the main buyer is a prime consideration to reduce the payment risk to the project and thereby the financing risk (NT2, SCP, SIEPAC—existing national markets).
- The reduction of political risk through the involvement of international development institutions and their provision of risk guarantees is an important element in the financing package (NT2, SIEPAC, SCP).
- A sovereign guarantee from a participating government is a necessary risk reduction measure (NT2, SAPP).

- The projects typically take at least a decade passing from the initial founding agreements to implementation and operation (all).
- The support provided by the external stakeholders such as the IFIs (e.g., World Bank and Asian Development Bank) is crucial to maintaining the momentum of project development (SAPP, SCP), including assisting in the resolution of critical issues such as environmental controversies (for hydro projects, transmission) and security.
- Strong political commitment is necessary to advance large projects, and this is assisted by a favorable history of intergovernmental cooperation (SIEPAC, SAPP, SCP). It can be enhanced by creating powerful institutions at the regional level (SIEPAC, SAPP).
- The foundation of project implementation rests on legally enforceable agreements between governments. This may be by multicountry treaty (SIEPAC) or by bilateral intergovernmental agreements (SCP), or multilateral government agreements (SAPP).
- Private-sector participation can be an important component of the project, both for funding and operational expertise (SCP, SIEPAC). This also improves the confidence of commercial lenders to the project.
- It is possible to create a relatively advanced regional electricity trading arrangement between countries that are at differing stages of internal market development (SIEPAC).
- It also shows that the experience of at least two of the cases show that post-conflict environments are not necessarily a barrier to trade (SIEPAC, SCP).
- Progressive development of the scale of trading can start from small interconnections under the institutional wing of a regional association (SAPP).
- The creation of a respected coordinating entity can serve to strengthen technical cooperation, act as a driver for integration, and provide a neutral forum for resolving disputes (SIEPAC, SAPP).
- The previous bullet point suggests that early trading arrangements in ECO could take advantage of existing dispute resolution procedures in agreements such as the ECO Trade Agreement and the Energy Charter Treaty. Dedicated procedures could then be developed incrementally as trade grows and becomes more sophisticated.

Several of the less successful aspects of the SAPP experience provide negative lessons of aspects to avoid in ECO:

- Political instability and direct physical security risks have limited trade and investment and result in severe supply interruptions.
- Lack of political commitment has slowed the process of integration.
- More than 10 years after the IGA signing (1995), trade within SAPP is a relatively small proportion of the potential. This partly illustrates the long-term view required of the timeframe for these projects.
- The failure to further develop trade is due in part to a continued focus on self-sufficiency policies in some governments despite clear evidence of the benefits of trade. Protectionist positions have also restricted cross-border investment in new facilities.
- The lack of a coordinated investment strategy has created uncertainty and restricted much-needed new investment in transmission capacity.
- Weaknesses in transmission pricing have also restricted trade by discouraging wheeling over large distances from supply sources to demand centers.

These lessons stress the importance of establishing a collaborative institutional structure but also show that this requires real political commitment toward trade.

Evolution of Trading Arrangements

The evolution of the trading arrangements depends only partially on the economic potential. The underlying economics has to contend with a number of specific risks and the successful implementation of projects also depends on the strength of the supporting institutional arrangements and on securing project financing. Each of these is discussed in turn in the following subsections. The final subsection makes recommendations on putting greater momentum into the evolution of electricity exports from ECO countries.

Risks to Trade in ECO and Possible Mitigation

As already highlighted in this report, new trading arrangements in the ECO region will need to address a number of risks and constraints to trade. The main categories of risk are as follows:

- **Political risk** is perhaps the most significant barrier to large-scale development of international trade in ECO. Major efforts in the development of international cooperation and supporting institutional structures will be necessary to facilitate expansion of electricity trade both within, and as exports from, the ECO region. This can be facilitated by support from external stakeholders such as the IFIs and the U.S. or Western Europe governments.
- A closely related issue is the s**ecurity risks,** which are of obvious importance in relation to the vulnerability of long distance transmission investments.
- **Commercial risks,** which include planning, design, construction, volume, supply and payment risks, are also significant in the context of complex, multicountry projects.
- A high level of perceived **financial risk** is a major barrier reducing the likelihood of attracting private equity investors into electricity trade projects in ECO.[79] In addition to specialized insurance and guarantee instruments, factors that would make the private sector more likely to invest would include private participants having a broad stake (e.g., have upstream generation investments prior to participating in a transmission project), seeing potentially significant returns (if uncertainties are resolved in their favor), having options on future expansion projects (though this would always be difficult as well as problematic to be made binding), and having the comfort of strong IFI/donor support.

As emphasized earlier in the report, many of the risks can be simultaneously addressed by careful structuring of the projects. An option for mitigating financial risk due to security of supply concerns is to structure projects on the basis of joint venture or cross-shareholding arrangements. The design goal for these structures is to link the cost of supply interruption in the importing country to the party best able to control the source of supply risk in the exporting country. An example is where the exporting utility takes a financial stake in the electricity sector of the receiving country. This approach can also apply to deal with the converse case of volume risk, with the receiving utility taking a financial stake in the exporting country.

Institutional Arrangements

The main areas where institutional support for trade can be strengthened and extended to promote trade and mitigate some of the risks are as follows:

- Putting in place enforceable intergovernmental agreements for specific trade arrangements.
- Building on existing institutional and multicountry agreements in ECO.
- Expanding participation in the Energy Charter Treaty and other external frameworks to support trade deals.
- Building regional institutions to further cooperation on technical, environmental, and regulatory issues.

International electricity projects outside of developed markets almost always require intergovernmental agreements to provide a legal underpinning and indicate commitment at the highest level to trade and to managing

[79] Other forms of private involvement in electricity trade projects that minimize financial risks can more readily be implemented.

risk. In formulating such agreements, there is scope to build on the bilateral agreements that exist for energy trade and the more general ECO agreements that are already in place, the primary ones being:

- ECO Charter and the Treaty of Izmir.
- Economic Cooperation Strategy for the ECO region.
- Framework Agreement on ECO Trade Cooperation.
- ECO Trade Agreement (ECOTA).

Some specific areas that warrant attention in the above agreements to provide a stronger framework for electricity trade are discussed in Box 9.1.

Multilateral agreements that assist the development of electricity trade can be generalized into two types:

1. Regional trade and investment agreements providing a framework to promote cross-border energy trade. For example, investment protection provisions and rights of free access to transit.
2. Specific agreements for the operation of electricity trading within a market—for example, with policies, regulations, and rules similar to SAPP and SIEPAC.

As highlighted earlier in the report, the most important multilateral energy agreement to which ECO member states have already subscribed is the **Energy Charter Treaty (ECT)**—see Box 5 with further details in Annex 2.

To further regional trade in electricity, one of the immediate aims of ECO states should be to build institutions that foster regional cooperation on technical, environmental, and regulatory issues. This cannot easily be done in the abstract: What is needed is to develop a pipeline of projects of mutual interests around which the institutions can grow in a manner that is commensurate with the growing levels of cooperation. An obvious starting point for this is in respect of studies:

- Study on Electricity Interconnections among ECO Countries (ongoing).
- Technical study to identify priority opportunities.

These studies would provide the ***tangible cooperation projects*** to sustain the cooperation and regional institution-building process. Some initial suggestions of the sort of projects that could be considered at this stage are presented in this Chapter with a more comprehensive list of the roadmap (Table 9.3).

Financing

The general options and issues for financing electricity trade were reviewed in Chapter 5. Here we briefly highlight the financeability of the electricity trade projects with the highest potential within ECO, and indicate the approach that might be taken toward their financing.

The potential new supply options from within the Central Asia region were outlined in Chapter 2. Among these, the following generation projects would appear to be those most promising for development within the near to medium term:

- The Sangtuda hydro plant in Tajikistan is being completed by RAO of Russia.
- The Ekibastuz coal-fired plant in Kazakhstan is owned by AES of the United States, which plans to build new units and rehabilitate the existing plant.
- There is an MOU with Iran to complete works on the Sangtuda II plant, primarily for export to Iran.
- The Talimadan gas-fired plant in Uzbekistan is under construction, and completion is expected soon.
- A gas-fired plant could be built on a site already prepared at Bishkek in the Kyrgyz Republic, although we are not aware of any

[80] The new north–south transmission line in Kazakhstan also opens the opportunity for Sangtuda to export to Russia.

[81] RAO, which remains majority owned by the Russian state, might be considered a quasi-private investor.

developer or financing commitment to the project.

The Sangtuda plants would be primarily for export, while the three thermal plants would serve some domestic demand but could also provide a significant proportion of their output to the export market. Bishkek would be built to meet the current peak demand deficit in the Kyrgyz Republic but could also export its surplus outside of this period.

Both RAO and AES have shown an interest in exporting electricity from their generation projects to Pakistan.[80] Funding for Sangtuda II may come in part from an Iranian source such as the state-owned utility, following the MOU to export to Iran. In each case, additional financing would be required to build transmission capacity to bring the output to market. The new transmission options for export from Central Asia are essentially to connect the region westward to Iran, southeast to South Asia, and possibly eastward to China.

Financing is available to the Sangtuda I and Ekibastuz plants from the quasi-private sector.[81] This commitment suggests that these companies are comfortable with the risk profile of the projects and are confident that financially viable markets will be found for their plants' output. This, in turn, suggests that they may also be willing to take a financing role in new transmission infrastructure. RAO in particular may have a higher tolerance for political risk and strategic motives for investing in the region.

Financing for a South Asian interconnection would be dependent on mitigating the risks discussed in Chapter 3. This would require guarantees from the governments involved and international financial institutions and bilateral agencies. The commitment of RAO to the region and its interest in finding a sufficient market to take its supply suggests that it could be a partner in the financing of such a line. If the guarantees were sufficient, a portion of the remaining debt or equity financing could be financed by private international financial institutions. A syndicated debt structure such as the one used by groups of international financiers for the Nam Theun 2 project may be an option.

Financing for a transmission line to strengthen connections to Iran would be dependent on mitigating similar risks.[82] This option does not currently have the attention of the international donor and concessionary lending community. In the absence of private-sector or external government support, Turkmenistan and Iran are financing new transmission from their own public funds.

Building Momentum in ECO's Electricity Trade Evolution

It is clear that trade in ECO has to evolve step-by-step from the existing rather modest bilateral arrangements, extending transmission systems and drawing in other sources of supply, thus encouraging the strengthening of the interconnected grid. Initially, risks will be covered primarily by guarantees from the participating governments, but wherever possible the more advanced risk mitigation mechanisms enumerated in this report should be incorporated into project design and implementation. Once there is experience to build upon from mitigating risks in the smaller, bilateral projects, the larger, dedicated export projects (notably the CASA project) will in due course come to fruition.

It has been recommended that a study be commissioned to draw up a comprehensive, sequenced set of projects for progressive implementation. The basic constituents for this list are as follows:

- **Intra-regional trade:** Small trade expansion projects amongst the Central Asia countries based on seasonal complementarities and distribution of fuel sources. This might be based on long-term power purchase agreements with government guarantees,

[82] A line to Iran could transit Afghanistan, or cross Turkmenistan with associated security issues for upstream suppliers.

but graduating into larger projects with joint investments involving private or quasi-private entities and attracting external guarantees and support (e.g., from IFIs). Part of this will involve developing mechanisms for equitable sharing of the benefits of water usage, an important prerequisite for further development of hydropower potential.

- **Coordination center:** Rebuild the role of the United Dispatch Center in Tashkent, Uzbekistan. Initially this could be a coordination center, similar to the SAPP Coordination Center, with technical control of the synchronized system coming later.
- **Afghanistan:** Build on existing cross-border trading arrangements with a view to strengthening the electricity sector (capacity-building in Afghan government and utilities, demonstration of operable projects to increase confidence that Afghanistan can be a reliable transit country etc.).
- **West cluster:** Foster the relationships being developed between Turkmenistan and Iran and Azerbaijan and Iran/Turkey.
- **East cluster:** Build on the four-country CASA project agreement, building the role and capacity of the associated working groups.

ECO Countries—Steps Toward an Enabling Framework

Although many of the trade options will inevitably take a long time to come to fruition, there is much that ECO governments can do immediately to create an enabling environment and be prepared for the type of complex project structures that are likely to emerge in due course. The measures suggested here are oriented to preempting concerns about risk and move the agenda of risk mitigation forward in parallel with the development of the projects themselves. The steps that ECO countries might take in this regard can conveniently be divided into four categories:

1. Improve the investment environment.
2. Ensure the electricity sector operates on a commercial, business-oriented basis.
3. Prepare to negotiate complex projects.
4. Participate in strengthening regional institutions.

Investment Environment

As highlighted throughout this report, it would be beneficial to attract investors into the electricity sectors of the member countries. The companies interested in investing may be private firms but would also be state-owned enterprises wanting to have a stake in a project in another country in order to mitigate part of the associated risks. The investment environment conditions that are necessary would be the same and indeed also apply to stimulating domestic and foreign investment in all sectors of the economy. The main elements requiring action to a greater or lesser extent by different ECO governments are as follows:

- Establish a clear, comprehensive legal framework for commercial investments.
- Enhance legal guarantees on private property, for example, through introducing or strengthening provisions in the Constitution.
- Have an independent central bank and a disciplined national budgetary system so as to establish a stable macroeconomic environment.
- Permit full currency convertibility or else, stable, predictable mechanisms for handling foreign currency.
- Entrench the independence and raise the stature of the judiciary.
- Provide the resources needed for rapid processing of legal disputes through the courts and for the enforcement of court or arbitration judgments.
- Complement the above with legislation giving a framework for private arbitration, including allowing arbitration in other

[83] These include different approaches to unbundling and allowing large customers to freely purchase their own energy, which can create multiple potential buyers in the sector.

countries with highly respected dispute resolution procedures.
- Adopt international dispute settlement procedures, such as ICSID arbitration and use these mechanisms to provide precedents.
- Provide adequate resources and incentive structures for the police and the military to operate in an efficient, apolitical manner.
- Streamline procedures for domestic and foreign investors to establish new businesses or execute major projects.
- In particular, in public–private partnership projects in any sector, establish fast-track planning and approval procedures.

Electricity Sector

Improved commercial performance of the domestic power sector in each country is an important prerequisite for increased regional trade in electricity. Electricity sector entities need to be financially solvent and creditworthy trading partners. The electricity sectors should also work toward becoming competitive (which may take different forms in different countries[83]), so that exporters for example would have a choice of buyers in destination countries. The evolution of internal trade within the countries would provide market signals for exporters. Within the exporting countries, there is need to establish stable supply to domestic markets to obviate the risk of energy exports being diverted to domestic consumption.

Many of the countries have already undertaken extensive electricity sector reforms, but there is still room in most cases for further progress in the following areas:

- Cost-reflective tariffs.
- Reduced losses (technical and nontechnical).
- Reduction or elimination of generalized supply-side subsidies (with targeted subsidies for low income consumers).
- Nondiscriminatory access to the transmission grid.
- Professional regulatory body in place.

It is important that the regulator be as autonomous as possible so as to avoid political pressures derailing the intentions of the reforms. Energy or multisector regulatory agencies already exist in most ECO countries.[84] When considering trade projects requiring large investment, it is important that there be predictable, stable regulation that is even-handed in dealing with domestic and foreign markets in both exporting and importing countries.

Capacity to Negotiate Complex Projects

An ECO government may seek to enhance the skills base in their country to effectively negotiate complex project structures that are likely to emerge as regional trade in electricity develops. Major projects would justify the engagement of professional transaction advisers, but the government nonetheless requires the skills to appreciate what is involved and interact effectively with its advisers. Many of these skills would also be applicable in other sectors, providing benefits elsewhere in the economy. The requirements cover a range of disciplines, including the following:

- International and commercial law.
- Financing and financial risk management.
- Public-private partnership arrangements.
- Regulation of delivery of infrastructural services.
- Electricity grid expansion and interconnection/ synchronization of existing grids.
- Conjunctive operation of generation facilities in large systems with a mix of hydro and thermal generation.

Regional Institutions

As clearly shown in the case studies, the existence of strong regional institutions provides a framework for increased trade and the integration of energy and other sectors across national boundaries. There are a number of

[84] Independent energy regulators exist in Azerbaijan, Kazakhstan (multisector regulator), Pakistan (separate electricity and gas regulators), and Turkey. As far as we are aware, independent regulators do not yet exist in the other countries.

Box 9.1 Strengthening of ECO Agreements to Facilitate Electricity Trade

The Economic Cooperation organization was established under the Treaty of Izmir (ECO Treaty). The Treaty contains general obligations and principles, and makes provisions for Specialized Agencies and Regional Institutions. In this context, the treaty provides the framework for the possible establishment of a regional institution in relation to electricity trading.

The ECO Trade Agreement seeks to support the development of trade among the ECO member countries. Specifically, its objectives are to:

> *foster, support, and boost regional trade based on common principles, and to reinforce economic cooperation among ECO Member States through the elimination of non-tariff barriers, reduction of tariffs, and exchange of concessions.*

It is unlikely that the existing trade agreements could be the sole or primary mechanisms for promoting cross-border trade in electricity, since they are general and not specific to the particular trade risks. However, it may be possible to amend them to include provisions that endorse power trade and transit as a regional policy and extend tax exemption and trade restrictions to energy (in a similar way, for example, to NAFTA).

The crucial function of intergovernmental agreements is to provide a legal basis for the implementation of projects. Grounded in this are the procedures, rights, and obligations for dispute resolution. At present, however, the ECO Treaty does not contain any explicit provisions concerning dispute resolution, and there are also no clear legal obligations under the Treaty. However, a number of trade-related agreements have been reached under ECO, which do allow for dispute resolution that could potentially form a template for the development of agreements on electricity trade:

- **The ECO Trade Agreement** provides for settlement of disputes between contracting states by the **Cooperation Council** established under the Agreement, comprising representatives of all member states and acting by a two thirds majority.
- **The ECO Transit Transport Framework Agreement** includes provision for the establishment of a **Transit Transport Co-ordination Council (TTCC)** to settle disputes between state parties. Any dispute not settled through consultation or the TTCC may be referred to ad hoc arbitration, to be conducted in accordance with the UNCITRAL Rules of Arbitration.

Source: ECA (2006).

institutions and agreements in the ECO region that could be strengthened as apart of a strategic move toward future deepening of regional trade and investment in specific sectors. This is discussed further in Box 9.1.

In the electricity sector itself, ECO countries could usefully create regional bodies to fulfil a number of different functions:

- **Electricity Forum:** An ECO-wide electricity sector forum to share experiences. This might, for example, hold periodic conferences involving energy ministries, power utilities, regulators, academics, etc.
- **Technical Cooperation Advisory Body:** A regional technical body to discuss and share experience in solving engineering problems (for example issues associated with grid interconnections).
- **Energy-Environment Cooperation Advisory Body:** Similar body to deal with environmental issues related to regional energy supply and usage.
- **Integrated Water Resource Management Advisory Body:** This could be part of the energy-environment body, or a separate entity. Given the importance of hydropower, regional cooperation in water that takes into account environmental flow requirements and all other uses (the IWRM approach) is important. Legal frameworks, such as interstate water sharing agreements, may well be required for this.[85]

[85] The parallel development of hydropower development and water resource management under the Nile Basin Initiative (in Africa) provides a relevant example from another region covering 10 countries.

- **Energy Regulation Cooperation Advisory Body:** Similar body to pool experiences and harmonise approaches to energy regulation in the ECO region.

As previously mentioned, the most expedient approach is for these institutions to develop in response to the demands arising from executing projects of mutual interest. This concept is developed further in this Chapter. ECO can play a facilitating role by providing a supportive political framework and more tangible encouragement through providing forums for discussion of electricity sector issues.

IFIs and Bilateral Donors—Steps toward a Trade-Facilitating Environment

Within the agenda of increasing regional trade in electricity, the most obvious role of the IFIs and bilateral donors is in respect of:

- Finance
- Risk mitigation

These roles imply providing resources for the identification, appraisal, and financing of projects, with particular emphasis on elements where donor financing and/or guarantees[86] can be structured to mitigate specific risks.

Donors can also, however, usefully assist the ECO countries in many of the areas identified above for improving the enabling environment:

- Assist in establishing a firm legal framework, strengthen the judiciary and dispute resolution procedures.
- Support the establishment of a PPP framework and supporting institutions.
- Promote electricity sector reforms, including the establishment of a professional, autonomous regulatory agency.[87]
- Provide resources and opportunities for capacity-building in the public and private sectors.
- Finance studies to identify trade and investment opportunities across countries.
- Facilitate intergovernmental agreements and the establishment or strengthening of regional institutions.

It is important that IFIs and donors coordinate their efforts among themselves so as to make the best use of resources in the region, and avoid the countries incurring opportunity costs in dealing with overlaps in donor efforts and the time-consuming processes that are often involved.

Conclusions on Development of ECO Electricity Trade

This Chapter has summarized the role that each country can play in the development of electricity trade both within the region and exports from the region. These opportunities were captured in Table 9.1 and Table 9.2, which highlighted the subregional nature of the west and east clusters, as well as the different roles that each country might have as importer, exporter, transit or market-integrating country. The immediate prospects within ECO are for the strengthening of intraregional trade within the CAR and of increased seasonal and base exports from both the west and east cluster exporters to Iran and Turkey. Kazakhstan will be well placed to export to Russia and China once the north–south interconnector has been completed.

Large-scale export projects from the west cluster countries to Iran and Turkey and from the east cluster to Pakistan will require the construction of new 500 kV transmission

[86] For example, in the form of risk mitigation products for private investors.

[87] Where such a regulator does not already exist.

lines through Afghanistan. Such projects are longer term both because of the long lead times involved and the current security situation in Afghanistan.

The evolution of electricity trade will be facilitated by the ECO countries, with the support of the IFIs and bilateral donors, working on strengthening the enabling environment for trade. The main areas on which the ECO countries can start work now are:

- Improving the investment climate,—macroeconomic conditions, legal framework, property rights, etc.
- Reinforcing the commercial basis of the electricity sector in each country, so that local utilities are creditworthy partners for trade projects.
- Strengthening regional institutions, including creating new entities in the electricity sector to foster technical, environmental, and regulation cooperation in the electricity sector.
- Implementing joint projects ranging from studies to major infrastructure investments. It is in response to the requirements of working on joint projects that the regional institutions will develop.

A necessary first step that is required is for ECO countries to agree on a pipeline of regional projects, which can be progressively implemented. In this regard, we recommend that a prioritization study be commissioned to accompany the existing study on interconnections. The two studies are as follows:

- Technical Study Electricity Interconnections among ECO countries (on-going study).
- Technical study to identify priority opportunities (recommended study).

The essence of our conclusions is that the way forward for ECO is to start with extensions to existing arrangements, building confidence and perceptions of shared gains by undertaking progressively more complex and ambitious projects. The regional institutions will develop in tandem—a bottom-up rather than top-down approach. Based on this approach, Table 9.3 presents a *roadmap* of actions for ECO countries to work toward realising the potential of electricity trade. The table seeks both to summarise in convenient form previous recommendations and to make these more concrete.

Table 9.3 Roadmap for the Development of Electricity Trade in ECO

Task	Objective/ Country	Means/Project	Period
		Creating national environments encouraging trade in electricity	
1	Attractive investment environment	Comprehensive legal framework for commercial investments Enhance legal guarantees on private property Independent central bank and sound fiscal policies Full currency convertibility or stable, predictable forex mechanisms Independent, well respected judiciary Rapid processing of legal disputes & enforcement of judgments Framework for private arbitration Adoption and use of international dispute settlement procedures Police and the military operate in an efficient, apolitical manner Streamlined procedures for domestic and foreign investors Fast track planning & approval process for PPPs	on-going
2	Well-functioning electricity sectors	Cost reflective tariffs Reduced losses (technical and non-technical) Reduction or elimination of generalized supply-side subsidies Non-discriminatory access to the transmission grid	on-going
3	Skills available to negotiate complex projects	International and commercial law Financing and financial risk management Public-private partnership arrangements Regulation of delivery of infrastructural services Grid expansion and inter-connection/synchronization of existing grids Conjunctive operation of generation facilities with mix of hydro and thermal	on-going
		Regional initiatives to encourage growth in electricity trade	
1	Studies to prepare for enhanced trade	Electricity interconnections among ECO countries Technical study to identify priority opportunities	on-going short-term
2	Strong regional institutions	ECO Electricity Form Coordination Center -start rebuilding role of UDC in Tashkent Strengthen ECO agreements to facilitate electricity trade Expand membership of Energy Charter Treaty Technical Cooperation Advisory Body Energy-environment Cooperation Advisory Body IWRM Advisory Body Energy Regulation Cooperation Advisory Body	short-term short-term short-term short-term medium-term medium-term medium-term medium-term
		Building on specific projects to maintain the momentum of regional cooperation in electricity	
1	Kazakhstan	Ekibastuz 2 x 500 MW (AES of USA) Increased exports to neighbors Exports to Russia and China	short-term
2	Uzbekistan	Talimardjan 800 MW subsequent phases: 3 x 800 MW Exports to neighbors as pre-cursor to large-scale exports to Pakistan	short-term
3	Kyrgyz Republic	Bishkek II 400 MW Primarily to meet domestic peak, but potential for seasonal exports	medium-term
4	Tajikistan	Sanguta I & II (RAO of Russia & Iran) and Rogan I and II (3,070 MW) Seasonal and base load exports to neighbours Massive capacity for export to Pakistan and elsewhere	short-term
5	Azerbaijan	Energy corridor between Russia and Iran via Azerbaijan Electricity sector trade opportunities	medium-term
6	Turkmenistan-Iran	Third 400 kV line being planned Swap arrangements to transit through Iran to Turkey & other markets	short-term
7	Tajikistan-Afghanistan	Transmission line from Sangtuda (Tajikistan) to Afghanistan (220 kV, ADB) Small exports to Afghanistan, but pre-cursor to major exports to other markets Opportunity to build-up weak but crucial electricity sector in Afghanistan.	short-term
8	TAP project	Cooperation via working groups formed under 2006 inter-govt Agreement Detailed technical & economic appraisal of alternative transmission routes Design, legal agreements, construction, etc.	short-term medium-term long-term

Source: ECA (2006).

Annex 1 Further Details of International Case Studies

SIEPAC

Market Backgrounds

Market reform in the region has progressed at varying speeds among the six countries. In 1990, Costa Rica was the first to move away from the state-owned vertically integrated utility model to a single buyer model, followed by Guatemala in 1991. By 1996 all six countries had moved to the single buyer model and in that year Guatemala implemented regulated wholesale competition (a cost-based pool). Nicaragua and Panama introduced reform toward wholesale competition in the second half of the 1990s and in 1996 El Salvador passed a law to begin the implementation of retail competition.

Costa Rica and Honduras are at less advanced stages of market development. These countries to operate centrally planned systems with the private sector involved through PPAs.

Transmission Pricing

Prior to 2002, wheeling charges were agreed among the country level transmission operators in the southern group (Honduras, Nicaragua, Costa Rica, and Panama) for transmission across the transit countries (Nicaragua, Costa Rica). A working group was established at the regional level to set the wheeling charges for different market conditions. Charges were determined as the difference between the short-run costs of energy in the supplying and receiving systems. This system evolved into the variable transmission charge (CVT) used in the transitional market.

The transitional market developed a day-ahead dispatch with hourly nodal prices. Transmission costs were based on the principles used in the southern group wheeling charges. Nodal prices were based on energy only bids and offers and bids for transmission services. Charges for transmission continued to be calculated on the basis of CVTs with an additional toll for using the tie-lines. A regional optimization was performed to determine the nodal prices for each half hour.

Generators supplying firm contracts must have sufficient capacity available to meet the contract and corresponding firm transmission rights. If these conditions are not met CRIE has the authority to impose penalties on the generator (this will be in addition to reputational damage in the market).

Institutional Structure

The temporary institutions created to oversee the design and implementation of the MER include:

- Group director, consisting of a representative of each government, oversees implementation of the project (issuing directives, and holding meetings on a quarterly basis.
- Committee on Programming and Evaluation (CPE), consisting of two representatives of the electricity sector from each country. The committee advises on the institutional and technical aspects of the design of the MER. It is also a supervisory body and provides independent evaluation of the project.

- Execution unit, consisting of a full-time manager and two experts. This is financed from technical assistance.
- Advisory group, made up of individual consultants with experience in international market design. The advisory group provides assistance to the group director, CPE, and execution unit on market design issues including regulation, administration, structure, operation, and development.

Institutions and Agreements Supporting Trade in the Region

The countries of Central America have a long history of cooperation and projects aimed at increasing coordination.

The Puebla-Panama Plan (PPP) is a regional initiative to promote economic integration and cooperation among the seven Central American countries (including Belize) and Mexico. It brings together a number of initiatives that had been developed independently under a single organized program. The SIEPAC project is included as one of 17 specific projects in eight areas being pursued under the plan.

The PPP was initiated by the government of Mexico, the largest country and politically and economically in the group, and by the Secretariat for Central American Integration (SICA). It is supported by the IADB and other IFIs including the World Bank.

Regional trade is also likely to be enhanced by the Free Trade Agreement between the U.S. and Central America (CAFTA), discussions began in 2002 and the signed into U.S. law in 2005. CAFTA includes a common legal framework for dispute resolution and for the management of direct foreign investment.

Southern Africa Power Pool (SAPP)

The history of the development of power trade within Southern Africa stretches back as far as 1906 when the Victoria Falls Power Company was registered in Southern Rhodesia "to harness the Victoria Falls and supply electricity to the mining industry on the Witwatersrand" in South Africa. At that time, the technology to transmit power over long distances did not exist, and the transmission of power from the Zambezi to the Witwatersrand had to wait until the 1970s, when Cahora Bassa was built.

Coal-fired power stations make up most of South Africa's installed capacity of 42,000 MW. Despite sophisticated abatement efforts, the region where most of these plants are located is severely polluted. The country has very limited hydropower resources. There is one nuclear plant, which caused considerable consternation when it was constructed during the apartheid era.

The prime target for hydro development in SAPP is a unique site on the Congo River, called Inga. This has 40,000 MW of hydro potential in a setting where virtually no civil engineering works would be required and where the environmental impact would be minimal. At present, only 2,468 MW have been installed.

History of Grid Interconnection in the Region

The first significant grid interconnection was a joint project between what are now Zambia and Zimbabwe on the Zambezi River, involving the construction of the Kariba Dam and 1,320 MW power station complex (1955-59) and the installation of 330 kV power lines providing a high voltage backbone to the electricity systems of the two countries. The power system of the DRC was later interlinked via a 220 kV 220 MW line from Lubumbashi to the Zambian copperbelt. Further south, the grids of Botswana, Lesotho, Swaziland, and Namibia were developed as offshoots of the South African grid.

In the late 1960s, the Portuguese colonial regime in Mozambique began investigations into the development of a major power complex downstream of Kariba, at Cahora Bassa on the Zambezi. The only market large enough for the proposed 2,075 MW station was South Africa. Eskom and other South African companies were heavily involved in the planning and execution of the project, which was completed over the period 1974 to 1979. By that time, Mozambique was embroiled in a civil war and the 1,360 km direct current (DC) power line was put out of operation by sabotage attacks. The line was eventually only restored to full operation in 1998.

Another significant transmission investment was the building of 400 kV 1,000 MW transmission lines from South Africa through Swaziland to Mozambique in order to supply the alumina-smelting project MOZAL. To plan, execute, and operate this project a joint venture transmission company MOTRACO, was formed in 1998. With all of the raw material being imported, the MOZAL project involves toll refining. What is being exported is the cheap electricity which South Africa and Mozambique are able to supply. At the time the MOZAL project was commissioned, the SAPP region had excess electricity generation capacity. That slack has since been taken up by growth in demand, and the region now faces shortages.

Trade in Electricity

Over the period 1997 to 2001, a research project carried out by SAPP with assistance from Purdue University developed models to demonstrate the potential for trade in electricity in southern Africa. Short-term and long-term models of the interconnected system were developed and scenarios developed of different ways of meeting projected energy demand. These ranged from noncooperative solutions, to full regional integration with a single market and a single system operator. Intermediate solutions were obtained by introducing *autonomy factor* constraints (either on the extent to which energy needs had to be met domestically—a more demanding requirement—or on the proportion of peak demand which had to be backed by domestic capacity).[88]

As power pool theory predicts, the results showed that there were gains from trade in the short run, but much larger gains to be obtained in the long run from coordinating electricity investments.

STEM

The Short-term Energy Market (STEM) arranges trade of firm energy demands and offers on an hourly basis for next day trade, or for the establishment of weekly or monthly contracts. Bids and offers are made via an Internet platform. The Coordination Center checks capacity on the interconnect transmission lines, matches demands and offers, and confirms the successful contracts. It also publishes (within 4 hours of the initial 10:30 am cut-off) a bulletin board giving details of all the demands and offers made. This results in trade being expanded on a bilateral basis in a post-STEM market, which typically accounts for 30 percent of the short-term energy traded.

When considering bids, precedence is given to established bilateral contracts. Irrespective of actual power flows in the system, wheeling charges in STEM contracts are set on the basis of assumed nominal wheeling routes, with the wheeling charges being shared equally amongst the countries lying on the assumed wheeling path.

Demand in the STEM market rose from 766 GWh in 2001 to 4,222 GWh in 2004, while supply was around 2,550 GWh and lower than this in 2005 when some utilities withdrew from STEM in order to rehabilitate equipment. Energy traded was far lower, however, with a peak of 842 GWh in 2002, which dropped to 178 GWh in 2005. The fact that demand and offered supply in the STEM market is always multiples of the level of trade that is reached indicates that the market is by no means efficient. Some of the reasons for this are that the main bilateral agreements, which take precedence, reduce flexibility and that the trades are struck on the basis of nominal conditions on the system.

Risks

The inoperability of the line for 17 years is somewhat ironic, because when it was built a longer route through Mozambique territory was chosen over a more direct route through

[88] See F. T. Sparrow and B. Bowen, *Modelling Electricity Trade in Southern Africa Year 3 Final Report* (West Lafayette, IN: Purdue, 2001).

Rhodesia, which at that time was considered insecure due to the liberation war that was intensifying during the 1970s. Had the line gone through what is now Zimbabwe, it would have had a much better chance of providing supply during the 1980s and 1990s.

Since the self-inflicted economic crisis that began around the year 2000, Zimbabwe has had increasing difficulty in making payments to Eskom and HCB for electricity imports. However, despite periods of nonpayment, the external suppliers have continued to provide electricity, this being remarkable testimony to the security of regional arrangements. Due to political reasons, the blackouts and load shedding experienced by Zimbabwean consumers since 2000 have been largely due to failures to operate internal generating capacity efficiently. Problems at the power stations are related to foreign currency shortages, lack of diesel and coal, and postponed maintenance. By mid-2006, the largest power station at Hwange, with a nameplate capacity of 960 MW, was operating at only 480 MW[89].

Exchange Rate Risk

The example of exchange rate risk mentioned in Chapter 7 relates to the Cahora Bassa project. The original Eskom-HCB contract was specified in the South African currency (rand), while much of the debt that was incurred was in hard currencies. At the end of the long period when there were zero revenues because of the sabotage of the DC transmission line, the agreed price in USc/kWh terms was derisory. A protracted negotiation was required before a tariff which HCB could live with was agreed and power flows to South Africa could resume.

Simplistic Wheeling Charging Formulae

The project that has been particularly prejudiced by the approach taken to wheeling charging is the Kudu gas project, off the coast of Namibia. If electricity were to be exported from Kudu to say Zimbabwe, the nominal route would be via the Cape and right up through the whole extent of South Africa and the Mathimba link across Botswana (see map, Figure 7.5). The simple formulae would thus result in a prohibitive wheeling charge. In practice, the export of power from Kudu to Zimbabwe would be done via offsets, and total wheeling costs incurred might actually be less than they were before the project comes of stream. The savings in this case would be through the Cape Peninsula being supplied from Kudu, rather than having power being expensively wheeled from Eskom plants in northern South Africa. The offset amount would be sent to Zimbabwe over a relatively short wheeling distance.

[89] S. Mangwengwende, *Ensuring Long Term Energy Security—A Zimbabwean Perspective* (2006).

Annex 2 The Energy Charter Treaty

Main Provisions of the Treaty

The Energy Charter Treaty (ECT) of (date) was the first binding multilateral investor protection treaty, to cover investment and trade and the first to apply transit rules to energy networks. It was also one of the first investor protection treaties to provide binding international dispute settlement, between state parties and between states and nonstates. The contracting parties (the CPs) to the ECT include some of the ECO countries.[90]

Investment

The ECT contains provisions for the protection, promotion and treatment of foreign direct investments in the energy sector, including protections against discrimination, expropriation, losses resulting from strife, transfer, restrictions, and breach of individual investment contracts.

The key provisions concerning investment require contracting parties are as follows:

- Encourage and create "equitable, favorable and transparent conditions for Investors to make investments..."
- Accord "fair and equitable treatment" and no discriminatory measures.
- Afford treatment regarding existing investments, which is no less favorable than that which it accords to its own investors or to investors of another contracting party.
- Observe any obligations it has entered into with an investor or in relation to an investment of an investor who is a national of or of any other contracting party.

In relation to **new investments** (*preinvestment*) (i.e., the phase of making investments and the issue of access conditions), the ECT only provides a soft regime. Each party must *endeavor to accord* to investors of each contracting party the protections set out above.

Trade

The ECT contains provisions relating to trade in energy, which generally reflect the rules of GATT—(that is, the principle of nondiscriminatory trade rules to energy & materials (but the ECT does not include a tariff standstill) and freedom of transit.)

To be protected under the treaty, the product needs to originate or terminate in a signatory country.

[90] The full list of current parties is—Albania, Armenia, Austria, Australia*, Azerbaijan, Belarus*, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Cyprus, Denmark, Estonia, European Communities, Finland, France, Georgia, Germany, Greece, Hungary, Iceland*, Ireland, Italy, Japan, Kazakhstan, Kyrgyzstan, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Moldova, Mongolia, Netherlands, Norway*, Poland, Portugal, Romania, Russian Federation*, Slovakia, Slovenia, Spain, Sweden, Switzerland, Tajikistan, The former Yugoslav Republic of Macedonia, Turkey, Turkmenistan, Ukraine, Uzbekistan, United Kingdom.

**—denotes state in which ratification of the Energy Charter Treaty is still pending.*

Observer States: Afghanistan**, Algeria, Bahrain, People's Republic of China, Canada**, Islamic Republic of Iran, Republic of Korea, Kuwait, Morocco, Nigeria, Oman, Pakistan**, Qatar, Saudi Arabia, Serbia and Montenegro**, Tunisia, United Arab Emirates, United States of America**, Venezuela.

***—denotes observer state which has signed the 1991 Energy Charter Declaration.*

Transit

The ECT obliges CPs to facilitate energy transit on a nondiscriminatory basis. The treaty explicitly covers grid-bound energy transport. All government approvals in relation to transit are required to be on commercial terms.

In addition, the ECT provides (Article 7 (4)) that if energy cannot otherwise be transported, a CP cannot stop new transit facilities from being built on its territory and is bound to not place obstacles in the way of new establishments, except as provided in applicable, consistent legislation. The only exception is where the state can demonstrate that to do so would endanger the security or efficiency of its energy systems.

However, the ECT does not oblige CPs to grant third-party access. The ECT's existing provisions are intended to be supplemented, extended, and modified by a legally binding transit protocol that is currently being negotiated. The transit protocol is intended to address the following issues:

- Binding obligations for CPs to prevent unlawful taking of energy in transit.
- Ensuring that access to available transit capacity is allocated on a non-discriminatory basis.
- Transparent criteria for setting transit tariffs.

The ECT has developed nonlegally binding model agreements (both intergovernment agreements and agreements between host governments and private companies) as guidelines for individual energy transit projects that are to be amended.

Dispute Resolution

The ECT includes several international dispute resolution mechanisms. There are three basic forms of binding dispute settlement:

1. State-state arbitration for basically all disputes arising under the ECT (Article 27);
2. Investor-state arbitration for investment disputes only (Article 26); and
3. Special provisions have been developed for the resolution of interstate disputes in the area of trade (Article 29, Annex D) and transit (Article 7). These derogate from the otherwise applicable provisions on state-to-state dispute settlement.

Investment Disputes

Investor-to-State Disputes

The ECT grants foreign investors the right to sue the host country in the case of "an alleged breach of an obligation of the host State under Part III of the Treaty"—that is, the provisions relating to investment promotion and protection. This article does not apply to other disputes in which a foreign investor might be involved.

Key features of the investor-state dispute resolution procedures include the following:

- Requirement for a period of three months for consultations.
- If consultations/negotiations fail, the foreign investor has three options as to where to submit the dispute for resolution (Article 26(2)):
  - To domestic courts or administrative tribunals of the host state to the dispute.
  - To any applicable, previously agreed dispute settlement procedure, such as an arrangement under bilateral investment treaties.
  - To international arbitration.
- **International arbitration:** If foreign investors choose to submit a dispute to international arbitration, they have the choice between the following arbitration procedures:
  - The International Center for the Settlement of Investment Disputes, Washington, D.C., established by the ICSID Convention of 1965. This option is available if both them home state of the investor and the host state are parties to the ICSID Convention. Alternatively, the foreign investor may invoke the ICSID Additional Facility Rules for the Administration of Proceedings by the Center.

  - Use a sole arbitrator or an ad hoc arbitration tribunal established under the UNCITRAL Arbitration rules.
  - Go through the Arbitration Institute of the Stockholm Chamber of Commerce.
- **State consent to international arbitration:** Under the ECT (Article 26(3)(a), each CP gives its unconditional consent to the submission of a dispute to international arbitration.

  States may make two types of limited reservation—(i) to exclude disputes already submitted by the investor to a competent forum, (ii) to exclude claims under specific contracts made between the defendant state and the investor (this reservation had to be made at time of entering the treaty, and therefore only applies to those countries listed in the relevant annex).

  The ECT includes an express requirement that subnational authorities adhere to the provisions of the ECT.
- **Applicable law and finality of awards: —**The dispute shall be decided in accordance with the provisions of the treaty and the rules and principles of international law (Article 26(6)). The award is binding and final.

It is important to note that these provisions only apply to disputes relating to the specific investment obligations of a state under the ECT. The ECT does not create a framework for resolving disputes between a private party and a state concerning trade or transit issues. These provisions also do not concern disputes arising under contracts, even with a state, that concern matters other than those specifically set out in the investment protection provisions of the ECT.

State-to-State Disputes

Article 27 of the ECT provides for interstate arbitration. The scope of interstate disputes is not limited to investment disputes but applied to the application and interpretation of the treaty as a whole—with very limited exceptions. After exhausting attempts to settle them amicably, disputes have to be submitted to an ad hoc arbitration tribunal, under the rules of UNCITRAL, unless there is an agreement to the contrary between the CPs to the dispute.

International arbitration is not available in the following cases:

- Application or interpretation of competition and environmental issues (Articles 6 and 19).
- Observance of obligations under an individual investment contract against states listed in Annex IA.
- Application or interpretation of trade related matters (Articles 29) or trade-related investment matters (Article 5) unless both parties to the dispute agree otherwise.

The tribunal shall decide the dispute in accordance with the Treaty and applicable rules and principles of international law. The arbitral award shall be final and binding. Unless the parties to the dispute agree otherwise, the tribunal shall sit in The Hague, and use the premises and facilities of the Permanent Court of Arbitration.

Trade Disputes

In the case of disputes concerning the trade provisions, the Treaty provides for a dispute resolution mechanism that is based on the GATT/WTO panel model, with disputes submitted to the appropriate WTO forum. It applies only in cases where at least one of the disputing parties is not a member of the WTO. The ECT therefore makes a GATT/WTO-like dispute settlement system available, although not all parties to the dispute are GATT/WTO members.

However, a contracting party or an investor does also have the right to submit a trade-related dispute (including a dispute on trade-related investment matters (TRIMs) to arbitration under Article 27, provided that they both agree.

The ECT provisions do not apply to any dispute that under an agreement among states that were constituent parts of the former Soviet Union.

Transit Disputes

The ECT gives CPs the possibility to invoke a conciliation mechanism concerning transit disputes, through the secretary-general of the ECT Secretariat who shall consult with the interested parties and appoint a conciliator within 30 days. If the conciliator fails to secure an agreement within 90 days, he/she shall recommend a resolution or a procedure to achieve such resolution, and shall decide the interim tariffs and other terms and conditions to be observed until the dispute is resolved. The conciliation procedures may only be invoked after exhaustion of all other dispute resolution remedies previously agreed between the CPs or entities concerned.

The ECT ensures continuity of supply during a transit dispute by providing that a state may not interrupt (or permit any entity to interrupt) the flow of energy prior to the conclusion of the conciliation mechanism. There are only two exceptions to this prohibition: where this is specially permitted in the original contract or agreement or allowed by the conciliator appointed to seek to resolve the dispute.

Application to ECO Electricity Trading Arrangements and Risk Management

The ECT provides a framework to address overriding issues of state responsibility concerning investment and transit matters. It is not, of itself, a mechanism for addressing the operation of a market, whether based on a standardized system of bilateral contracts, or a tight or loose trading pool.

Similarly, its dispute resolution procedures are specifically limited to disputes between states and disputes between a state and an investor who is a national of another contracting state.

The dispute mechanics between investor and state are limited to disputes concerning specific treaty obligations.

The provisions do not set out a mechanic for binding arbitration between two entities trading or operating in the market, and in such dispute, where neither party can be considered to be a state actor, or their actions attributable to a state actor, the ICSID procedure will not be available. However, the provisions for arbitration under either UNCITRAL or the Stockholm arbitration tribunal could be adopted in a regional agreement for the ECO regions.

Annex 3 UCTE Reserves Definition and Use

This annex discusses the UCTE definitions of operating reserves and their use within a synchronized area, including the relationship between reserves and energy used for balancing (in a balancing market or pool). The key reference is the *UCTE Operation Handbook: www.ucte.org/ohb.*

Reserve and balancing energy are used in different ways in different balancing markets, but a typical system control / dispatch hierarchy looks like this:

primary reserves
secondary reserves
balancing energy tertiary reserves

The annex also briefly discusses how reserves are procured by system operators and the payment methods.

Dispatch and System Operation

Fast response is provided within seconds of a system frequency deviation by primary reserve. Secondary reserve capacity is dispatched to release primary reserve capacity. Tertiary reserve capacity is dispatched to release secondary reserve capacity. Balancing energy is dispatched in parallel with tertiary reserves on an economic basis. This means that the tertiary reserves need to be included along with balancing energy in one single bid stack.[91]

Table A.1 shows the UCTE definitions of reserves, how they are controlled and used.

In the discussion of reserves, the procurement and provision of the reserve capacity and energy is distinguished from the payment for primary and secondary reserve services.

Provision and Procurement of Primary and Secondary Reserves

Primary reserves are procured either under regulated arrangements or competitively via tenders or auctions. The price structure may include a capacity payment only, or capacity and energy. Primary reserve energy is expected to be net zero in each settlement period, so does not need to be netted out from balancing energy.

Secondary reserves are procured either under regulated arrangements or competitively via tenders or auctions. The price structure should include a capacity (availability) payment and an energy payment. The response of a generator to a secondary reserve control signal from the centralized, automatic control system in the dispatch center will not cause the generator to have a financial imbalance in the balancing market because the energy in question (whether positive or negative) was generated under a secondary reserve contract.

Payment for Primary and Secondary Reserves

Payment for reserve in an integrated or single buyer market is generally included in other use of system charges proportionately to all system users, not apportioned to individual users (who may have caused part of the need for use of reserve). However, pools or balancing markets within synchronized areas aim to

[91] Markets co-optimizing all energy and reserves would place all categories of reserve in a single price stack.

Table A3.1 Reserves—UCTE Definitions

Control	Purpose	Type	Using	Applied by/to	Over periods of
Primary	Maintain balance between generation and demand in the network.	decentralized, automatic	turbine speed governors	Adjust the generator output of a unit as a consequence of a frequency deviation/ offset in the synchronous area.	seconds
Secondary	Regulate the generation in a control area based on secondary control reserves to: •Maintain interchange power flow at the control program with all other control areas. • Restore frequency in case of a frequency deviation originated in the control area to its set value in order to free the capacity engaged by the primary control.	centralized, automatic	network characteristic method	Select generator sets in the power plants comprising this control loop.	minutes
Tertiary	Restore an adequate secondary control reserve at the right time.	manual (or automatic)	generators	Change the working points.	15 minutes

Source: UCTE Operation Handbook (2006).

apportion the cost of reserve to the *causer.* This leads to the need for rules on how to detect cause and allocate costs.

Primary reserve ancillary services have the following characteristics:

- All parties benefit proportionately from them.
- Primary reserve energy is net zero over the course of a market settlement period (hour).
- No parties can be considered to have "caused" the need for primary reserve energy.

- No party would be in a position to respond (in real time) to any price signals relating to primary reserve.

Therefore, the cost of providing primary reserve services should be added to the other costs allocated to the use of system charge and allocated proportionately to all network users.

Secondary reserve ancillary services have the following characteristics:

- All parties benefit proportionately from them.
- Secondary reserve energy may not necessarily be net zero over the course of a market settlement period (hour), but should be net zero over the course of an invoice period (month).
- If a party has caused the need for secondary energy, that party will experience a financial imbalance in the market.
- The need for secondary energy tends to be random, rather than predictable and hence it is not appropriate to send price signals to all balancing market participants, which would increase the volatility of balancing market prices without any benefit to the system or the participants.

Therefore, the cost of providing secondary reserve services could be added to the other costs allocated to the use of system charge and allocated proportionately to all users.

Tertiary Reserve

According to the dispatch hierarchy in Table 19, tertiary reserves are dispatched in parallel with balancing energy and on a least-cost (lowest bid price) basis. The cost of providing tertiary reserve may therefore be recovered from payments for imbalances by parties who have an imbalance in each settlement period.

Annex 4 Terms of Reference

Terms of Reference for Trading Arrangement and Risk Management in International Electricity Trade

(A Policy Paper for Regional Electricity Trade)

A. Background

1. Electricity (and energy) sectors in the broader South Asian Region, including in the member states of Economic Cooperation Organization (ECO)[92], are characterized by large diversity in a number of dimensions: size, resource endowments, interconnections with neighbors, generation mix, degree of electrification, seasonality of demand, growth potential, etc. This diversity offers significant opportunities for cross border electricity/energy trade and regional energy cooperation, which have not been fully exploited. These opportunities range from daily and seasonal exchanges of electricity, taking advantage of non-coincidental peaks and troughs, to larger scale trade in electricity and gas. The ECO region is in the neighborhood of some of the world's largest energy producers (Russia and Middle East) and consumers (China and India), which offers additional opportunities for cross-regional electricity and energy trade and transit.
2. Both the individual member states and the ECO as a region have recognized that there is unrealized potential for increased energy trade within the region, as well as between the region and its neighbors. The countries are actively looking for trade opportunities and selectively enhancing physical infrastructure which would facilitate electricity exports and imports. At the regional level, the ECO has declared cooperation in the energy sector as one of the priority areas.
3. The member countries of the ECO region have been active in identifying trading and investment opportunities. The five Central Asian states (Kazakhstan, Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan) have physical infrastructure that enables them to operate their electricity systems synchronously (as was the case while they were in the Soviet Union) and interconnect with Russia, as well as with Afghanistan. Turkmenistan has strengthened electricity interconnections with Iran and is exporting electricity both to Iran and to Turkey. Iran has also strengthened its interconnections with all neighboring countries and is discussing parallel operation of its electricity system with those of Azerbaijan and Russia. Afghanistan, whose physical electricity infrastructure is least developed, is building new high voltage transmission lines with Uzbekistan and planning new ones with Tajikistan in the near future. Pakistan is importing electricity from Iran since 2004 to help supply its western areas bordering Iran. There are active discussions between Tajikistan, Pakistan, and Afghanistan about electricity exports from Tajikistan (and also from other Central Asian states) to the other two countries. In the gas sector, Pakistan and India are considering gas imports from Iran (and possibly other Middle East countries), as well as from Turkmenistan (through Afghanistan). These opportunities, when

[92] ECO (see www.ecosecretariat.org) includes Afghanistan, Azerbaijan, Iran, Kazakhstan, Kyrgyz Republic, Pakistan, Turkey, Tajikistan, Turkmenistan, and Uzbekistan.

considered in conjunction with electricity imports, provide an interesting set of possibilities, with gas and electricity imports potentially both complementing and substituting for each other.

4. It has been recognized that there is a lack of region-wide analytical studies which would quantify and evaluate the potential for regional energy trade, estimate cost of transnational physical infrastructure, and investigate non-physical barriers to regional energy cooperation. To address these issues and to translate its declarations on regional energy cooperation into specific actions, the ECO region has undertaken some specific initiatives. In August 2005, the region commissioned a study on strengthening region-wide electricity interconnections, funded by the Islamic Bank for Development (IsDB). In June 2005, in cooperation with the World Bank, ECO organized a workshop on regional electricity trade (Tehran, June 29–30, 2005), attended by the member states (except Azerbaijan and Turkmenistan), and a number of international financing organizations (ADB, IDB, UNESCAP, and WB). The participants at the workshop agreed that the lack of clear understanding of the comparative costs and benefits of electricity trade opportunities, and of the policy, institutional, and regulatory issues that govern successful electricity trading, were among the key barriers to increasing cooperation and trading. It was agreed that an effort should be made to undertake the necessary analytical work which would close the information gap and that would help promote specific initiatives and projects on cross-border electricity trade and investment. The analytical work would help evaluate the electricity trade potential, identify priority investment projects, and harmonize the policy, institutional, and regulatory environments across the region to facilitate regional trade and investments. ECO has requested assistance of the World Bank and other donors to carry out the aforementioned analytical work.
5. The existing electricity trades are conducted mainly in the "island mode," in which only part of the national electricity system of one of the countries (typically the importing one) is synchronously connected with the power system of the other country, but disconnected from the rest of its own power system (only some Central Asian states operate their entire national power systems synchronously). The trade is also typically done through short-term arrangements, agreed on a bilateral basis, rarely involving more than two countries. If the countries were to utilize full regional potential, the trading arrangements would need to become multilateral, longer-term and, thus, technically and institutionally more complex, requiring multilateral and region-wide cooperation. The proposed analytical work would support these needs.
6. The proposed work is part of a series of analytical studies that would inform the ECO region (and other stakeholders) on the opportunities for electricity/energy trade and investment, their costs and benefits, and advise on policy, institutional and regulatory harmonization and commercial arrangements that would help promote regional cooperation in electricity trading. The studies would complement the one on electricity interconnections already under way (financed by IsDB, as mentioned above) and should help promote specific deals and projects. The studies would address the following areas:
   (i) trading arrangements and risk management in international electricity trade;
   (ii) issues and practices in interconnecting electricity systems;
   (iii) supply security risks in international energy trade;
   (iv) a presentation of the main opportunities for increased electricity trade in the ECO region, an analysis of the constraints to realizing those opportunities, and a proposal for overcoming the constraints.

B. Objectives

7. The objectives of this study are to:
   - Describe good practices in international electricity trading arrangements— with particular attention to risk management and involvement of private sector—as a function of the level of integration of the electricity markets involved in the trading; the potential for electricity (and energy trade); and the prevailing institutional, legal, policy, and commercial environment;

- Advise the ECO region and its member countries on the optimal approach to increased cooperation and trading in the electricity sectors in terms of the form of the trading arrangements; institutional organization; policy and regulatory environment; risk management; investment strategies; etc., and how these arrangements could evolve over time.

8. The information and recommendations of the study should be useful to the policy makers at the regional level as well as at the level of member states, both in pursuing region-wide initiatives and in negotiating specific trading and investment deals, such as export of electricity from Central Asia to South Asia (Afghanistan and Pakistan), as well as others.

C. The Scope of Work

9. The work would address the following issues:
10. **International electricity trading arrangements.** International electricity trade takes place in a number of ways, some of which are (the list is illustrative rather than complete):
    - Opportunistic, ad-hoc short-term bilateral exchanges of surpluses between national utilities across national borders, on predetermined or ad-hoc agreed terms;
    - Long-term contracts for bulk supply, often from dedicated power plant(s), from one country to another country (or countries), frequently conducted in island mode;[93]
    - Integrated multicountry markets (such as NordPool, or South Africa Power Pool).
11. Such trading arrangements differ in their institutional, regulatory, organizational, technical and commercial dimensions, as well as in the constraints and potential benefits that they offer to the participants. Generally, the complexity of the arrangements increases as the level of integration increases, but so do the benefits.
12. The consultant will review and describe the alternative international electricity trading arrangements and their attendant features (technical, commercial, organizational, institutional, regulatory, etc.). The review should include description of the possible evolution of the international electricity trading arrangements from the simpler ones (e.g., bilateral cross border trade) toward the more integrated ones.
13. **Risks and risk mitigation in international electricity trade and investments.** International electricity trading projects[94] include a number of stakeholders, such as sellers and buyers, project sponsors/investors (which could be private and public, domestic and foreign); project companies; host governments; national utilities and regulators; offtakers; affectees; lenders and insurers (commercial and international financing institutions); construction contractors; nongovernmental organizations; general public, etc. The project risks include (the list is illustrative rather than complete): availability of electricity (supply risk); availability of demand (demand/market risks); price and payments; exchange rate; profit repatriation; construction risks (costs overruns, completion schedule, technology risks); uncertainties in environmental and social impact; financing; fuel supply risks (or hydrology risk for hydropower plants); access to the facilities (production, transmission, consumer); political or natural events (political disturbance, sabotage, terrorism, flood, earthquakes, other natural events, etc.); developments which may affect the project (e.g., construction of an upstream hydropower plant in case of hydropower); other legal, regulatory, and policy risks (e.g., labor laws, electricity market structure and regulation, natural resource laws, commercial laws); etc. Some of the risks are of the same or similar nature as for

[93] One power system is said to be connected to another in an "island mode" if a part of that power system is disconnected from its native system and connected to the other one with which it then operates synchronously (i.e., with the same system frequency).

[94] The projects discussed here include both physical investment projects with accompanying trading arrangements and "pure" trading deals of buying and selling electricity without physical investments involved. Clearly, not all the aspects mentioned throughout the text apply equally to the both types of the projects.

the projects limited to a single country; however, international projects may introduce new risks or give a different dimension to the shared ones.

14. The study will take into account the fact that risk mitigation arrangements depend on the legal, policy, regulatory, institutional, and commercial environment, and vice versa—the latter could be designed so as to facilitate risk mitigation.
15. The study will describe how risks are managed—identified, assessed, allocated, and mitigated—in international electricity trade projects; how the associated contractual and institutional framework documents are designed as a function of the trading arrangements *between* and *within* the relevant markets involved in the trade; and how the projects are structured to mitigate the risks. The study will describe the main elements of project arrangements and associated contractual and framework documents. The study will address all important risks, with a particular focus on those specific to international electricity investment and trade projects, bilateral and multilateral. The study will recommend options for structuring international electricity projects in the ECO region, including—as a special case study—electricity exports from Central Asia (Tajikistan, in the first place) to South Asia (Afghanistan and Pakistan).
16. The study will describe a typical set of legal documents for an international investment project in the electricity sector and what they cover (such as concession agreements between the government(s) and developer(s); transit agreement (if electricity is to transit a third country); shareholder agreements between the shareholders; power purchase agreements; operating agreements; guarantee agreements; construction contracts; etc.—this list is not exhaustive and depends on the overall framework for trade—bilateral or multilateral, or in a more integrated regional market, with or without an intergovernmental framework agreement, etc.).
17. **Role of the public and private sectors and options for financing.** The study will examine the role of the public and private sectors and options for public–private partnerships promoting regional electricity trade and investment, from creating appropriate enabling environment to undertaking specific projects, and how such partnership could accelerate advance the trade through appropriate incentives and sharing of benefits and risks. Elements of such partnership could include intergovernmental framework agreements with appropriate institutional arrangements that would enable private sectors to finance investment projects and enter into commercial contracts. The governments could also play a significant role at the project level, especially in such aspects as mitigating environmental and social impact, guaranteeing performance of national utilities or national regulation, and providing concession for development of a resource.
18. **Options for financing international electricity projects.** The study will describe options for financing international electricity trade and investment projects, in the context of risk-mitigation strategies (including financial risk-mitigation instruments), and the role that the private sector can play. The study will focus on the options that could be of particular interest in the ECO region context.
19. **International experience.** The study will present best practice in international experience for the issues examined, illustrated with specific cases of particular relevance to the ECO region. Presentation of the cases should include an overview of the physical trade and a description of policy, institutional, regulatory, and technical arrangements and their evolution over time.
20. **Opportunities and constraints.** The study will describe the main opportunities for increased electricity trade in the ECO region, including the existing generation surpluses, as well as the potential for new investments. The study will then describe the main constraints to realizing those opportunities, and propose a set of policy, institutional, and regulatory measures for overcoming the constraints.

21. **Recommendation.** Based on the review, the consultant will:
- Describe a possible evolution of increased electricity trade in the ECO region, on the basis of international experience and the specifics of the region.
- Propose measure that needs to be taken in the policy, institutional, and regulatory areas to enable and promote increased regional electricity trade and investment on the basis of economic criteria and associated risks.
- Propose a roadmap for the region, including organizational forums to discuss and promote regional electricity trade at the policy and technical levels.
- Examine the initiative for electricity exports from Central Asia to South Asia, and describe options for its financing, institutional arrangements, and risk mitigation. Describe the role that this initiative could have on encouraging wider electricity in the region.

D. Qualifications and Required Skills

22. The assignment should be carried out by a consulting firm with an appropriate experience in international electricity trading arrangements, including in the policy, institutional, and regulatory areas, as well as in the areas of project structuring and finance.

E. Working Arrangements

23. This is expected to be largely a desk study. The consultant should coordinate closely with the World Bank team in charge of the study. The consultant may also need to work with ECO Secretariat and member countries, at their discretion, to the extent needed to ensure the study's relevance to the region. The consultants should get familiarized with other recent relevant work (such as under the USAID-financed South Asia Regional Initiative—SARI), World Bank program for energy in South and Central Asia (in progress), a World Bank study on electricity exports potential in central Asia, and so on.

F. Deliverables and Schedule

24. Deliverables include an inception report and the final report, with interim draft reports as outlined in the table below. The assignment is expected to last about 18 weeks, assuming no more than two weeks for each review and comment period between deliverables. The main deliverables and the timeline are summarized in the following table.

Main Deliverable	Description	Due Date (after start of assignment)
Inception Report: Work Plan	Submission of detailed work plan, including approach and methodology; outline of the report; and a list of the main international cases to be included in the study	2 weeks
Draft Final Report	Draft final report, covering all the issues as per the Terms of Reference	14 weeks
Final Report	Amended version of final draft report addressing review comments A PowerPoint presentation summarizing the main findings and recommendations	18 weeks

25. The reports should be submitted in English language, as MS World files in format suitable for electronic transmission. In addition, two hard copies should be submitted of all the reports.

The consultant may be required to make a presentation of the findings to ECO member state officials. This decision would be made at a later stage. In case the presentation is required, an additional amount covering consultant's travel expenses will be added to the contract.

List of Formal Reports

Region/Country	Activity/Report Title	Date	Number
	SUB-SAHARAN AFRICA (AFR)		
Africa Regional	Anglophone Africa Household Energy Workshop (English)	07/88	085/88
	Regional Power Seminar on Reducing Electric Power System Losses in Africa (English)	08/88	087/88
	Institutional Evaluation of EGL (English)	02/89	098/89
	Biomass Mapping Regional Workshops (English)	05/89	—
	Francophone Household Energy Workshop (French)	08/89	—
	Interafrican Electrical Engineering College: Proposals for Short-and Long-Term Development (English)	03/90	112/90
	Biomass Assessment and Mapping (English)	03/90	—
	Symposium on Power Sector Reform and Efficiency Improvement in Sub-Saharan Africa (English)	06/96	182/96
	Commercialization of Marginal Gas Fields (English)	12/97	201/97
	Commercializing Natural Gas: Lessons from the Seminar in Nairobi for Sub-Saharan Africa and Beyond	01/00	225/00
	Africa Gas Initiative—Main Report: Volume I	02/01	240/01
	First World Bank Workshop on the Petroleum Products Sector in Sub-Saharan Africa	09/01	245/01
	Ministerial Workshop on Women in Energy and Poverty Reduction: Proceedings from a Multi-Sector and Multi-Stakeholder Workshop Addis Ababa, Ethiopia, October 23–25, 2002	10/01 03/03	250/01 266/03
	Opportunities for Power Trade in the Nile Basin: Final Scoping Study	01/04	277/04
	Energies modernes et réduction de la pauvreté: Un atelier multi-sectoriel. Actes de l'atelier régional. Dakar, Sénégal, du 4 au 6 février 2003 (French Only)	01/04	278/04
	Énergies modernes et réduction de la pauvreté: Un atelier multi-sectoriel. Actes de l'atelier régional. Douala, Cameroun du 16–18 juillet 2003. (French Only)	09/04	286/04

	Energy and Poverty Reduction: Proceedings from the Global Village Energy Partnership (GVEP) Workshops held in Africa	01/05	298/05
	Power Sector Reform in Africa: Assessing the Impact on Poor People	08/05	306/05
	The Vulnerability of African Countries to Oil Price Shocks: Major	08/05	308/05
	Factors and Policy Options. The Case of Oil Importing Countries Maximizing the Productive Uses of Electricity to Increase the Impact of Rural Electrification Programs	04/08	332/08
Angola	Energy Assessment (English and Portuguese)	05/89	4708-ANG
	Power Rehabilitation and Technical Assistance (English)	10/91	142/91
	Africa Gas Initiative - Angola: Volume II	02/01	240/01
Benin	Energy Assessment (English and French)	06/85	5222-BEN
Botswana	Energy Assessment (English)	09/84	4998-BT
	Pump Electrification Prefeasibility Study (English)	01/86	047/86
	Review of Electricity Service Connection Policy (English)	07/87	071/87
	Tuli Block Farms Electrification Study (English)	07/87	072/87
	Household Energy Issues Study (English)	02/88	—
	Urban Household Energy Strategy Study (English)	05/91	132/91
Burkina Faso	Energy Assessment (English and French)	01/86	5730-BUR
	Technical Assistance Program (English)	03/86	052/86
	Urban Household Energy Strategy Study (English and French)	06/91	134/91
Burundi	Energy Assessment (English)	06/82	3778-BU
	Petroleum Supply Management (English)	01/84	012/84
	Status Report (English and French)	02/84	011/84
	Presentation of Energy Projects for the Fourth Five Year Plan (1983–1987) (English and French)	05/85	036/85
	Improved Charcoal Cookstove Strategy (English and French)	09/85	042/85
	Peat Utilization Project (English)	11/85	046/85
	Energy Assessment (English and French)	01/92	9215-BU
Cameroon	Africa Gas Initiative – Cameroon: Volume III	02/01	240/01
Cape Verde	Energy Assessment (English and Portuguese)	08/84	5073-CV
	Household Energy Strategy Study (English)	02/90	110/90
Central African Republic	Energy Assessment (French)	08/92	9898-CAR
Chad	Elements of Strategy for Urban Household Energy The Case of N'djamena (French)	12/93	160/94
Comoros	Energy Assessment (English and French)	01/88	7104-COM
	In Search of Better Ways to Develop Solar Markets: The Case of Comoros	05/00	230/00

Congo	Energy Assessment (English)	01/88	6420-COB
	Power Development Plan (English and French)	03/90	106/90
	Africa Gas Initiative – Congo: Volume IV	02/01	240/01
Côte d'Ivoire	Energy Assessment (English and French)	04/85	5250-IVC
	Improved Biomass Utilization (English and French)	04/87	069/87
	Power System Efficiency Study (English)	12/87	
	Power Sector Efficiency Study (French)	02/92	140/91
	Project of Energy Efficiency in Buildings (English)	09/95	175/95
	Africa Gas Initiative – Côte d'Ivoire: Volume V	02/01	240/01
Ethiopia	Energy Assessment (English)	07/84	4741-ET
	Power System Efficiency Study (English)	10/85	045/85
	Agricultural Residue Briquetting Pilot Project (English)	12/86	062/86
	Bagasse Study (English)	12/86	063/86
	Cooking Efficiency Project (English)	12/87	
	Energy Assessment (English)	02/96	179/96
Gabon	Energy Assessment (English)	07/88	6915-GA
	Africa Gas Initiative – Gabon: Volume VI	02/01	240/01
The Gambia	Energy Assessment (English)	11/83	4743-GM
	Solar Water Heating Retrofit Project (English)	02/85	030/85
	Solar Photovoltaic Applications (English)	03/85	032/85
	Petroleum Supply Management Assistance (English)	04/85	035/85
Ghana	Energy Assessment (English)	11/86	6234-GH
	Energy Rationalization in the Industrial Sector (English)	06/88	084/88
	Sawmill Residues Utilization Study (English)	11/88	074/87
	Industrial Energy Efficiency (English)	11/92	148/92
	Corporatization of Distribution Concessions through Capitalization	12/03	272/03
Guinea	Energy Assessment (English)	11/86	6137-GUI
	Household Energy Strategy (English and French)	01/94	163/94
Guinea Bissau	Energy Assessment (English and Portuguese)	08/84	5083-GUB
	Recommended Technical Assistance Projects (English & Portuguese)	04/85	033/85
	Management Options for the Electric Power and Water Supply Subsectors (English)	02/90	100/90
	Power and Water Institutional Restructuring (French)	04/91	118/91
Kenya	Energy Assessment (English)	05/82	3800 KE
	Power System Efficiency Study (English)	03/84	014/84

	Status Report (English)	05/84	016/84
	Coal Conversion Action Plan (English)	02/87	—
	Solar Water Heating Study (English)	02/87	066/87
	Peri-Urban Woodfuel Development (English)	10/87	076/87
	Power Master Plan (English)	11/87	—
	Power Loss Reduction Study (English)	09/96	186/96
	Implementation Manual: Financing Mechanisms for Solar Electric Equipment	07/00	231/00
Lesotho	Energy Assessment (English)	01/84	4676-LSO
Liberia	Energy Assessment (English)	12/84	5279-LBR
	Recommended Technical Assistance Projects (English)	06/85	038/85
	Power System Efficiency Study (English)	12/87	081/87
Madagascar	Energy Assessment (English)	01/87	5700-
	Power System Efficiency Study (English and French)	12/87	075/87
	Environmental Impact of Woodfuels (French)	10/95	176/95
Malawi	Energy Assessment (English)	08/82	3903-
	Technical Assistance to Improve the Efficiency of Fuelwood Use in the Tobacco Industry (English)	11/83	009/83
	Status Report (English)	01/84	013/84
Mali	Energy Assessment (English and French)	11/91	8423-MLI
	Household Energy Strategy (English and French)	03/92	147/92
Islamic Republic of Mauritania	Energy Assessment (English and French)	04/85	5224-
	Household Energy Strategy Study (English and French)	07/90	123/90
Mauritius	Energy Assessment (English)	12/81	3510-
	Status Report (English)	10/83	008/83
	Power System Efficiency Audit (English)	05/87	070/87
	Bagasse Power Potential (English)	10/87	077/87
	Energy Sector Review (English)	12/94	3643-
Mozambique	Energy Assessment (English)	01/87	6128-
	Household Electricity Utilization Study (English)	03/90	113/90
	Electricity Tariffs Study (English)	06/96	181/96
	Sample Survey of Low Voltage Electricity Customers	06/97	195/97
Namibia	Energy Assessment (English)	03/93	11320-
Niger	Energy Assessment (French)	05/84	4642-NIR
	Status Report (English and French)	02/86	051/86

	Improved Stoves Project (English and French)	12/87	080/87
	Household Energy Conservation and Substitution (English and French)	01/88	082/88
Nigeria	Energy Assessment (English)	08/83	4440-UNI
	Energy Assessment (English)	07/93	11672-
	Strategic Gas Plan	02/04	279/04
Rwanda	Energy Assessment (English)	06/82	3779-RW
	Status Report (English and French)	05/84	017/84
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Trading Arrangements and Risk Management in International Electricity Trade

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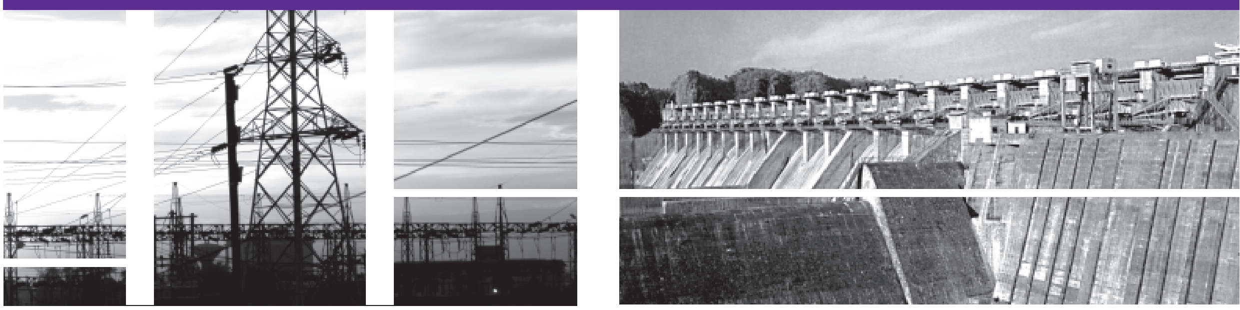

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