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# World Bank Framework for Development of Regional Energy Trade in South East Europe

**David Kennedy and John Besant-Jones**



THE WORLD BANK  
GROUP



The Energy and  
Mining Sector Board

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**The World Bank, Washington, DC**



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## FOREWORD

The December 6th 2003 signing of the Athens memorandum by Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Macedonia, Romania, Serbia and Montenegro, Turkey, and United Nations Interim Administration for Kosovo (UNMIK), whereby these countries have agreed to develop a South East Europe Regional Energy Market (SEEREM) is a major development for this region. The initiative is sponsored by the European Commission and the Stability Pact, and the intention is that the SEEREM will ultimately form part of the wider European energy market.

The World Bank supports establishment of a SEEREM, whilst recognizing the need for deep institutional reform if liberalization is to succeed. This paper draws on the Bank's experience of energy market liberalization and regional energy markets elsewhere and provides a vision for the SEEREM. The paper focuses on risks to SEEREM development, ways that these can be addressed, and the role of the Bank together with other institutions in supporting SEEREM development. The intention is to propose a set of actions that would unlock the full potential benefits of the SEEREM whilst at the same time minimizing any adverse impacts.

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## **ABSTRACT**

This Bank framework is motivated by the Athens Memorandum establishing a South East Europe Regional Energy Market (SEEREM). The aim is to outline challenges for successful SEEREM implementation, and to define a supporting role for the World Bank.

The framework highlights risks, and provides risk mitigation strategies, related to the following: institutional reform to support power market liberalization; power market design; technical capacity to support market development (i.e. power generation and transmission capacity); South East Europe (SEE) gasification; environmental compliance costs; power market liberalization impacts on the SEE coal industry.

Five key proposals in the framework are for the Bank to: support a phased approach to market opening, starting with trading based on bilateral contracts and third party network access, moving to a more sophisticated model only after the institutional framework is sufficiently developed; use regional benchmarking in its policy support work with individual countries and as a trigger for investment financing; use a special instrument for finance of investments to support development of the regional market; support work to assess the economics of SEE gasification and costs of compliance with EU environmental standards; complete a regional power Generation Investment Study.

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## ABBREVIATIONS AND ACRONYMS

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APL	Adaptable Programmatic Loan
bcm	billion cubic meters
CEER	Council of European Energy Regulators
CIDA	Canadian International Development Agency
EAR	European Agency for Reconstruction
EBRD	European Bank for Reconstruction and Development
EC	European Commission
EIB	European Investment Bank
EKC	Electricity Coordinating Center
EU	European Union
GDP	Gross Domestic Product
GW	Giggawatt
GWh	Giggawatt-hour
IAS	International Accounting Standards
IFC	International Finance Corporation
IFI	International Financial Institution
LCP	Large Combustion Plant
LRMC	Long Run Marginal Cost
KFw	Kreditanstalt für Wiederaufbau
kW	Kilowatt
kWh	Kilowatt-hour
MIGA	Multinational Investment Guarantee Agency
MW	Meggawatt
MWh	Meggawatt-hour
Nordel	Nordic Electricity Market
SCADA	Supervisory Control and Data Acquisition
SECI	South East Europe Cooperation Initiative
SEE	South East Europe
SEEREM	South East Europe Regional Energy Market
SRMC	Short Run Marginal Cost
tcm	thousand cubic meters
UCTE	Union for Coordination and Transmission of Electricity
USAID	United States Agency for International Development
WHO	World Health Organization

## EXECUTIVE SUMMARY

### Background

This Bank framework paper to support development of regional energy trade in South East Europe (SEE) covers Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Kosovo<sup>1</sup>, Former Yugoslav Republic of Macedonia (hereafter referred to as “Macedonia”), Romania, Serbia and Montenegro, and Turkey. All these countries are signatory to the Athens Memorandum whereby they have agreed to develop a South East Europe Regional Energy Market (SEEREM) for power and gas; the SEEREM is the motivation for this framework.

Sectors covered are primarily power and gas. District heating and coal are discussed to the extent that they interface with regional energy market development.

The framework outlines the Bank’s vision for regional energy market development and defines its role in supporting the evolution of regional energy trade. The framework highlights risks associated with SEEREM development, and proposes risk mitigation measures. The framework elaborates the Bank’s role supporting policy reform and institutional development, and on lending for power generation, transmission, distribution, district heating, and gas infrastructure.

The main themes of the framework are:

- the need to phase market development in tandem with institutional reform;
- the importance of (effective) tariff and regulatory reform for regional energy market development;
- affordability impacts of price reform, and mitigation through social safety nets/energy efficiency improvements;
- the importance of tailoring the power market framework to the SEE context (liberalization should be based initially on a simple [bilateral contracts] trading model);
- the need for energy industry restructuring;
- the need for substantial investments in power generating capacity, and energy (power and gas) networks;
- the need for further work to elaborate necessary investments in the power sector;

- the need to further assess the economics of introducing new environmental legislation in the power sector, and of SEE gasification;
- the need to address potential stranded costs in the coal sector prior to power market liberalization.

Five key proposals for the Bank are: to support a phased approach to market opening, starting with trading based on bilateral contracts and third party network access, moving to a more sophisticated model only after the institutional framework is sufficiently developed; to use regional benchmarking in its policy support work with individual countries and as a trigger for investment financing; to use a special instrument for finance of investments to support development of the regional market; to support work to assess the economics of SEE gasification and costs of compliance with EU environmental standards; to complete a regional power Generation Investment Study.

### Power market development in South East Europe

The framework discusses potential benefits of power trade and concludes that these are significant in SEE given heterogeneous resource endowments, scope for sharing of reserve capacity, non coincidental seasonal peak, and opportunities for trading with other regions (western, central and eastern Europe); benefits would be manifest in lower power prices for a given level of system security.

The framework outlines different trade models, and argues that the most appropriate model for the near term in SEE would be opening of the non household market in a phased manner, with third party network access and bilateral contracts between generators and large consumers. More sophisticated trading models (e.g. a day ahead power pool) are likely to be appropriate further in the future in SEE.

In order to support the proposed model, the framework argues that certain conditions relating to tariffs, payments discipline, the social safety net, regulatory development, and industry restructuring should be fulfilled.

<sup>1</sup> Kosovo is currently under the administration of the United Nations INTERIM Administration IN Kosovo (UNMIK) according to the terms of UN Security Resolution 1244 of June 1999. Kosovo is treated as a separate entity for the purposes of this paper, to the extent that data permits.

The framework benchmarks SEEREM countries and concludes that, whilst progress has been made, further reforms are necessary in order to support successful market opening. Notwithstanding this, the framework concludes that it is reasonable to expect that required reforms can be implemented in time for proposed market opening from the end of 2005.

On the technical side, the framework highlights the need for adequate generation and transmission (quantity and quality) capacity to support . Based on a preliminary analysis, 4.5 GW of additional power generation capacity may be required to meet incremental power demand in SEE to 2010, with a similar amount of generation capacity requiring rehabilitation. In addition, new transmission interconnections will be required given the lack of current network integration. In these circumstances, an investment support mechanism (e.g. capacity obligations for large consumers/distribution companies) is likely to be required if capacity balance is to be maintained.

### **Gas market development in South East Europe**

The Athens Memorandum requires that SEE countries undertake gas sector reforms through development of regulatory frameworks and industry unbundling with a view to increased gasification. The framework assess scope for gas price reductions that would support increased gasification in the region. Specifically, the framework explores the potential impact of Caspian gas in SEE, and concludes that this is unlikely to lead to price reduction in the medium term.

The framework notes that increased use of gas for heating in the residential sector would help to address the problem of current high energy intensity in SEE. Though there may be scope for increased gasification at current gas prices in SEE, primarily through increased use of gas in the residential sector, with the possibility that incremental power demand may be best met through gas fired power generation, gas trade/market development is likely to proceed more slowly than power market development.

### **Environmental aspects of the SEEREM**

The framework provides a preliminary estimate of compliance costs were the European Union Large Combustion Plant (LCP) Directive to be introduced in

SEE. Under the LCP Directive, investments in technology to reduce sulfur dioxide and nitrogen oxide would be required, with related costs of the order \$5 billion. Given affordability/finance constraints, it is likely that the environmental framework in SEE will have to involve a variant on the LCP Directive (e.g. this would only be applied to new plant).

### **SEEREM impact on the coal industry**

As the power market develops it is likely that this will create pressure for performance improvements in the coal sector. Given that the coal sector in SEE currently performs inefficiently, there is the possibility that there could be substantial stranded labor costs following power market liberalization. The framework estimates that around 100,000 jobs would need to be shed in order for the coal industry in SEE to be viable. Labor restructuring before power market liberalization would support the latter, and would better foster the emergence of viable coal industries in the region.

### **Challenges for SEEREM implementation**

The framework identifies the following *near term* challenges for SEEREM implementation:

- To increase effective tariffs to cost recovery levels for each category of consumers.
- To develop an independent regulatory framework including distribution tariff methodologies.
- To identify regional investment priorities through completion of a generation investment study and related modeling of the transmission network to identify bottlenecks.
- To develop a capacity support mechanism ensuring that finance for necessary investments is secured.
- To assess economic and technical viability of new gas pipelines/alternative gas supplies (e.g. LNG) and distribution projects and gas fired power plant.
- To reform gas tariffs towards cost recovery and improve payments discipline.
- To estimate costs associated with improving environmental performance.
- Taking into account compliance costs, to develop a legislative framework for improved environmental performance.
- To develop social programs for coal industry labor restructuring.
- To separate viable from non viable mines.

## **The World Bank's Contribution**

The World Bank will focus its policy support towards development of an institutional framework for non household power market liberalization by the end of 2005.

Specifically, the Bank will focus on the following:

- In Albania, on tariff reform, improvement of payments discipline, and strengthening of the social safety net.
- In Bosnia, on payments discipline, industry restructuring, regulatory strengthening, and strengthening of the social safety net.
- In Croatia, on industry restructuring
- In Macedonia, on payments discipline and energy strategy
- Montenegro, on improvement of payments discipline, industry restructuring and regulatory development
- In Romania, on power market development
- In Serbia, on energy legislation, regulatory strengthening, power industry restructuring
- In Turkey, on power market development.

In addition, the Bank will work with selected countries on institutional reform in the gas sector, and development of gas distribution concessions.

On investments, the Bank will develop a dedicated facility – termed an *Adaptable Programmatic Loan (APL)* – for finance of investments to support power trade.

In order to qualify for financing under the facility, countries will have to fulfill certain criteria relating to regulatory reform and industry restructuring, to be drawn from the Athens Memorandum and related legal agreements.

Subject to fulfillment of criteria, countries would be able to apply for Bank financing of projects in the following areas: dispatch system upgrades, transmission capacity, protective relays, substations, transmission/distribution metering, communication systems, governor upgrades on power stations.

In addition the Bank will undertake with the EC a Generation Investment Study to identify economically beneficial investments in power generation and transmission, and will undertake/participate in a study on the economics of regional gasification.

Subject to the results of the proposed gas study, the Bank will consider developing a Gas APL to finance construction of gas pipelines (e.g. the Greece – Turkey pipeline or offshoots) and gas distribution networks depending on the economics of increased gasification. Where the private sector is involved, the Bank would offer guarantees to private investors. For public sector projects, the Bank would offer debt finance and guarantees.

## 1. INTRODUCTION

This Bank framework paper to support development of regional energy trade in South East Europe (SEE) covers Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Kosovo, Macedonia, Romania, Serbia and Montenegro, and Turkey. All these countries are signatory to the Athens Memorandum whereby they have agreed to develop a South East Europe Regional Energy Market (SEEREM) for power and gas; the SEEREM is the motivation for this framework.

Sectors covered are primarily power and gas. District heating and coal are discussed to the extent that they interface with regional energy market development.

The framework outlines the Bank's vision for regional energy market development and defines its role in supporting the evolution of regional energy trade. The framework focuses on the Bank's role supporting policy reform and institutional development, and on lending for power generation, transmission, distribution, district heating, and gas infrastructure.

The framework starts with a short background on energy trade in SEE covering potential benefits, existing and future trade, and trading models. Next an exposition of the Athens Memorandum is provided. An overview of reform and investment challenges in the context of the Athens Memorandum is then presented, and finally the Bank's response – in terms of policy support and investment lending – is outlined.

Technical annexes are attached to the main text to support the coverage of strategic issues. The annexes discuss: the basic economics of power trade; institutional aspects of power trade; power transmission capacity in SEE; SEE gasification; donor support for SEE energy trade development.

The main themes of the framework are:

- the need to phase market development in tandem with institutional reform;
- the importance of (effective) tariff and regulatory reform for regional energy market development;
- affordability impacts of price reform, and mitigation through social safety nets/energy efficiency improvements;

- the importance of tailoring the power market framework to the SEE context (liberalization should be based initially on a simple trading model);
- the need for energy industry restructuring;
- the need for substantial investments in power generating capacity, and energy (power and gas) networks;
- the need to further assess the economics of introducing new environmental legislation in the power sector, and of SEE gasification;
- the need to address potential stranded costs in the coal sector prior to power market liberalization.

Some of these areas (e.g. pricing, regulation) are already central to the Bank's work with individual countries in SEE, and feature in Bank Country Assistance Strategies. They are discussed in the current framework given the centrality of commercialization and regulatory reform to market development. Whilst Country Assistance Strategies focus on country specific analysis, the framework paper adopts a regional perspective to assessment of reform progress and outstanding challenges. In addition, the framework paper focuses on regional issues not covered in Country Assistance Strategies (e.g. regional power market design, SEE gasification, environmental legislation).

The framework paper outlines broad steps towards market liberalization; it does not discuss detailed issues. Neither does it attempt to answer all outstanding questions relating to the SEEREM. Rather, the framework paper flags areas where further work is required (e.g. in design of a capacity support mechanism for the SEEREM, and a protection mechanism for residential consumers, together with assessment of investments required to support increased trade) to mitigate risks related to market development and to unlock potential benefits.

Five key proposals for the Bank are: to support a phased approach to market opening, starting with trading based on bilateral contracts and third party network access, moving to a more sophisticated model only after the institutional framework is sufficiently developed; to use regional benchmarking in its policy support work with individual countries and as a trigger for investment financing; to use a special instrument for finance of investments to support development of the regional market; to support work to assess the economics of SEE gasification and costs of compliance with EU environmental standards; to complete a regional power Generation Investment Study.

## 2. BACKGROUND

### *Benefits of regional power trade*

#### *Generic benefits of power trade<sup>1</sup>*

Power trading can yield benefits when resource endowments differ across countries. For example, the interconnection of a largely thermal power system with a largely hydropower system allows energy banking. The thermal-based system transmits energy to the hydro-based system during off-peak periods. This displaces hydropower in meeting the load on the largely hydropower system, which allows water to be stored or banked in the reservoirs of the hydropower system. This stored water can then be used to provide power to meet peak demand on the largely thermal power system.

Additional scope for trade in electricity occurs when fuel costs for power generation are lower in one country than in an adjoining one, which justifies the construction of power plants dedicated to exports that use this fuel.

Another advantage of trading electricity is that acceptable power supply reliability can be achieved with a lower capacity reserve margin when networks are interconnected as opposed to operating independently.

Further economies may occur where utilities face different system load shapes or experience peak loads at different times of the day/year. In this situation, the output of peaking plant may be shared between countries.

A fundamental distinction can be drawn between relatively short term and opportunistic trade and firm, long term trade. The former influences the decisions of trading countries about dispatching energy from their power plants. The latter also influences their decisions about system expansion and new capacity investments. In other words, greater benefits from system operation and investment can be derived from both short term and firm trades. Power trade would typically start with short-term trade, and move to firm trade over time as confidence in market institutions is developed.

In terms of practical examples, the best known regional power market is the Scandinavian power pool – NORDEL. Regional power markets are under development in the European Union, Southern Africa (Southern Africa Power Pool), Indochina (the Intergovernment Agreement on Regional Power trade signed by six countries bordering on the Mekong River), and six Central American countries (Sistema de Interconexion Electrica para los Paises de America Central, or SIEPAC). Similar developments are under discussion in eastern Africa and western Africa.

#### *Trade benefits for SEE*

Some benefits from electricity trade in SEE are realized currently, with volumes traded around 9% of final SEE demand, rising to 14% if trade with Greece and Turkey is included. The main exporters in the region are Bosnia and Herzegovina, Bulgaria and Romania, whilst other countries are net importers; data relating to SEE power trade is presented in Table 1. Trade is typically on a short term rather than firm basis, and is characterized by limited competition, high transaction costs and a lack of flexibility in exploiting short-term opportunities for trading.

Going forward, there would seem to be scope for ongoing export of power from Bosnia and Herzegovina. Given peak demand of 1950 MW and installed capacity of 3,850 MW, 50% of which is hydro, Bosnia and Herzegovina should in the future supply peak power to the regional market.

Montenegro has peak demand of 700 MW and installed capacity of 870 MW, 650 MW of which is hydro. Exports of peak power will continue to take place under a contract between Montenegro and Serbia. Imports of base power will depend on the extent to which aging thermal plant is rehabilitated, which in turn will depend on coal industry restructuring to improved financial viability.

Albania has peak demand 1200 MW and installed capacity of 1600 MW, 90% of which is hydro. Albania's power trade is currently limited, largely due to limited transmission interconnection capacity with neighboring systems, with potential for increased exports in peak periods (particularly in wet years) and imports of base power (particularly in dry years). It would be expected

<sup>1</sup> This discussion is elaborated in Annex 1.

**Table 1. Annual energy exchange between SEE countries in 2001 (GWh)<sup>2</sup>**

	BULGARIA	ROMANIA	SERBIA AND KOSOVO	ALBANIA	BOSNIA	CROATIA	MACEDONIA	MONTENEGRO	TURKEY	REGIONAL TOTAL EXPORTS
Bulgaria		388	1379				24		3000	4791
Romania	866		1193							2059
Serbia and Kosovo	222	285		102	598		1503	1762		4472
Albania			36					19		55
Bosnia			1085					2350		3435
Croatia										
Macedonia			8							8
Montenegro			1610	721	98					2429
Regional total imports	1088	673	5311	823	696	0	1527	4131	3000	17249
Demand	36210	52577	33797	5432	9804	14455	6293	4116		162684

that trade would increase as Albania becomes better connected to the regional power network.

In Macedonia currently around 15% of power is imported from the region. Over time this figure may increase as demand grows and domestic coal resources are exhausted. Then there will be scope for power imports from Bulgaria, given current and forecast net capacity in the Bulgarian power system, and a new interconnection between Bulgaria and Macedonia currently under development. In addition, and given that Bulgaria will maintain relatively high reserve to cover its large nuclear units, sharing of reserve between Bulgaria and Macedonia (or other countries) offers potential economic benefits.

Another potential net exporter in the region is Turkey, which under present contractual obligations will have a

system reserve margin of around 20% in the medium term. Technical constraints to trade – the power system in Turkey does not operate synchronously with that in SEE – are likely to be overcome in the medium term.

In other directions, there is scope for power trade between SEE and (western/eastern) Europe. Indeed, it is envisaged that the SEE energy market will become part of the EU internal energy market; see discussion of the Athens Memorandum in section 2 below. From a technical point of view, this would be feasible given that power systems in Europe and SEE operate according to shared technical standards through membership of the Union for Cooperation and Transmission of Electricity (UCTE), and that SEE will shortly be reintegrated with the European grid (see section *Technical capacity to support power trade* below).

<sup>2</sup> The source for this table is "Review of Electricity Supply and Demand in South East Europe", Working paper, World Bank: Washington, 2003. Disaggregated data for Serbia and Kosovo is not presented in this report. In 2003, power exports from Kosovo were 3070 GWh, whilst imports were 2111 GWh. Kosovo exported power mainly to Serbia, and imported power mainly from Macedonia and Montenegro.



Trade between Ukraine/Russia and SEE would generally not be technically feasible at the moment, although moves are underway to create conditions that would support trade through synchronizing system operation. An alternative would be rehabilitation of existing transmission links through Moldova, or construction of new links, to allow power transfer with asynchronous system operation. Significant benefits could ensue if trade is technically feasible given non coincidental peak load periods between Russia and SEE.

Within the region it is unlikely that there is scope for a *rolling peak* given that there is a maximum one hour time difference between countries. There may however be scope for trade to exploit non coincidental seasonal peak. In the last few years Greece has become a summer peaking system and has imported power in the summer<sup>3</sup>. Meeting summer demand growth with increased imports rather than additions to domestic capacity would yield economic benefits.

From a technical point of view the potential increase in trade is not constrained. The UCTE does not stipulate a minimum reserve requirement for countries, requiring only that forecast power demand is balanced a year in advance (under contracts [including import contracts]).

From a political point, countries will limit their dependence on the regional market to provide power. Discussion with countries in SEE suggests that the acceptable upper bound on net imports is likely to be around 20-25% of demand, at least in the medium, term, though in the long term this could increase through successful market development and integration.

A preliminary estimate<sup>4</sup> is that if SEE were to operate as a regionally integrated system dispatching on a least cost basis, then operating costs could be reduced by 11-15%. There would be additional cost savings relating to capital, for example, through exports from surplus to deficit countries, and sharing of reserve. In the short term, savings would be reflected in lower prices where these are currently relatively high, and increased net revenues for utilities with the potential for increased exports of hydro based power. In the longer term, integrated operation would lead to lower prices than in a limited trade scenario.

A full understanding of the benefits from regional integration/market development would require dynamic modeling of the regional system, discussed more in section *The Bank's Contribution* below.

The Bank's vision for development of a regional market is: (a) for current trade to be maintained and made more efficient with more electricity traded on a firm basis to better exploit differences in resource endowments across the region (b) the scope for reserve sharing and differences in seasonal peak loads between some countries [Greece and the rest of the region] to be exploited as the market develops and transmission constraints are eased.

### **Trading models**

There are various potential power trading mechanisms to effect regional integration that could be implemented in SEE including: trade between national utilities (for the purposes of this framework termed *national trade*), competition for the non-household market, full wholesale competition, retail competition.

National trade would typically take place between national utilities under contracts (short or long term) stipulating prices and quantities of power to be traded (or circumstances where power would be traded, for example, in an emergency situation, or in a wet year); this is the current model for trade in SEE.

Under competition for the non-household market, large customers are able to contract power directly with generators or traders. Under full wholesale competition, distribution companies cease to be captive customers of national generators, and instead are allowed to shop around for power. These types of competition may be implemented through bilateral contracts between utilities and eligible customers or through day ahead spot markets ("power pools"), or both.

Under retail competition, residential consumers are free to choose their power supplier. Liberalization of the residential market should incentivize power suppliers to improve performance, reducing costs and offering power at lower prices. Introduction of retail competition is expensive in terms of metering and software requirements, and institutionally taxing. It typically takes place at the end of a power sector reform process, if at all. In the

<sup>3</sup> Greece is a net importer throughout the year, with most imports occurring in summer (around 800 GWh in summer 2002).

<sup>4</sup> Taken from *Standard Market Design of the SEEREM*, Council of European Energy Regulators (CEER), 2003.

case of SEE, retail competition is a long way off, and is not considered further in this framework.

The institutional requirements differ for national trade and competition for non-households/full competition. To realize the potential economic gains, energy markets should be liberalized by moving from national trade to non-household competition and later to full wholesale competition. This liberalization should be accompanied by tariff reform, improvement in payments discipline, regulatory reform, industry restructuring and the introduction of various trading mechanisms.

More specifically, in order to support national competition, effective tariffs (tariffs and payments) should provide sufficient cash flow to cover costs. To the extent that affordability is a problem at cost recovery tariffs, a social safety net should be in place to protect vulnerable groups in society.

In order to move to non-household competition, at a minimum, power industries should have been restructured, with unbundling of different functions (generation, transmission, distribution), and the development of an independent regulatory framework. In order that the introduction of non-household competition is not disruptive for the part of the market not opened to competition, tariffs should be rebalanced and major payments problems resolved prior to liberalization.

For full wholesale market competition, payments by users to distributors and other suppliers must be made fully and promptly, so that companies have sufficient cash income to meet their payment obligations in the competitive part of the market. In addition, a mechanism for protecting residential consumers from rapid upward price swings should be in place prior to liberalization of this part of the market.

Regarding the market mechanisms for non household competition, it is most straightforward to proceed with the introduction of competition based on bilateral contracts, with subsequent introduction of a complimentary day ahead spot market as institutional and technical capacity is strengthened.

Institutional arrangement for different phases of competition are discussed more in Annex 2.

If the institutional framework is in place, then moving from national trade to non-household and full wholesale competition should result in improved governance, yielding economic benefits in the form of lower prices for a given level of system security. The Bank supports moving in a phased manner from the current system of national trade to one of full wholesale competition.

### **The Athens Memorandum**

In recognition of potential gains from increased energy trade, and as part of a wider movement to deeper regional integration within the region, and between the region and the EU, the governments of Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Macedonia, Greece, Kosovo, Romania, Turkey, and Serbia and Montenegro signed the "Athens Memorandum – 2002" whereby they agreed to develop a South East Europe Regional Electricity Market (SEEREM).

Under the Athens Memorandum, participating countries have committed to undertake the following steps:

#### **Policy**

- Energy strategy to be adopted.

#### **Effective tariffs and affordability**

- Power tariffs and payments discipline to be such that effective tariffs cover costs.
- Social safety net for the power sector to be in place.

#### **Regulation**

- Independent regulator to be set up.
- Grid codes to be adopted and implemented.
- Transmission tariff methodologies to be adopted

#### **Industry commercialization and restructuring**

- Increased utility transparency to be achieved through application of International Accounting Standards (IAS) and best practice on corruption abatement as advised by a reputable international body to be adopted.
- Transmission system operator to be set up. This entity should be independent at least in terms of its legal form, organization and decision making from other activities not relating to transmission.
- Distribution system operator(s) to be set up. This entity should be independent at least in terms of its legal form, organization and decision making from other activities not relating to distribution.

**Market development**

- Information exchange between national dispatch centers to commence, moving to teleinformation exchange amongst dispatch centers.
- Commercial codes to be developed
- Open network access and liberalization of the market for non-household consumers to take place in a phased manner from 2005.

**Environmental**

- To adopt EU environmental standards.

Regarding inter-regional trade, the Memorandum states that the energy market in SEE will eventually be integrated into the European Union’s internal energy market.

Though trade with other regions is not mentioned, there is scope for significant economic benefit trading power between SEE and Eastern Europe (Russia and Ukraine via Moldova); significant technical barriers remain to be overcome before such trade can take place (e.g. investments to allow asynchronous operation, or to synchronize operation, of systems in SEE and Eastern Europe).

The 2003 revision of the Athens Memorandum also includes provisions relating to gas market development. Requirements for the gas sector largely mirror those for the power sector and include: setting up of an independent gas regulator; unbundling of different gas industry functions with legal; separation of transmission and distribution from other industry functions; open access to networks and storage facilities; to open the gas market in a phased manner from 2005, defining eligible customers at that time to include power generators, and such that 20% of the market is liberalized. separate ownership of transmission, distribution. For countries in SEE where gas penetration is currently less than 10%, a gas expansion plan to raise use of gas above this threshold before 2010 must be adopted and implemented.

The Athens Memorandum sets up the following institutions:

- A Ministerial Council to provide strategic guidance and endorse proposals. The Ministerial Council will meet annually.
- A Permanent High Level Group of Energy Ministers’ representatives, to prepare the Ministerial Council and ensure follow up of its decisions.
- The South East Europe Energy Regulation Forum (The Athens Forum) comprising representatives of the EC,

Governments, Regulators, Transmission System Operators, the Council of European Energy Regulators, the European Transmission System Operators, UCTE, electricity companies, donor countries, and consumers. The Athens Forum will meet at least twice yearly.

The Bank is currently working with the EC, donors (primarily Canada and the United States), and other lending institutions (the EBRD, EIB, KfW) to support development of the SEEREM; respective roles of these institutions are elaborated in section *Donors and other IFIs* below.

**3. ISSUES FOR DEVELOPMENT OF A SEEREM AS ENVISAGED UNDER THE ATHENS MEMORANDUM**

This section assesses progress and outstanding challenges related to the Athens Memorandum and SEEREM development. Some of the issues covered relate directly to the Athens Memorandum, for example, market design under the Athens Memorandum, and compliance with Athens Memorandum milestones for power sector reform.

Other issues covered may not be mentioned in the Memorandum, but are of crucial importance if a regional energy market is to be developed. For example, though the Memorandum does not cover power sector investment, generation capacity is a key issue in market design, whilst transmission capacity is a key issue as regards trade.

Whilst heat is not mentioned in the Memorandum, this sector could potentially impact on both power and gas market development given opportunities for switching away from use of power for heating.

Gas is mentioned in the Memorandum, though the focus is more on the institutional side, with an implicit assumption that increased gasification of the region would be economically beneficial. This framework takes a different approach, trying to assess in section *Gas sector* the extent to which gasification is desirable, before moving to a consideration of institutional aspects in the Memorandum.

Section *The environment* focuses on the requirement under the Memorandum to move to EU environmental standards, and attempts to provide a rough estimate of compliance costs for environmental upgrade related to sulfur and nitrogen emissions.

Finally, though the coal sector is not mentioned in the Memorandum, both power and gas market development could have large impacts for coal industries in the region; these should be well understood if they are not to derail reforms under the Athens Memorandum, and are discussed in section *The coal industry*.

## **Power sector**

### **Market design under the Athens Memorandum**

There has been limited progress in developing market institutions in SEE, except in Romania, where a market operator has been set up and the market partially liberalized. Trading takes place through tenders which may be both non transparent and time consuming, with little in the way of secondary markets (for trading contracted power); this provides scope for improvement as regards the efficiency of trade.

The detailed language in the Memorandum talks of establishing compatible national electricity market models to create institutions for the operation of an integrated electricity market in SEE.

In terms of trading models, the Athens Memorandum is not specific. It would seem to be consistent with liberalization of the non-household market and full wholesale competition. The ambiguity here comes from the fact that eligible customers are not defined in the Memorandum. Neither does the Memorandum specify whether markets will be based on contracts and/or day ahead trading.

Following this, a market design for non-household/full wholesale competition was proposed by the Council of European Regulators (CEER) and accepted in principal by the Athens Forum in October 2003. The main features of this proposed design are a contracts based market with day ahead trading administered by a regional market operator and simple (non market) arrangements for balancing. An interim regulated tariff for residential consumers would protect this customer category from upward price swings following liberalization. The design includes the possibility of capacity obligations for large consumers.

The CEER proposal envisages moving from non-household to full wholesale competition over a number of years. It does not specify the timeframe for

introduction of day ahead trading *vis a vis* contracting based on bilateral contracts, thus it is not clear whether a phased approach is advocated in this respect.

Given the wide divergence in reform starting conditions amongst SEE countries and the reform progress that has been made (discussed below), one key issue going forward may be whether/the extent to which a country failing to meet national level requirements will be able to participate in the regional market. The assumption in this framework paper is that countries will meet requirements under the Athens Memorandum. Should this assumption not hold, revised minimum criteria for participation will be required.

Additional outstanding issues related to market design include:

- Design of the contracts market (standard contracts, commercial code, market surveillance, etc.)
- The relationship between national and regional market operators
- The timing of the introduction of the day ahead market *vis a vis* the contracts market
- Detailed design of the day ahead market, particularly whether this will be voluntary or mandatory, and the level of complexity in the bidding process
- the interrelationship between contracts and day ahead markets *vis a vis* congestion management
- Functioning of the balancing market, particularly as regards determination of balancing prices
- Capacity obligations for customers, given large investment requirements in the region/sector
- The scope of interim regulatory protection (which customers will be eligible, and for how long)

### ***Institutional capacity for support of a regional power market: Athens Memorandum benchmarking and challenges***

This subsection discusses reform progress in SEEREM countries against benchmarks laid out in the Athens Memorandum: effective tariffs and affordability; regulation; industry restructuring. Reform progress in these areas is summarized in Table 2, and discussed in more detail in Annex 2.

Table 2 shows the considerable variation across SEE in meeting the benchmarks so far. The benchmarks most widely addressed (by 7, 8 or 9 of the countries) are

payments problems, tariff balancing and effective tariff at cost recovery. The benchmarks least addressed (by only 1 or two countries) are transmission tariff methodology, secondary regulations, and unbundling of the power supply industry. Six of the countries have addressed social safety nets and put a regulator in place. On a country basis, Romania leads with action on all eight benchmarks, followed by Turkey (7), Bulgaria (6) and Croatia (5). The remainder have addressed between two and four benchmarks.

**Table 2. Reform progress against Athens memorandum benchmarks**

	For national competition			For non-household competition				
	Effective tariff at cost recovery	Social safety net	Transmission tariff methodology and grid code	Tariffs balanced	Payments problems	Industry unbundled	Regulator in place	Secondary regulations
Albania	No	Yes	No	No	Yes	No	Yes	No
Bosnia	Yes	Yes	No	Yes	Yes	No	No	No
Bulgaria	Yes	Yes	No	Yes	Yes	Yes	Yes	No
Croatia	Yes	Yes	No	Yes	Yes	No	Yes	No
Kosovo	No	No	No	Yes	Yes	No	No	No
Macedonia	Yes	No	No	Yes	Yes	No	Yes	No
Montenegro	Yes	No	No	Yes	Yes	No	Yes	No
Romania	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Serbia	Yes	Yes	No	Yes	Yes	No	No	No
Turkey	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes

### Benchmarks for national competition

#### Effective tariffs and affordability

- The end 2002 average SEE tariff across customer categories was 3.5 cents/kWh. This is typically enough to cover cash operating costs at current levels of receivables and to support national trade, given

the underlying costs in the region. The exception here is Kosovo, where the average tariff was 2.7 cents/kWh at the end of 2002. In Albania and Serbia, recent tariff increases brought these countries above the 3.5 cents threshold.

- Affordability is a problem for poor groups in all countries and will become so increasingly as tariffs increase. All countries in SEE have in place a social safety net with the exceptions Macedonia, Montenegro and Turkey. The safety net typically takes the form of a block tariff which provides power to cover basic needs at a discounted rate, with additional consumption charged at higher rate. This is an appropriate interim solution to the affordability problem before targeted subsidy schemes can be effectively introduced.

#### Regulation

- Transmission and distribution tariff methodologies have been adopted in Bulgaria, Romania and Turkey. The transmission system operators in the region will together propose a transmission tariff methodology to support trade in the SEEREM taking into account network constraints and the possibility of transmission congestion. This will have to balance the need to provide correct signals for trade with the need to finance investments; these two objectives may be – but are not always – mutually consistent. Regarding technical secondary legislation, Romania and Turkey are the only countries in the region to have adopted a grid code.

#### Benchmarks for non-household competition

##### Effective tariffs and affordability

- Cross subsidy between industrial and residential customers is only a problem in Albania; elsewhere in SEE residential tariffs exceed industrial tariffs. Residential to industrial tariff ratios are relatively low in Bosnia, Bulgaria, Croatia, Romania and Turkey. Residential tariff increases might be expected as these countries adopt full wholesale competition.
- In all countries with the possible exceptions of Croatia and Turkey there will be a need to increase tariffs as investments are undertaken. Though these investments, and associated tariff increases, would also have to take place in the absence of the SEEREM – probably more so given that the SEEREM should

bring efficiency gains – there is a risk that they will be associated (e.g. by politicians, media, consumers) with market development, unless public perception is conditioned by a major improvement in supply quality and customer service standards.

- Payments discipline is a problem in SEE and this is potentially disruptive as regards market liberalization. Average collections relative to billings in the region are 85%, whilst average distribution losses are 22%, at least half of which is theft from the system. Barter is a problem in Montenegro, Republika Srpska, Romania and Turkey.

### **Regulation**

- Independent regulators are in place in Albania, Bulgaria, Croatia, Romania and Turkey. Legislation for enabling setting up of independent regulators has been adopted in Bosnia, Macedonia and Montenegro, and legislation has been drafted and sent to parliament in Serbia.

### **Industry commercialization and restructuring**

- Power utility restructuring has progressed in Bulgaria and Romania where there has been vertical unbundling (i.e. separation of generation, transmission and distribution). In other countries, vertical unbundling remains a major challenge for SEEREM development. There has been some horizontal unbundling within thermal generation (i.e. splitting generation into a number of potentially competing companies) in Bulgaria, but not in other SEE countries; this remains a challenge if a sufficient number of generators to sustain competition are to be created. Regarding transparency, utilities in the region typically do not provide accounts to IAS with unqualified audit; qualifications here range from valuation issues relating to assets, receivables/payables, costs, and provisioning.
- Private sector interest in the region has diminished as strategic investors have suffered in emerging markets. Though some interest remains, with the sale of distribution companies in Romania moving forward, it may be the case that other means of introducing the private sector should be considered for an interim period. The obvious choice here is for private participation under incentive based management contracts, something that – when properly designed – can be particularly beneficial where payments discipline is a problem.

### **Over view of market design and institutional capacity**

The conditions are currently not in place to support liberalization of the non-household market. Reforms are underway, however, that would support the introduction of competition for some large customers. In particular, it would seem feasible that most SEEREM countries establish an independent regulator by 2004, and unbundled utilities by 2005. With progress during this period in improving collections, opening of the non-household market in a phased manner on the basis of bilateral contracts (i.e. not on the basis of a regional day ahead market) would seem to be a reasonable target.

### **Technical capacity to support power trade**

From a technical point of view, there are pre-requisites to support each of the stages of competition (national, non household, etc.). In order to support national competition, it is necessary that either there are capacity surpluses in some countries and deficits in others, or different types of capacity (thermal, hydro) in different countries, or both.

From a transmission point of view, and for all trade models, it is necessary that systems operate synchronously and in parallel, and that there is adequate transmission capacity (as regards level and reliability), both within and between countries.

For non household competition, in addition to the above technical requirements, it is necessary that there is capacity balance at the regional level; should this not be the case, then generators would not be subject to competitive pressure, and could exploit capacity shortages through manipulation of market prices.

From a metering point of view, non household competition requires that generators and large consumers have meters that are able to record both quantity supplied/consumed by period (peak and off peak). More sophisticated trading models (e.g. day ahead trading in a power pool) requires more sophisticated metering, for example, to record hourly power supply by generators.

All trade models benefit from the introduction of tele-information systems in transmission, together with control mechanisms (SCADA). Both of these help to improve system reliability, and therefore support integrated system operation, reducing potential negative spillover effects between countries.

## Power generation

The technical conditions for national competition are currently fulfilled in SEE: there are capacity surpluses in some countries, and deficits in others, and different resources; these aspects are manifest in current trade flows (see section 2 above).

Regarding the technical conditions for non household competition (i.e. capacity balance), a preliminary assessment of the need for new generating capacity in the SEE was carried out for the Bank by the Electricity Coordinating Center (EKC) in Belgrade<sup>5</sup>. The EKC study focused on Albania, Bulgaria, Bosnia and Herzegovina, Croatia, Macedonia, Romania, Serbia (including Kosovo) and Montenegro. It used country level data obtained from utilities in the region on installed capacity, planned capacity additions, and demand, to estimate a regional supply-demand balance for the period to 2012.

The study found that currently the region has installed capacity of about 49.5 GW, comprising 55% thermal, 35% hydro, and 10% nuclear. Investment over the past 10-15 years has been limited, with the average age of capacity now in excess of thirty years, and some plant are over forty years old. Capacity availability is poor by international standards and reliability is declining. In poor hydrological years, parts of the region are unable to meet their energy needs, with resultant load shedding.

Looking forward, under a scenario of only 2% regional power demand growth, the EKC study suggests that 4.5 GW capacity addition together with 3-4 GW capacity rehabilitation up to 2012 will be required in order to provide power supply-demand balance in the region; this is notwithstanding possible capacity surpluses in some individual countries. The associated investment cost is of the order \$8 billion; this excludes costs related to environmental retrofit (see section *The coal industry* below).

## Power transmission

The transmission network in former Yugoslavia was designed to operate synchronously and in parallel with the UCTE network, i.e. to form part of the western European power grid. Links with the UCTE network were broken in the early 1990s, when substations in Bosnia and Herzegovina and Croatia were damaged.

Since that time, the networks of Serbia and Montenegro, Macedonia, Greece, part of Bosnia and Herzegovina, and subsequently Bulgaria and Romania, have operated synchronously and in parallel. Substation rehabilitation in Bosnia and Herzegovina and Croatia is required in order that the SEE region is reconnected to the UCTE network. Both projects are funded and reconnection is expected in 2004. Further substation rehabilitation/upgrade is required in the region for full compliance with UCTE standards, for example, in Albania, where large investments are required in the transmission network for improved reliability. In the case of Turkey, investments are required to support the move to synchronous operation with the rest of the SEE power system.

Transmission bottlenecks are likely to develop between countries in the region and between SEE and western/central Europe as power trade increases. Typically there is one line between neighboring countries within SEE, and links to the UCTE and CENTREL (comprising Hungary, Poland, Czech Republic and Slovakia [all of which are members of UCTE]) networks provide only limited transfer capability. Currently there are no interconnections between the following neighboring countries in SEE: Albania and Macedonia; Macedonia and Bulgaria; Greece and Turkey.

The Balkans Task Force, established in 1996 by the EC, considered nineteen possible transmission projects in the region; see Annex 3 for more details. Of the projects identified as priorities, most have now been implemented/are under implementation. Exceptions are interconnection projects linking Albania with the rest of the region (through Montenegro, Macedonia, Kosovo).

Clearly as regional trade increases, and given the limited existing links between SEE countries, and SEE with western Europe/CENTREL (where there may be capacity surpluses), new interconnections will be required; further analysis is required to identify which interconnections would yield economic benefits in a regional trading context.

Turning to metering at the high voltage level, SEEREM participant countries generally fulfill metering criteria, both for national and non household competition. Notwithstanding this, investments in more modern meters allowing more accurate and remote real time reading and disconnection would yield benefits, particularly as regards financial settlement and demand management through time of day pricing.

<sup>5</sup> Published as "Review of power demand and supply in South East Europe", Working Paper, World Bank: Washington, 2003.

Work on developing a tele-information network has been completed in Croatia and is underway in Bulgaria, Macedonia and Romania and Serbia. New investments in tele-information systems are required in Albania, Bosnia and Montenegro<sup>6</sup>. As regards control systems, though dispatch center upgrade has been implemented in most SEE countries, further work remains to be done in Albania and Croatia.

### Power distribution

To the extent that successful trading will require that power companies have adequate cash flows, and where payments discipline is currently poor, investments in metering of residential and commercial customers may be required. Experience from other transition economies suggests that re-metering is one necessary component of a successful program to improve payments discipline; see Annex 2 for discussion. Given payments problems in SEE, there are potential high return projects, and these would support upstream investments in generation and transmission.

### Heating

Energy intensity (measured as the ratio of energy consumption to output (GDP) in SEEREM countries is high by international standards. Together Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Romania, Serbia and Montenegro, Macedonia and Kosovo consume a total of around 90 million tones of oil equivalent (toe) of primary energy, or 5% of total primary energy consumption in Europe. Average energy intensity for these countries is nine times that of western Europe (at nominal exchange rates)<sup>7</sup>. Energy intensity for selected SEEREM countries, together with the EU, is presented in Table 3.

A large part of high energy intensity relates to inefficiency in the heating sector. District heating and/or gas penetration rates – potentially efficient sources of heat provision – are often low. Where district heating networks exist, these often function badly, with high network losses (of the order 30%-35%) and frequent supply interruptions. Power is used extensively for heating in all SEE countries except Romania.

**Table 3. Energy intensity of SEE countries, 2000<sup>8</sup>**

COUNTRY	ENERGY INTENSITY: TOE/CAPITA	ENERGY INTENSITY: TOE/000'S USD GDP
Albania	0.5	0.4
Bosnia	1.1	1.4
Bulgaria	2.3	1
Croatia	1.8	0.4
Romania	1.6	0.8
Serbia, Montenegro and Kosovo <sup>9</sup>	1.3	1
Macedonia	1.4	1.7
Turkey	1.1	0.4
European Union	3.9	0.2

Given that use of power for heating can be highly inefficient, particularly in densely populated areas and where alternative heating sources are potentially available, there may scope for reducing energy intensity through switching to lower cost forms of heating. More efficient heat provision would require performance improvement in district heating and/or deeper penetration of gas networks.

From the perspective of Athens Memorandum implementation, more efficient heat provision could help to mitigate some of the adverse affordability consequences that may be associated with the SEEREM. In addition, more efficient provision of heating would reduce peak power demand where power is currently used for heating. This would reduce investments needed in power generation, something that could be particularly important in the context of the SEEREM, where capacity requirements are likely to be substantial, available finance limited, and where a capacity deficit would undermine market functioning.

### Gas sector<sup>10</sup>

Gas in SEE is currently supplied by Gazprom, either directly, or indirectly through traders. The level of gasification in SEE is relatively low, with combined gas demand from Albania, Bosnia and Herzegovina, Macedonia, and Serbia of less than 1 bcm per year,

<sup>6</sup> Discussed in *Teleinformation system and ancillary services market development in SEE*, USAID, 2003

<sup>7</sup> Comparative statistics are taken from "Energy policy in South East Europe: developments and IEA contribution", IEA: Paris, 2003.

<sup>8</sup> Table derived from IEA data and *Transition Report 2001*, EBRD: London.

<sup>9</sup> IEA provides data for the Federal Republic of Serbia, including Montenegro and Kosovo.

<sup>10</sup> The basis for the first part of this section is a report "Cost of gas supply to Albania, Bosnia and Herzegovina, Macedonia and Serbia", provided by Economic Consulting Associates to the World Bank in August 2003.



though countries in the region are exploring scope for increased gasification through deeper penetration of gas distribution networks and possible gas fired district heating.

Increased gasification – justifying efforts towards industry institutional reform (see below) – would be supported through gas competition resulting in reduced gas prices. Scope for increased competition may exist given the increasing import capacity of Turkey for Russian and Caspian gas, over and above what is required to supply the Turkish domestic market.

Turkish import capacity from Russia increased when the Blue Stream pipeline, potentially shipping 8.8 bcm of gas annually, recently became operational. Regarding Caspian gas, the Governments of Azerbaijan, Georgia and Turkey have entered into agreements regarding a Shah Deniz pipeline which could ship 7 bcm of gas annually from the Caspian to Turkey starting in 2007.

It may be the case that Turkey is prepared to sell gas to SEE at a price below the current Gazprom price. This will depend on Turkish contractual obligations for off-take of Russian and Caspian gas, the price of Caspian gas at the Turkish border, costs of transporting gas across Turkey and SEE, and gas prices in western Europe.

In recognition of the potential for Turkish gas exports to SEE and into western Europe, a project to construct a new Greece – Turkey gas pipeline has been developed. In conjunction with the Greece-Turkey pipeline, Albania, Bosnia and Herzegovina, Macedonia, Greece, Serbia and Turkey signed an interconnection agreement in February 2003, whereby there was agreement to explore options for exporting gas from Turkey via Greece to the other signatory countries.

The Bank has commissioned a preliminary study to establish possible delivery prices of Caspian gas to SEE countries. The study suggests that based on current off take contract prices between Turkey and Azerbaijan, together with transport costs associated with new pipelines, Caspian gas would come in to SEE at around the current price charged by Gazprom<sup>11</sup>. Delivered gas prices could fall if off take prices in Turkey are

renegotiated; there would seem to be scope for this given that off take prices currently exceed costs of supply; these issues are discussed in more detail in Annex 4.

Increased gasification may be economically feasible at the current Gazprom price to the region, with deeper penetration in the residential heating sector particularly as power prices increase<sup>12</sup>. New gas fired generation may be able to compete with new coal fired generation under this scenario – more so depending on the value of carbon credits (see section *The environment* below) although it would be unlikely to be chosen ahead of coal fired generation rehabilitation. Thus gas-fired generation might be expected to increase in line with power demand to the extent that gas pipeline capacity would allow this.

Increased gasification based on deeper penetration in the residential sector will require financially viable gas distribution companies. In turn, this will require that retail gas prices cover costs. Data on retail gas prices in SEE is presented in Table 4. The average retail tariff for the region is around \$140/tcm; this is close to the current border price. Given that the retail price should cover the border price plus a margin for transportation and distribution costs, retail tariff increases are required in the region on average. The Table shows that significant price increases are required in Romania.

**Table 4. Retail gas prices in SEE<sup>13</sup>**

COUNTRY	RETAIL GAS PRICE/TCM
Bosnia & Herzegovina	\$277
Bulgaria	\$210
Croatia	\$155-199
Macedonia	\$172
Romania	\$83
Serbia <sup>14</sup>	\$160
Turkey	\$195

<sup>11</sup> The study also assessed the potential for imports of LNG to SEE and concluded that Caspian gas would be 20% cheaper than LNG from Algeria arriving at a terminal in the Mediterranean basin.

<sup>12</sup> Power prices are sufficiently high in Turkey to support increased residential gasification. The challenge here is to develop and implement a framework for gas distribution concessions.

<sup>13</sup> Data is for 2003 where possible, otherwise the most recent year available is used. Source: Regional study of regulatory reform and supply/demand for natural gas in the Baltics, Poland and South Eastern Europe, report by Economic Consulting Associates to the World Bank, February 2003.

<sup>14</sup> Serbia does not include Kosovo or Montenegro; there is no gas industry in these latter two.

Though we do not have a comprehensive data set relating to collections in the gas sector, this is a problem in a number of countries. Improvement in payments discipline towards industry financial viability will be required to support increased trade.

As regards the more general institutional framework, the Athens Memorandum stipulates requirements including the need to set up independent gas sector regulators, to legally unbundled different industry components (production, transportation/storage, distribution and supply), and to open markets in a phased manner from 2005.

Progress in gas sector institutional reform is summarized in Table 5. Bulgaria, Croatia, Romania and Turkey have each set up independent regulator and adopted a legal framework for market opening. The challenge here is to develop and implement secondary legislation to support market functioning (e.g. transmission tariff methodologies). In other SEE countries there is no legal framework for gas sector regulation and liberalization (excepting Macedonia). The challenge for these countries is to adopt legislation which would enable the establishment of an independent regulatory framework.

Legal unbundling of gas industries as required under the Athens Memorandum remains a challenge for all countries to a greater or lesser extent. Gas industry organization in the region is characterized by vertically integrated companies, sometimes also integrated with oil companies. Some progress has been made in Romania, and to a lesser extent in Croatia, though further separation in these countries (e.g. of trading from network companies) will be required.

### **The environment<sup>15</sup>**

Standards for environmental performance referred to in the Athens Memorandum are laid out in the EU's Large Combustion Plant (LCP) Directive (2001/80/EC). Though this does not currently apply in SEE, it provides a useful benchmark, particularly given aspirations of SEEREM countries for EU accession<sup>16</sup>, and proposals to consider introducing the Directive in the context of the SEEREM.

The LCP Directive specifies plant level limit values for sulfur dioxide (SO<sub>2</sub>) and nitrogen oxide (NO<sub>x</sub>) emissions according to (i) the fuel used (ii) the size of plant (iii) the date at which the plant came in to operation or underwent a major rehabilitation.

**Table 5. Gas sector reform in SEE**

<b>COUNTRY</b>	<b>INDUSTRY ORGANIZATION</b>	<b>LEGISLATION FOR REGULATION AND LIBERALIZATION</b>	<b>REGULATOR</b>
Albania	Integrated	No	No
Bosnia & Herzegovina	Integrated trader, transmission, supply company. Also a distribution company, another trader, and two small transmission cos.	No	No
Bulgaria	Integrated	Yes	Yes
Croatia	Separate transmission co.	Yes	Yes
Macedonia	Integrated	Yes	No
Romania	Integrated	Yes	Yes
Serbia	Integrated	No	No
Turkey	Integrated trader and transmission company, separate distribution companies.	Yes	Yes

<sup>15</sup> The discussion in this section is based on a consultancy report "Environmental regulation and energy use in South Eastern Europe" carried out for the Bank in the context of the energy trade framework.

<sup>16</sup> An alternative benchmark would be the United Nations European Economic Cooperation (UNECE) protocols signed under the Convention on Long Range Transport of Air Pollution (LRTAP). These protocols set standards for sulfur dioxide and nitrogen dioxide emissions. These protocols are not legally binding for SEEREM countries, though there is pressure for their compliance from the international community. Standards in the protocols are broadly in line with those of the EU LCP Directive.

The LCP Directive distinguishes between *existing plant*, that is, plant which came into operation before July 1987, and *new plant*, coming into operation after July 1987. Under these definitions, all plant in SEEREM countries can be regarded as existing plant.

Limits for existing plant are more relaxed than those for new plant. There is however provision in the LCP Directive requiring that these are equalized by 2008, in other words, that environmental performance of existing plant should conform with limits for new plant from this time. Given that little or none of the plant in SEE currently complies with limits under the LCP Directive, environmental investments would be required if the Directive were to be introduced.<sup>17</sup>

For large plants in SEE there are two alternatives for compliance with LCP Directive limits on SO<sub>2</sub> emissions. Flue gas desulphurization using dry scrubbers is appropriate for countries where coal has a low sulfur content. In SEE, use of this technology would be feasible in Serbia and Montenegro and Macedonia. The cost of introducing dry scrubbers is of the order \$160-220 per kW for lignite-fired plant<sup>18</sup>. Where coal has a higher sulfur content, wet scrubbers are required, at a cost in the order \$190-320 per kW. For NO<sub>x</sub> compliance, new burners can be installed to existing plant at a cost of around \$10-20 per kW. Applying these costs to installed thermal capacity of 27,000 MW provides a minimum compliance cost in the order \$5 billion.

This suggests that a requirement for compliance with EU environmental standards would impose a major financing burden on SEE countries. Further work is required in order to establish costs of environmental performance improvement, with a view to defining appropriate standards for these region (be these prevailing national standards, or EU standards, or somewhere between). A subsequent challenge would be to find funding for environmental investments.

Focusing on rehabilitation, rather than environmental retrofit of existing plant, there is a question over whether coal fired rehabilitation would be preferred to new gas fired plant taking into account additional environmental costs. It is likely, based on generation studies for countries in the region, that coal fired rehabilitations

including environmental upgrades would still be preferred ahead of gas fired plant for base, and possibly mid merit capacity, for gas prices in the range as discussed in section Gas sector above; should this not be the case, funding for stranded costs related to environmental standards would be required.

In addition to legislation for SO<sub>2</sub> and NO<sub>x</sub> emission reduction, the legal framework could be strengthened in SEE as regards carbon emissions and power generation based on renewable energy. Assuming that SEEREM countries sign the Kyoto protocol, related mechanisms (e.g. carbon credits) or carbon taxes (these would not require ratification of Kyoto) could impact on the economics of coal fired power plant, though again, this would more likely be important for new rather than rehabilitated plant. In addition to carbon credits/taxes, legislation to support renewable energy investments (e.g. network access for small generators, and arrangements for sale/purchase of power from renewable sources) would encourage emission reduction.

### **The coal industry<sup>19</sup>**

The demand for coal from power generation is unlikely to change much whilst current plant continues to operate. As noted in section Gas sector above, the gas price is unlikely to fall to a level where gas fired plant will displace existing coal fired plant.

As power demand grows, however, gas fired plant may be added rather than coal fired plant, particularly when environmental aspects are taken into account (as discussed in section *The environment*). Should this happen, potential for increased regional coal demand will not be unlocked.

In addition, and as existing plant is retired, location decisions for new coal fired plant will be influenced by relative coal prices in the region; coal fired power generation investment in a country with a relatively high coal price will be unattractive. Thus for a given regional total coal demand, relative demand across countries in SEE may change.

<sup>17</sup> This point applies notwithstanding derogations which allow plant running for less than 2000 hours per year is allowed to continue operating until 2015, because most plant runs for more than 2000 hours.

<sup>18</sup> Most of the coal used for power generation in SEE is lignite, see section The coal industry.

<sup>19</sup> The discussion in this section is a consultancy report "Coal industry restructuring in SEE" carried out for the Bank in the context of the energy trade framework. The report reviews more detailed work carried out on a country by country basis.

The magnitude of these effects would probably depend on the power trading model, with limited effects in a context of trade between national utilities, and more pronounced effects in a fully liberalized market<sup>20</sup>. Given that there is scope for significant coal industry performance improvement in SEE, restructuring should take place before full power market opening in order to mitigate potential problems associated with falling demand and related stranded costs.

Presently, the largest coal industries in the region are in Bulgaria, Serbia and Romania. The coal production in each of these countries is around 30 million tons per year. Kosovo as well as Bosnia and Herzegovina presently produce below 10 million tons per year, though Kosovo holds the largest reserves of low-cost lignite in the region. In all of the large SEE coal producing countries, operating costs are significantly above international benchmarks.

A large part of coal sector inefficiency in SEE reflects the need for labor restructuring, either because mines are non viable/marginal or due to overstaffing in potentially viable mines given current output levels.

Current staffing levels for the major producers in SEE, together with estimates of labor that would be required in viable industries, are presented in table 6. The table shows that there is a need to shed around 100,000 coal miners in the region if industry financial viability is to be achieved.

**Table 6. Current and future employment in the coal industry**

COUNTRY	CURRENT EMPLOYMENT	LABOR FORCE IN VIABLE INDUSTRY	REQUIRED LABOR FORCE REDUCTION (%)
Bosnia & Herzegovina	15,000	3,000	80
Bulgaria	40,000	5,000	80
Romania	40,000	7,000	83
Serbia	25,000	8,000	68

## 4. WORLD BANK SUPPORT

### Areas for IFI support of SEEREM development

This section summarizes key issues for successful implementation of the Athens Memorandum, and areas where the IFIs and donors can support development of energy trade in SEE.

In order to provide strategic vision, and given the importance of reform sequencing, power sector challenges are presented for each stage in the development of regional trade, as would be consistent with a phased approach to market opening; near term challenges are the consolidation of benefits through national trading, and the development of an institutional framework for non-household competition.

Regarding other sectors, in heat the near term priority is to improve sector performance, through developing an institutional framework to support investment. In gas, the near term priority is to elaborate the economics of increased gas trade in the region. Regarding the environment, further work is required to understand compliance costs related to EU environmental standards. In the coal sector, restructuring is desirable before full market opening.

More specifically, challenges in the power, heat, and gas sectors, environment performance, and the coal sector in SEE are:

#### Power sector

##### Stage 1: national trade

- To increase tariffs and payments to cost recovery levels
- To develop a social safety net for support of the poor in the face of tariff increases
- To develop cost reflective transmission tariff methodologies and mutually consistent grid codes
- To increase efficiency of existing power trade.

##### Stage 2: non-household competition

- To increase effective tariffs to cost recovery levels for each category of consumers.
- To develop an independent regulatory framework including distribution tariff methodologies.

<sup>20</sup> Potential effects will be elaborated as part of the Bank's GIS.

- To set up market operators/arrangements for market surveillance
- To identify regional investment priorities through completion of a generation investment study and related modeling of the transmission network to identify bottlenecks.
- To develop a capacity support mechanism ensuring that finance for necessary investments is secured.
- To develop a framework for financing of new transmission interconnections.
- To undertake new and rehabilitation investment ensuring that regional energy balance is maintained and environmental performance improved and network losses reduced.

**Stage 3: trade with other regions**

- For trade with the EU, same benchmarks as for non-household market liberalization above.
- For trade with eastern Europe, technical solution to problem of (current) asynchronous system operation.
- For trade with EU and eastern Europe, development of stranded cost resolution mechanisms.

**Stage 4: day ahead and balancing trade**

- Establishment of a regional market operator, or arrangements for integration of national market operators.
- Elaboration of detailed day ahead and balancing market design.

**Stage 5: full competition**

- To develop a mechanism for protecting consumers from upward price swings and periods of sustained high prices.

**Heating**

- To commercialize district heating companies.
- To strengthen the regulatory framework for district heating.
- To undertake feasibility studies of district heating rehabilitation and energy efficiency projects.

**Gas sector**

- To assess economic and technical viability of new gas pipelines/alternative gas supplies (e.g. LNG) and distribution projects and gas fired power plant.

- To reform gas tariffs towards cost recovery and improve payments discipline.
- To develop a regulatory framework which would support industry viability and trade.
- To unbundle vertically integrated gas industries.
- To sign contracts and implement economically viable pipeline and distribution projects.

**Environment**

- To estimate costs associated with improving environmental performance.
- Taking into account compliance costs, to develop a legislative framework for improved environmental performance.
- To secure funding for environmental investments.

**Coal industry**

- To develop social programs for labor restructuring.
- To separate viable from non viable mines.
- To commercialize viable mines.

**Donors and other IFIs**

Donors active in SEEREM development include United States and Canadian bilaterals, together with the European Agency for Reconstruction (EAR). The United States is focusing on supporting regulatory development and power industry restructuring, whilst the Canadians are focusing on supporting development of market institutions and rules. The EAR is supporting regulatory development in selected countries. Annex 8 contains a matrix of current donor support for SEEREM development.

The EBRD, KfW and EIB are currently active in financing power generation, transmission and distribution projects in SEE. For example, EBRD and KfW are developing a project for finance of an IPP in Bulgaria (Maritsa East 1), whilst EBRD and MIGA have worked together on another Bulgarian IPP project (Marisa East 3). EBRD and EIB have agreed to finance transmission network upgrade in Serbia. In Bosnia, the EBRD is working with the Bank to support transmission network rehabilitation. In Albania, EBRD, EIB and the Bank are financing transmission and distribution investment, and are developing a power generation project.

The EBRD has proposed that a regional contract exchange be developed. Utilities would be able to buy and sell power at the exchange (i.e. contracts would be physical rather than financial), both from/to each other and intermediaries. Participants would post offers to buy/sell power and enter into potentially tradable contracts. The proposal is that SEE trading would be encompassed in an existing exchange (e.g. the Dutch trading house ENDEX).

A well functioning exchange would increase efficiency of existing national trade by increasing transparency/competition *vis a vis* auctions of power, reducing transaction costs, and increasing flexibility.

Outstanding issues relating to this proposal include: commitment of SEEREM countries to the contract exchange concept; arrangements for market surveillance (physical delivery of power and financial settlement); the relationship between the proposed contract exchange and the regional market operator proposed by CEER.

### **The Bank's Contribution**

The Bank will draw on its full range of instruments to provide policy support and investment finance through loans and guarantees to support development of SEE energy trade. Policy support and investment finance are now discussed in more detail. Clearly the intention is that these two will be complimentary.

### **Policy support**

The Bank's policy support work will focus on the power sector. The approach will overlap with the Bank's existing country based work, where the wider objectives are for improved power supply to support growth, and reduction of the fiscal burden related to the power sector.

The Bank's policy support work in the power sector will be based around helping countries to move in a phased manner towards liberalization of the non-household power market. Key areas of focus will be effective tariff reform (i.e. tariffs and payments discipline), social safety net reform, industry commercialization, regulatory development, and market design. The Bank is already active in these areas through its policy support work with individual countries.

Going forward, the Bank will work with countries to design reform programs taking account of the regional perspective, assessing proposed reforms against benchmarks set out in the Athens Memorandum. The Bank will also benchmark countries in SEE against each other in order to determine what is feasible in the regional context, and will work actively with donors to this end.

Based on its current assessment of reform progress relative to Athens Memorandum milestones, summarized in Table 2 above, and priorities as regards appropriate sequencing of reforms for phased liberalization, summarized in section *Trading models* above and elaborated in Annex 2, the Bank will focus on the following:

- In Albania, on tariff reform, improvement of payments discipline, and strengthening of the social safety net.
- In Bosnia, on payments discipline, industry restructuring, regulatory strengthening, and strengthening of the social safety net.
- In Croatia, on industry restructuring
- In Macedonia, on payments discipline and energy strategy
- Montenegro, on improvement of payments discipline, industry restructuring and regulatory development
- In Romania, on power market development
- In Serbia, on energy legislation, regulatory strengthening, power industry restructuring
- In Turkey, on power market development.

The intention is that at a minimum, all SEEREM countries establish independent regulators by the end of 2004, and unbundled power utilities by the end of 2005; this would provide the basis for phased opening of the non-household market from the end of 2005 onwards.

On the trading mechanism, the Bank will work with the EBRD to ensure that any contract exchange is consistent with proposed market design for the region. On market design, the Bank will actively participate in discussion on this issue through the Athens Forum. The Bank will focus on protection of residential consumers in the market, incentives for investment, and the relationship between national and regional market operators.

In the heat sector, the Bank will engage in policy dialogue with client countries in the context of investment projects. The bank will support tariff and regulatory reform, and accompanying measures *vis a vis*

the social safety net, together with commercialization of district heating companies.

In the gas sector, the Bank will focus on price reform in Romania; this is currently a key issue given the size of the gas industry in Romania, large price distortions, fiscal considerations and the need for investment. In Bulgaria, the Bank will support the Government’s objective to increase gasification through supporting design of residential gas concessions.

The Bank will broaden its scope of work to support institutional development of the gas industry as required for all participant countries under the Athens Memorandum as the economics of increased gasification in SEE become clearer.

In the coal sector, policy support will focus on design and implementation of social programs in the context of industry restructuring. More specifically, the Bank will continue to support coal industry restructuring in Bosnia, Romania and Serbia.

### Investments/finance/guarantees

#### Power

The Bank’s finance of investment/co-finance with other IFIs to support regional trade in energy will depend on:

- The extent of institutional development
- The level of trade
- The level of investment required

As a first step, the Bank will develop a dedicated facility – termed an *Adaptable Programmatic Loan (APL)* – for finance of investments to support power trade.

In order to qualify for financing under the facility, countries will have to fulfill certain criteria relating to regulatory reform and industry restructuring, to be drawn from the Athens Memorandum and related legal agreements.

Subject to fulfillment of criteria, countries would be able to apply for Bank financing of projects in the following areas: dispatch system upgrades, transmission capacity, protective relays, substations, transmission/distribution metering, communication systems, governor upgrades on power stations<sup>21</sup>.

As discussed above, large investments are required to support SEEREM development, and the APL would be highly beneficial in this context. In linking qualification for finance under the facility to reform benchmarks the APL would support development of an institutional framework to support regional trade.

The Bank will consider developing a second phase APL to finance generation investments that support the regional market. In order to proceed with this, at a minimum, the Bank would require that an institutional framework for national trade is in place, and that there is sufficient traded volume to make economically viable export oriented generation projects.

The Bank together with the EC will complete a generation investment study together with related transmission modeling, and elaborate a program of investments to support development of economically beneficial regional power trade. In addition, the Bank will undertake a complementary study to assess the cost of improving environmental performance in power generation.

For generation and transmission investments, the following considerations will be important:

#### Generation investments

If generation investments are required in the medium term, it is unlikely that these would be delivered on a *pure market* basis given the limited extent of the market currently, and the market risks involved.

A capacity support mechanism to secure required investments would involve off-take agreements between generation and transmission/distribution companies. Typically commercial finance is not available for transmission companies/projects where the risk is primarily related to transmission companies, or for state owned distribution companies/projects where risk is primarily related to state owned distribution companies. Then there would be a potential role for the Bank in financing generation projects subject transmission/distribution company risk.

In order to ensure competitiveness of plant in a regional context, the Bank would consider financing public projects and public-private partnerships. Criteria for Bank Group finance would include:

<sup>21</sup> Country/regional World Bank finance ceilings would apply to the APL.

- (i) consistency with the least cost expansion plan for the region.
- (ii) adequate commercial finance unavailable
- (iii) (for private projects) sponsors selected through tendering procedure
- (iv) plant compliant with the EU Large Combustion Plant Directive
- (v) off take contracts consistent with EU competition guidelines.

Two financing instruments would be appropriate:

- (i) political risk carve out through partial guarantees of payments to project companies under off take contracts (possibly provided by MIGA)
- (ii) lending to project companies (possibly provided by IFC)

In both cases (private or state owned sponsors) provision would be made in project structures for lifting of guarantees (or, alternatively, offering rolling guarantees)/refinancing of sovereign guaranteed debt, to be triggered by specified events related to sector reform (e.g. transmission company commercialization and credit rating improvement, generation privatization, entry in generation).

### **Transmission investments**

Transmission interconnection investments are typically not suited to a project finance structure; it is difficult to capture all project benefits in cash flows. In these circumstances, economically desirable interconnection projects may require corporate financing in order to proceed. The relevant corporate entity here is usually the national transmission company.

In the case of the SEEREM, new interconnections are highly unlikely to be forthcoming on a project finance basis in the medium term because the market rules are not yet developed or tested, thus the potential security for this type of structure is currently not adequate. As regards corporate finance of transmission companies, and as noted above, this is typically not available in SEE on a commercial basis.

If economic benefits of additional interconnection are to be unlocked, facilitating power transmission from surplus to deficit regions, this would probably require IFI participation, through sovereign guaranteed lending to transmission companies on both sides of trading.

### **Power distribution**

Distribution projects may be financed by the private sector/on a commercial basis in some SEE countries (e.g. Bulgaria and Romania), depending on how planned privatization proceeds. In these circumstances, the Bank would offer to guarantee projects.

In countries which are not yet ready to sell assets, or where private interest to buy assets might be limited, and where network losses are high, then potential high return projects would probably require sovereign finance, given lack of creditworthiness of distribution companies (related to poor payments discipline/inadequate tariffs).

The optimal project structure in these circumstances would involve sovereign guaranteed lending to distribution companies with private participation under management contracts to strengthen incentives and for institution building in distribution companies. The Bank will consider finance of distribution projects, both under and outside the APL facility.

Recognizing the importance of power distribution investment in the context of the SEEREM, the Bank will seek together with other IFIs to set up a donor financed fund for a regional distribution study and development of distribution projects.

### **Heating**

The Bank will focus on high return investments in district heating, considering generation projects where there is a capacity deficit, network rehabilitations, and end user energy efficiency improvements, including metering and control projects.

### **Gas**

The Bank will seek to undertake/participate in a regional gas study, and to launch individual feasibility studies for deeper penetration in gas distribution networks, *inter alia*, in Bulgaria and Turkey.

Subject to the results of the feasibility study, the Bank will consider developing a Gas APL to finance construction of gas pipelines (e.g. the Greece – Turkey pipeline or offshoots) and gas distribution networks depending on the economics of increased gasification. Where the private sector is involved, the Bank would offer guarantees to private investors. For public sector projects, the Bank would offer debt finance and guarantees.



## ANNEX 1. BASIC ECONOMICS OF POWER TRADE

Power system operators can use interconnections between neighboring countries to trade reserve capacity, and energy on a short term or long term basis. This section describes the range of models for trading electricity on regional interconnections.

### Trading reserve energy

One advantage of trading electricity is that acceptable power supply reliability can be achieved with a lower capacity reserve margin in interconnected networks than if the networks operated independently. Another advantage is that the size of generating units in an interconnected system can be larger, while still meeting system reliability standards; this can produce considerable economies of scale.

There are three reserve capacity services that are typically contracted for:

- emergency energy to be supplied at cost for a limited period (often 6 hours);
- scheduled outages to be covered by supply from another utility; and
- a proportion of spinning (immediately available) reserve.

### Short/long term energy trade

Short term energy trade – sometimes called *economy*, or *non firm* trade – allows countries to change dispatch patterns on an opportunistic basis. It may take place when a power utility facing a given short run marginal cost (SRMC) can purchase from a utility with a lower SRMC (e.g. resulting from an excess of hydro power in a wet year) after allowing for transmission costs.

Long term trade (sometimes called *firm* trade) may occur where systems have different fuel costs or capacity mixes. Whereas decisions about economy trade are made on the basis of SRMC, decisions about firm trade are typically made on the basis of long run marginal cost (LRMC [SRMC plus capital cost]), and potentially impact both dispatch and system expansion.

Long term trade may occur in the following situations:

- the necessary storage of a hydropower-based system in the dry season can be lowered if thermal power is imported. Then the thermal-based system transmits energy to the hydro-based system during off-peak periods. This displaces hydropower in meeting the load on the largely hydropower system, which allows water to be stored or banked in the reservoirs of the hydropower system. The stored water can then be used to provide power to meet peak demand on the largely thermal power system.
- when fuel costs of generation differ between countries, this may justify construction of power plants dedicated to exports based on this fuel. For example, since the 1990s, combined cycle gas turbines burning cheap local natural gas have been constructed in northern Mexico for export of electricity to the United States.
- the scope for cost savings is also increased where two utilities face different system load shapes or experience peak loads on their systems at different times of the day/year. In these circumstances, there is scope for countries to share peak capacity.

### Scale economies

Joint planning of capacity additions together with firm power contracts and coordinated dispatch allows interconnected systems to function as one large system. This, in turn, permits larger average unit sizes, and hence economies of scale. This may be significant for small developing country utilities. Some economies of scale can also be achieved without coordinated dispatch, simply through utilities using interconnection to permit joint development of specific projects. The typical example of this type of trade is a large hydropower plant constructed in one country to supply power to a neighbor, such as Kariba North in Zambia to export power to Zimbabwe, the large hydropower plants in Quebec that supply Northeastern United States, Cahora Bassa in Mozambique to supply South Africa, the bi-national Itaipu plant on the Brazil/Paraguay border in which Paraguay's share is exported to Brazil, and Nam Theun 1 in Laos for export to Thailand.

Economies of scale in unit size are reached relatively early in larger power systems. The unit costs per megawatt capacity in gas turbines fuelled by natural gas have become relatively flat for unit sizes above 100MW. The unit costs per megawatt capacity in coal-fired and

oil-fired steam generating plants typically fall by some 25% when plant sizes double from 110 MW to 220 MW. Economies of scale in these types of plant may be fully realized with plant of approximately 500 MW.

### **Interconnection and economic trade**

Trade across an interconnector should increase until the marginal benefits – from displacing more expensive capacity, or from additional sales – equal the marginal cost of transmission across the interconnected network. The same argument applies to expansion of an interconnection, where costs of new generation and transmission will need to be taken into account.

Some costs of interconnection are fixed – this includes the physical costs of building and maintaining interconnections. Interchanges between linked grids will be affected by system disturbances or unexpected load variations, and this necessitates additional power monitoring, as well as the installation of suitable automatic generation control equipment. These costs rise as connections increase in voltage, length and number; they remain whether the network is used or not.

Operating costs also increase as interconnection deepens. Costs are of three main kinds:

- Increased losses and maintenance costs, where interconnections require transmission over long distances.
- Operating costs incurred by greater harmonization of systems, such as the adoption of standards that would not otherwise be regarded as optimal. For example, frequency control in the UCPT system is +/- 0.02 Hz, while in the UPS of Eastern Europe it was +/- 0.2Hz. Existing connections are through back to back DC links, and synchronous connections would entail adoption of the UCPT standards by Eastern Europe.
- Transaction costs of entering into, monitoring and enforcing contracts. A market trading system that coordinates through audited costs rather than through price bids, for example, incurs high monitoring costs. High transactions costs can hinder the development of regional power networks.

### **Transmission pricing and organization**

Transmission in SEE is typically integrated within utilities, and not separately priced. Where it is priced (e.g. for wheeling contracts), the price methodology tends to be unsophisticated and ineffective at providing accurate price signals on the marginal costs of losses and transmission constraints. The costs of transmission generally form a high proportion of the cost differential between generation in exporting and importing countries. A failure to unbundle and accurately price transmission services is therefore likely to constrain electricity trade.

Transport of electricity, sometimes through various borders, remains a major potential bottleneck to trade. Three major conditions seem to be required to overcome this.

- Firstly, transmission should only be a “service” with a specific tariff structure independent from energy prices.
- Secondly, as transmission will remain in a monopoly situation within given areas, it should be regulated and international agreements should be discussed between different concerned countries so that part of the transmission regulatory regimes includes an international transit (i.e. wheeling) clause.
- Thirdly, some sort of international coordination between the dispatching centers of the different transmission companies will have to be put in place to ensure the technical feasibility of such international transfers of electrical energy.

### **Contract risk coverage**

Risk coverage is a major issue in electricity trade. Though the seller/exporter is generally protected through “take or pay” contracts and the purchaser/importer through “penalties” for delivery or quality failures, contract enforcement can be a major issue/potential obstacle, both for short term and firm trade.

The risks posed to both parties are more substantial in the case of firm power trade. In this case, an exporting country is required to make major long term investments. It faces the risk that the purchaser will renege on contract, and attempt to drive prices towards short run operating costs, providing insufficient cash flow to finance capital costs. An importing country faces risks relating to reliability of supply if it is import dependent as regards its ability to be able to meet maximum demand.

One solution here is to increase the credibility of long term contracts, for example, through introduction of commercial codes and supporting technical capacity (e.g. as regards metering, teleinformation equipment information flows, and billing systems) and depositing of bonds/irrevocable letters of credit with a third party.

## **ANNEX 2. INSTITUTIONAL CAPACITY FOR SUPPORT OF A REGIONAL POWER MARKET: BENCHMARKING AND CHALLENGES**

This annex discusses reform progress and challenges with respect to the following milestones in the Athens Memorandum: tariff reform, affordability, payments discipline, regulation, market design, industry commercialization.

### **Power tariffs**

In a national trade model it is necessary that average tariffs cover average operating costs in order that there is adequate cash flow to pay for power imports. The alternative is for some form of government support, either through direct subsidy or sovereign guarantee (explicit or implicit) of contract payments. Turning this around, if average tariffs do not cover average operating cost, then the power sector could represent an increasing fiscal or quasi fiscal liability in a context of bilateral trade.

Table 7 shows that average<sup>22</sup> tariffs for countries in SEE range from 2.8 to 7.6 cents/kWh. Assuming that average operating costs (including generation, transmission, distribution and supply) are in the region of 3.5 cents/kWh<sup>23</sup>, the data suggests that most power industries in the region have positive operating cash flow at 2002 tariff levels, and would be able to sustain trade without government support. The exceptions here are Albania – where the Government part finances power imports – and Serbia.

In a context of competition for the non-household market, it is important that tariffs should cover costs for

each category of consumers. As the non-household market is liberalized, any cross subsidy from large customers to residential customers will be eroded. To the extent that there has historically been cross subsidy from industrial to residential consumers in SEE, tariff reform will be required in order that market development proceeds smoothly. Unless tariffs cover costs for residential consumers, distribution companies will not be financially viable on a stand alone basis.

Taking 4 cents/kWh as a proxy for average operating cost related to distribution company consumers<sup>24</sup>, table 7 shows that most distribution companies in SEE would be financially viable in a context of non-household competition. Amongst countries where residential tariff reform would be required relative to 2002 tariff levels are Albania, Kosovo and Serbia. From the point of view of large industry, using 3 cents/kWh as proxy for operating cost, tariffs for this customer category might be required in Macedonia, Kosovo and Serbia following liberalization<sup>25</sup>.

The discussion above does not allow for the fact that some countries are undertaking large scale investments. Where this is the case, a relatively high industrial to residential price ratio would suggest that the former bear a relatively high share of investment costs, something that would change after liberalization of the non-household market with price rebalancing in favor of industrial consumers. The data in the table shows that tariffs for non residential consumers exceed operating costs in Albania, Bosnia, Bulgaria, Croatia and Romania. To the extent that tariffs for industrial consumers in these countries reflect investment finance costs, larger residential tariff increases might be expected upon liberalization.

In a regional market setting under *full* competition, and abstracting from transmission constraints, power tariffs will tend to converge<sup>26</sup>. Where tariffs are currently below the regional average, tariff increases would be expected following liberalization. The average tariff for the region is 4.8 cents/kWh. The largest tariff increases would then be expected in Albania, Bulgaria, Macedonia, Kosovo

<sup>22</sup> This is the simple average. To the extent that non residential consumption is less than 50% of total consumption, the average tariff calculated in this way is likely to be an underestimate of the actual average tariff.

<sup>23</sup> This figure draws on accounting information provided to the World Bank by various utilities in SEE. Companies in SEE with an average tariff of 3.5 cents/kWh typically have positive operating cash flow, though not necessarily positive income, reflecting the fact that revenue is often insufficient to cover depreciation charges, particularly when payments discipline is a problem.

<sup>24</sup> Costs at the low voltage level exceed those at higher voltages, hence this figure is higher than the figure for average operating cost above.

<sup>25</sup> In other countries where data in Table 7 relates to industrial and commercial customers, industrial tariff increase may also be required.

<sup>26</sup> In practice prices will never fully converge: there will always be instances where it is not economic to increase transmission capacity to reduce congestion. Nevertheless, prices will tend to converge over time as economic investments in transmission are undertaken.

and Turkey, all of which have an average tariff below the regional average tariff.

**Table 7. Residential and Industrial power tariffs in SEE countries<sup>27</sup>**

COUNTRY	RESIDENTIAL TARIFF (CENTS/KWH)	NON RESIDENTIAL TARIFF (CENTS/KWH)
Albania	3.5	5.5
Bosnia	6.4	5.6
Bulgaria	4.4	4.4
Croatia	7.7	6.7
Macedonia	4.1	2.9
Kosovo	3.2	2.4
Montenegro	7	2.6
Romania	5.9	4.7
Serbia	3.2	1.8
Turkey	7.9	7.3

Also in a context of full competition, power generation tariffs will tend towards the cost of entry as the regional reserve margin falls and/or new entry occurs. End user tariffs reflecting the cost of entry (or the cost of rehabilitation for an interim period) in SEE would be of the order 7 cents/kWh and likely to prevail within the medium term<sup>28</sup>. Large tariff increases will be required in all SEE countries with the exceptions of Croatia and Turkey as new entry occurs.

### Affordability

Tariff increases will have affordability impacts, that is, power will not be affordable for all groups in society at higher tariffs. The available evidence suggests that whilst the average (mean) consumer in SEE countries is typically able to pay for power, affordability is at critical levels for poorer groups<sup>29</sup>. For example, in a recent study carried out in the context of the SEEREM, the

power affordability ration was above 10% for the lowest income deciles in Bulgaria and Romania, and for unemployed, pensioners and beneficiaries of social assistance in most of the SEEREM countries<sup>30</sup>. This may be compared to the World Health Organization (WHO) benchmark which suggests that no more than 10% of household income should be spent on power<sup>31</sup>.

Given that affordability is a problem, and if social/political problems are to be avoided, social safety nets should be in place to ensure that all members of the population are able to meet basic energy need. Amongst candidates for the social safety net in SEE are targeted subsidies and block (or lifeline) tariffs. The former mechanism has the advantage that it minimizes the cost of supporting the poor. Block tariffs are more costly, though have the advantage that they have better coverage in countries where the poor are not easily identifiable. In the SEE context, block tariffs can provide an interim solution whilst social security frameworks are developed, and whilst Governments are budget constrained<sup>32</sup>.

Progress has been made in SEE where most countries have in place a social safety net. Typically this is a block tariff, with the exception being Serbia, which has both a block tariff structure and some targeted social assistance for power consumption. Countries where there is a need to introduce a social safety net are Macedonia and Montenegro. In Serbia, the block tariff structure allows 600 kWh consumption at a low marginal price, a level that should be reduced in order to promote incentives for energy efficiency; in other SEE countries, the first block of consumption is up to 250 kWh.

### Payments discipline

In a context of bilateral trade where payments discipline is poor – cash collections are low and/or commercial losses are high – financial viability of utilities may be undermined. Even if tariffs cover operating costs, effective tariffs may not fulfill this criteria. Then bilateral

<sup>27</sup> Data excludes tax. Prices are end 2002. Data sources: European Regional Regulators' Association (ERRA) database, World Bank internal data. Non residential tariff includes commercial and industrial customers. Non residential tariff data for Macedonia, Kosovo, Montenegro and Serbia relates to high voltage consumers.

<sup>28</sup> A survey of Long Run Marginal Cost studies in SEE suggests a range of 6-8 cents as the cost of supply for residential consumers, see Ian Pope Associates (IPA), *Power sector affordability in South East Europe*, report for the EBRD: London, October 2003.

<sup>29</sup> This is discussed in *Transition Report 2001*, EBRD: London.

<sup>30</sup> See IPA *ibid*.

<sup>31</sup> The WHO definition relates to power for heating, or other heat sources. To the extent that power is used for heating the WHO benchmark is the appropriate one. To the extent that other sources of heating are used, the benchmark for power affordability should be much lower (i.e. affordability is more of a problem than suggested in the text above).

<sup>32</sup> Conclusion of USAID conference on affordability in Sofia, Bulgaria, in October 2003.

trade may require government support, either directly (through subsidy) or indirectly (through sovereign guarantee of contract payments). In other words, good payments discipline is required if bilateral trade is to take place without government support.

Payments discipline is a significant problem in most SEEREM countries, as shown in Table 8 below. The average collection ratio for the region is 85%. Distribution losses – comprising technical and commercial (non billed consumption) losses average 22%. Barter payment – which is often non transparent, and takes place at non market prices – is a problem in Montenegro, Republika Srpska, Romania and Turkey. These figures may be compared to western Europe, where collections are close to 100%, commercial losses are negligible, and barter is non existent.

**Table 8. Payments discipline in power sectors of SEE**

COUNTRY	COLLECTION (%)	BARTER (%)	DISTRIBUTION LOSSES (%)
Albania	88	0	37
Bosnia <sup>33</sup>	98	0	10
Bulgaria	90	0	22
Croatia	80	0	11
Macedonia	80	0	19
Kosovo	60		58
Montenegro	80	15	19
Romania	93	35	12
Serbia	85	12	19
Turkey	90	0	14

Upon non-household market liberalization, some paying non-household customers are likely to migrate to other suppliers. The result would be a reduction in the collections ratio for distributions companies, leading to strained financial viability. Depending on the level of collections, distribution companies might not be able to cover operating costs at current tariff levels, and would

not be able to finance investments. Lack of cash flow would feed up the supply chain, with shortfalls relative to operating costs and investment finance needs in generation and transmission.

For large non paying customers connected to the high voltage network (i.e. served at the transmission rather than the distribution level), migration of paying customers could exacerbate cash flow problems for the market operator or the transmission system operator, depending on the market rules. For example, to the extent that non paying customers are able to continue participating in day ahead or balancing markets, finances of the market operator/transmission system operator would be strained upon liberalization.

Rather than accommodate non payment through regulatory/market design<sup>34</sup>, ideally payments discipline should be improved before the market is opened. This is implicit in the Athens Memorandum requirement for SEEREM countries to adopt plans for reduction of commercial losses. Payments discipline can be improved through strengthening the legal framework and disconnecting non paying customers, together with restructuring and privatizing/liquidating non paying large industrial consumers. Experience suggests that the private sector has been successful improving payments discipline in transition economies, including in SEE, where the presence of ENEL has supported increased collections and reduced commercial losses (see discussion *Private Sector* in this section below).

**Regulation**

One challenge in developing the regulatory framework for trade – be this national (in a context where there may be third country transit), or for non-household customers, or full competition – will be to introduce region wide transmission tariff methodologies that would support (economically efficiency) trade.

<sup>33</sup> Data relates to Bosnia and Herzegovina. Collections are of a similar order in Republika Srpska, although barter payments account for 40% of the total there. Distribution losses in Republika Srpska are 25%.

<sup>34</sup> The experience here in transition economies is not favorable. For example, algorithms to allocate limited cash flows in the Ukrainian power pool have undermined bidding incentives in that market. See V. Nosov, “Non payments in Ukraine’s power sector” *Policy Studies* 5, International Centre for Policy Studies, Ukraine, 1999.

Transmission tariffs should reflect physical flows (including loop flows in networks where there is more than one link between different nodes) of electricity and related technical losses and possible network congestion.

Pancaking – imposition of charges by all countries between generator and consumer when such charges have no relation to underlying marginal cost – has been a problem in western Europe market liberalization and should be avoided in SEE if trade is to prosper<sup>35</sup>. In other words, existing import and export charges should be phased out, something that is envisaged as part of the Athens process.

On the other hand, financing of investment will require departures from marginal cost pricing. The chosen transmission methodology should minimize associated price distortions (e.g. by charging investment costs to domestic rather than international consumers, or by auctioning access to congested capacity) in order to support trade development.

Transmission companies in the region are working together to develop a cross border tariff methodology in close collaboration with regional regulators, the Council of European Energy Regulators and the European Transmission System Operators, although a detailed proposal has yet to be tabled.

A second challenge in developing the regulatory framework for the market will be to introduce mutually consistent grid codes (technical conditions for network access). Progress has been made here in Romania, where a grid code in compliance with the EU Power Directive has been adopted. Elsewhere in SEE various countries (e.g. Bulgaria, Croatia) are working towards developing grid codes, though these are yet to be finalized.

Ideally methodologies will be developed and implemented by independent regulators who will ensure that there is a level playing field for trade, with equal network access to all customers whether domestic or international. All SEEREM countries have made progress in fulfilling the Athens Memorandum requirement to set up an independent regulator. Bulgaria, Croatia and Romania have an independent regulator in place, whilst Bosnia, Macedonia and Montenegro have passed legislation enabling the setting up of an independent regulator, and legislation has been drafted in Serbia<sup>36</sup>.

Drafting and implementation of distribution company tariff methodologies will be important to support sustained financial viability of the industry in a context of non-household market liberalization. Such methodologies will act as a commitment by countries/regulators to sustained cost recovery tariffs required to support non-household competition as discussed in above. Distribution methodologies based on principles of cost recovery have been adopted in Bulgaria and Romania, with arrangements typically in place for development of methodologies in other countries of the region.

### **Market design**

National trade typically takes place on the basis of contracts between national utilities. Contracts may be short term (as in the case of current export contracts from Bosnia) or long term (as between Serbia and Montenegro). They may relate to exchange of base or peak power, or sharing of reserve, or trade to take place in certain contingencies (for example, in a wet year).

In order to improve efficiency of bilateral trade contracts may be tendered rather than negotiated. A utility may then offer to sell or buy a quantity of power through international competitive tender. If gains are to be realized through this mechanism, the tender should be open and transparent. Some tendering in SEE currently takes place, with Bosnia and Herzegovina, MACEDONIA, and Serbia all active in the market.

Further efficiency gains may ensue through the setting up of a contract exchange where utilities may offer to sell or buy quantities of power, and where existing contract may be traded. One advantage of a contract exchange is that it may be more transparent than a tendering process for sale or purchase of power. In addition, trade of existing contracts can yield economic benefit, for example, where a utility has over-contracted, through facilitating secondary trading. In the SEE context it would be feasible to set up a trading framework using and existing exchange (e.g. ENDEX) in order to minimize set up costs.

For non-household and full competition there are a number of important questions as regards institutional design. These include whether the market should be based on bilateral contracts or a day ahead spot market

<sup>35</sup> Discussed in *Completing the Internal Energy Market*, European Commission, 2001.

<sup>36</sup> See *Regulatory benchmarking report*, USAID, 2003.

("pool") model, the role of balancing markets, real time clearing of demand and supply, the role of a market operator, investment support mechanisms, and generation price regulation. These are now discussed in turn.

Evidence from transition economies (Georgia, Kazakhstan, Ukraine) suggests that power markets based on bilateral contracts between generators and large consumers are the most appropriate in a setting where payments discipline is a problem, institutional capacity constraints may be binding, and where security for finance of investments is required<sup>37</sup>. This model is widespread in Europe and was recently adopted in England and Wales to replace the former predominant day ahead spot market.

A bilateral contracts market may not cater for the whole of demand (customers in the market aim to avoid over contracting, that is, purchase under contract of capacity which they may not use). In order to meet residual (i.e. non contracted) demand, and to allow trade of contracts, an additional mechanism is required.

One such mechanism is a day ahead spot market for *balancing*. Introducing this market after bilateral contracts, as technical and institutional capacity is strengthened, and limiting its scope by making participation voluntary as opposed to mandatory, could minimize problems experienced elsewhere in transition economies with day ahead markets.

A bilateral contracts market requires a body to oversee operation (e.g. as regards power accounting and financial settlement). This body may be a separate *market operator* or a unit in the transmission company (the latter may be more practical for small markets).

For day ahead markets, a market operator is required to organize clearing of demand and supply, and subsequent financial clearing (i.e. ensuring the flow of funds from purchasers to sellers). This type of market operator should also be responsible for overseeing the contract market.

A regional day ahead market would likely perform better than a set of sub regional/national markets in SEE, particularly given the small size of some countries involved. A regional market would minimize transaction

costs and increase the likelihood of achieving regional least cost dispatch. Having said this, moves are underway to set up national operators in various SEE countries, and any proposal for a regional operator would have to take account of this.

Given that power demand in SEE is not responsive to price in real time<sup>38</sup>, it would not possible to operate a real time market (where price clears demand and supply). In these circumstances, to meet differences between real time and forecast demand the best that can be achieved is to purchase power efficiently, for example, through tendering of contracts by the system operator for spinning reserve. In SEE, tendering would ideally take place on a regional basis to allow full sharing of reserve between countries. Rather than pricing balancing power on the basis of demand and supply, which is not technically feasible, balancing prices should be set to encourage consumption in contract and day ahead markets, that is, to ensure that as much consumption as possible is market based.

Given that price signals do not function in power markets as in other markets (i.e. they typically do not fully clear demand and supply), and given un-hedged price volatility in power markets, free entry in generation is not a sufficient condition to guarantee that the optimal level of capacity will be provided<sup>39</sup>. For these reasons, countries where power markets have been liberalized rarely rely on free entry to provide and adequate system reserve margin.

For example (i) transmission system operators (in Australia and Scandinavia) have contracted in reserve capacity to meet target reserve margins (ii) large consumers are required to purchase to cover demand plus a reserve margin (e.g. in United States and Canada) (iii) capacity payments are made (e.g. in Chile and [before reform of the pool] England and Wales).

In the case of SEE, the following additional considerations will be important: (i) the market rules will be untested (ii) the regulatory rules will be untested (iii) the creditworthiness of participants in the market will be untested. Given these circumstances, in light of significant risks for investors, an investment support mechanism is likely to be required if an adequate reserve margin is to be maintained.

<sup>37</sup> See *Transition Report 2001*, EBRD: London, for a discussion.

<sup>38</sup> This will be the case for the foreseeable future given installed technology for metering and data communication in SEE.

<sup>39</sup> See R. Turvey, "Ensuring adequate generating capacity", *Utilities Policy* 11, 2003, for a discussion.

An investment support mechanism might involve system operators tendering for capacity under long term (physical or financial) contracts, or a requirement for distribution companies to secure adequate capacity including a reserve margin on a medium/long term basis. In either case, sovereign backing (e.g. sovereign guaranteed finance) would be required where transmission/distribution companies are not creditworthy.

Should an investment support mechanism be required, ideally this will be designed to select projects that are least cost on a regional basis, under contracts that balance the need to provide security for investors with the objective to foster a competitive market (i.e. contracts should be commensurate with loan tenors for project finance, should not cover the whole of output, etc.).

Experience from Canada and the United States shows that reliance on price as the sole means for rationing capacity can result in sustained high prices which may be undesirable from an economic viewpoint and socially/politically unacceptable. This could be a problem in the SEEREM, where it is possible that there will be a supply deficit. One way to avoid unduly high prices is through contracts between generators and consumers (e.g. distribution companies). Alternatively market design might include generator price caps and/or supply obligations (e.g. to tariff consumers).

The Athens Forum has recognized the importance of market design for the SEEREM, and a proposal was presented by the Council of European Regulators (CEER) to the third Athens Forum in October 2003. The proposal was drafted by the Greek power regulator working in conjunction with regulators in western and eastern Europe, the Romanian power regulator and the Ministry of Energy in Serbia.

The CEER proposal is to have a contracts based market, with day ahead trading administered by a regional market operator, and a simple balancing mechanism. The proposal mentions the possibility of consumer capacity obligations in order to secure required investments. For protection of residential consumers, it is proposed that this group would be able to purchase power at a regulated tariff from domestic generators for an interim period; in the terminology of this framework, the proposal is thus to move from *non-household* to *full wholesale* competition.

Both capacity obligations and residential consumer protection will require much elaboration going forward. In addition, the relationship between the proposed regional market operator and the national market operators that have been (are being) set up in the region will be a key issue. A decision will be required on whether participation in the day ahead market will be voluntary or mandatory. Other areas requiring substantial work include the interface between contracts and day ahead markets, and the mechanism for determining balancing prices.

### **Commercialization**

Corporate governance is important if national trade is to unlock efficiency gains (for example, through utilities purchasing imports to minimize costs of supplying the domestic market). In order that bilateral trade is efficient, power utilities should operate in a transparent manner, publishing accounts to IAS. Utilities in the region typically do not provide accounts to IAS with unqualified audit; qualifications here range from valuation issues relating to assets, receivables/payables, costs, and provisioning.

Still on corporate governance, managers in utilities should be incentivized to act commercially (e.g. in respect to purchases, sales, collections, performance improvement); this remains a major challenge in SEE.

To best support non-household and full competition – and to support increased transparency and strengthening of management incentives – generation, transmission and distribution would be unbundled; this is the best way to promote equal network access to all market participants. The minimum allowed in terms of unbundling under the Athens Memorandum is that different industry functions should be separate legal entities with fully independent management.

One way to achieve this is to set up different industry functions as subsidiaries within a holding company structure. An alternative is for full separation, that is, separate ownership of different functions. From a competition point of view, separate ownership is preferable to common ownership with legal separation in all but the smallest countries in the region (e.g. Macedonia, Montenegro), where full separation may make assets unattractive to potential future investors.



Regarding horizontal unbundling, splitting of generation assets into a number of companies can promote competition and ease concerns about market power, subject to constraints as regards scale. In SEE, there is scope in some of the bigger countries (e.g. Bulgaria, Romania, Serbia) for unbundling of generation into two or more competing companies.

In accordance with industry unbundling required “under the Athens Memorandum, separate transmission companies have been set up in Bulgaria and Romania. As regards ownership separation of generation and distribution, this has taken place in Romania. Regarding horizontal unbundling of generation, this has not taken place in the region, except to a limited extent in Bulgaria. In other SEE countries, plans for restructuring have typically been drafted, but not adopted by government, thus unbundling remains a major challenge for SEEREM development.

**Private sector**

Evidence from Albania, Georgia, Kazakhstan and Moldova suggests that introduction of the private sector to distribution, together with re-metering and computerization of billing, can lead to improved payments discipline<sup>40</sup>. This also requires government commitment as regards allowing disconnection of non paying customers, whether these be residential, budget entities, or large state owned enterprises. If payments discipline is not improved the funding gap for the industry will increase upon liberalization and other solutions will be required, either increased power tariffs, or government support.

Evidence suggests also that private sector participation in power can result in cost reduction, particularly in a context of competition for the non-household market or full competition. Private sector participation can then limit the price increases necessary to ensure power sector financial viability. Furthermore, private sector participation can help to mobilize commercial finance for necessary investments.

The appetite of the private sector for purchase of assets in transition economies has declined recently for the following reasons:

- The collapse of ENRON, following which energy traders have focused on balance sheet strengthening rather than international expansion.
- Investors have lost money in the US and the UK.
- US and European companies lost money in Latin America following currency devaluation.
- Political/regulatory risk perceptions have increase following problems with Power Purchase Agreements (PPAs) in Indonesia, Philippines, Pakistan and regulatory problems in Hungary, Kazakhstan and Moldova.

Discussion with investors who have previously shown interest in the region suggests that currently there is no appetite for increased equity in transition economy power sectors from American, English, Spanish and Swedish companies formerly interested in these markets. There is only limited interest from French, German and Italian companies.

In terms of private participation in SEE, currently no distribution assets are privately owned. Forthcoming distribution company privatizations in Bulgaria and Romania will reveal more about potential for sale of distribution companies in the region [update.] In power generation, private sector participation is currently limited to two projects there are currently two private projects under development in Bulgaria.

In cases where there is not sufficient investor appetite for equity in power sector assets, incentive based management contracts could provide an interim means for private participation in the context of the SEEREM. Amongst the transition economies, management contracts/management assistance contracts have led to improved performance in the power sectors of Albania and Georgia. In the case of Albania, introduction of private management resulted in cash collection improvements from 45% to 90% and an 8 percentage point reduction in commercial losses within two years.

<sup>40</sup> See *Transition Report 2001*, EBRD: London, for a discussion.

### ANNEX 3. POWER TRANSMISSION CAPACITY IN SEE

The Balkans Interconnection Task Force, established in 1996 by the EC, considered nineteen possible transmission projects. These projects were evaluated by the Task Force and priorities ranked as follows:

1. 400 kV interconnection line between Arad (Romania) and Sandorfalva (Hungary)
2. Development of the telecommunications system in the Balkan electricity sector
3. Installation of out-of-step relay protection, automatic synchronization and fault recorder devices on the following 400 kV tie-lines: Blagoevgrad (Bulgaria) – Thessaloniki (Greece); Sofia West (Bulgaria) – Nis (Serbia); Kosloduy (Bulgaria) – Tintareni (Romania); Maritsa East 3 (Bulgaria) – Babaeski (Turkey); Dobrudja (Bulgaria) – Vulkanesti (Moldova)
4. Reconstruction of 400 kV overhead transmission lines in Bosnia & Herzegovina: Gacko – Mostar; Refurbishment of 400 kV/220 kV transformation in Mostar sub-station.
5. Reconstruction of 220 kV overhead interconnection lines: double circuit Tuzla (Bosnia & Herzegovina) – Djakovo (Croatia) (two 220 kV lines)
6. 400 kV interconnection line Oradea (Romania) – Bekescaba (Hungary)
7. Technical support for data exchange between the Dispatching Centres of the former Yugoslav Republic of Macedonia and of neighboring countries
8. 400 kV interconnection line Elbasan (Albania) – Podgorica (Montenegro)
9. 220 kV interconnection line Vrutok (Macedonia) – Bureli (Albania)
10. Upgrading of interconnection line Bitola (Macedonia) – Amindeo (Greece) from 150 kV to 400kV 400 kV interconnection line between Greece and Bulgaria:
11. 400 kV interconnection between Greece and Bulgaria: Philippi (Greece) – Maritsa 3 (Bulgaria)
12. 400 kV interconnection line between Thessaloniki (Greece) – Hamidabat (Turkey)
13. 400 kV transmission line between Stip (Macedonia) – Blagoevgrad (Bulgaria)
14. 400 kV transmission line between Bitola 2 (Macedonia) – Elbasan (Albania)

Important points to note about the projects considered by the Task Force are:

- The projects 3, 2 and 7 concerned necessary infrastructure for a safe synchronous operation and regional system capable of serving a high volume of energy transactions.
- The 400 kV interconnection lines between Albania and Montenegro (project 8), in combination with projects suggested by Bosnia & Herzegovina (project 4), were characterized as top priority, and would create the Adriatic coast interconnection line to UCTE.
- Proposed interconnections between Macedonia and Bulgaria, Greece and Turkey were characterized as projects of major importance, as they would constitute the first 400 kV interconnections between these countries.
- Proposed projects on interconnection and reinforcement of the Romanian network, and especially those projects aimed at upgrading the interconnection with Hungary (projects 1 and 6), were regarded as being of particular interest for integration of the Balkan System with the main UCTE main grid.

In the intervening period since 1996 many of the above projects have been developed and are under implementation. A notable exception here is interconnection between Albania and MACEDONIA.

Under the US funded *South East Europe Cooperative Initiative* (SECI), a Project Group on “Development of Interconnection of Electric Power Systems of SECI Countries for Better Integration to the European System” comprising transmission system operators in the region was established. The SECI Project Group undertook a “Regional Electricity Transmission Planning and Interconnection Study” which modeled the potential impact of twelve new transmission links under various hypothetical inter (between SEE, UCTE and CENTREL) regional (not intra – it was assumed that countries in SEE were individually balanced) power flows.

This study found that new links between Albania-Montenegro and Serbia-Hungary would ease transmission constraints and reduce network losses. The study found also that new lines between Croatia-Hungary and MACEDONIA-Albania would reduce network losses, and that lines from Hungary-Romania and Bulgaria-Greece would increase maximum exchange based on the N-1 security criteria.

## ANNEX 4. CASPIAN GAS IMPORT PRICES TO SEE

In recognition of the potential for Turkish gas exports to SEE and into western Europe, a project to construct a new Greece – Turkey gas pipeline has been developed. The pipeline would be 295 km long, costing around \$280 million and with a capacity of 11 bcm per year. The Greek part of the pipeline (85km) is currently under construction, whilst the Turkish part is at the engineering studies phase.

In conjunction with the Greece-Turkey pipeline, Albania, Bosnia and Herzegovina, Macedonia, Greece, Serbia and Turkey signed an interconnection agreement in February 2003, whereby there was agreement to explore options for exporting gas from Turkey via Greece to the other signatory countries.

Two alternative routes would be consistent both with the interconnection agreement and the desire of Turkey to export gas to the western Europe market. One route would feed off a possible Greece – Italy pipeline, going north from Greece, through Albania, to Macedonia, and north through Serbia, connecting with the existing Serbian network (*the Italian route*). An alternative route would go north from Greece to Macedonia and to Serbia, with a branch from Macedonia to Albania (*the northern route*).

The Bank has commissioned a preliminary study to establish the economics of these pipelines and possible delivery prices to SEE countries under the alternative routes above. The study forecasts delivered gas prices on the basis of Turkish border prices plus capital costs of new pipelines. Three Turkish border prices were assumed: the low and high cases correspond to extremes of prices observed at the Croatian border over the period 1999-2001. The mid case price approximates to what would be paid under current Turkish off-take agreements for an oil price of \$25/barrel. The capital cost for the two routes was assumed to be of the order \$300 million. Delivered gas prices under these assumptions are presented in table 9.

The data in the table suggests that increased gasification would be potentially economically viable under the low price scenario<sup>41</sup>, with the exception of Albania under the northern pipeline route, where gas prices are close to critical levels for heating and gas fired power generation. From the perspective of other countries, the northern route would deliver gas at lower prices than the Italian route.

For the mid price scenario, prices would be comparable with current Gazprom prices for countries other than Albania. New pipelines would then seem to offer little advantage over existing supply routes. Increased gasification would be feasible, with deeper penetration in heating distribution, particularly as power prices increase. New gas fired generation may be able to compete with new coal fired generation under this scenario – more so depending on the value of carbon credits although it would be unlikely to be chosen ahead of coal fired generation rehabilitation. Thus gas fired generation might be expected to increase in line with power demand to the extent that gas pipeline capacity would allow this.

It is worth noting that the average price on the EU15 border is around \$120/tcm for an oil price of \$25/barrel. Netting back, if Turkey is to penetrate the western European market, the price at the Turkish border would have to be somewhere between the low and mid price forecasts. Though this price would probably support increased gasification, it would be below the current agreed off take price for Caspian gas in Turkey.

There would seem to be scope for price reduction given that the estimated cost of delivering gas to the Greece-Turkey border is a maximum \$100/tcm, and may be considerably less. Turkey is not in a position where it has to drop prices due to large sunk costs associated with off take agreements or investments. Nevertheless, there would be benefit to Turkey/Azerbaijan in reducing prices to improve the economics of pipeline investments required for export to SEE and western Europe. It should be noted that a border price of \$100/tcm plus transport costs associated with new pipelines comes well within the \$120 price in western Europe<sup>42</sup>.

<sup>41</sup> Prices required for increased gasification in power are around \$110/tcm and for residential heating around \$150/tcm.

<sup>42</sup> A third possible route for export of gas from Turkey to western Europe is via Bulgaria, Romania and Hungary. Assuming that capital costs associated with this route are lower than those associated with the northern route, then prices of gas in Albania, Bosnia and Herzegovina, MACEDONIA and Serbia would be higher relative to the figures mentioned in the discussion.

**Table 9. Delivered gas prices in SEE under new pipelines**

<b>GAS PRICE AT</b>	<b>TRANSPORT COST</b>	<b>LOW CASE</b>	<b>MID CASE</b>	<b>HIGH CASE</b>
Greece-Turkey border		80	120	160
+ gas transport across Greece		15	17.50	20
+ transport fees across Greece	unknown			
<b>NORTHERN ROUTE</b>				
Greece-Macedonia border				180
+ gas transport to Negotino	1.95	95	138	182
+ gas transport to Albanian branch	51.6	97	139	234
+ gas transport from Negotino to Skopje	1.38	149	191	183
+ gas transport through Serbia	4.45	98	141	188
+ gas transport to Bosnia & Herzegovina	+ costs for existing network	103	145	
<b>ITALIAN ROUTE</b>				
Greece-Albania border				180
+ gas transport to Elbasan	3.98	95	138	184
+ gas transport to Albanian branches	14.25	91	142	198
+ gas transport from Elbasan to Skopje	4.07	113	156	188
+ gas transport from Skopje to NIS	4.45	103	160	193
+ gas transport to Bosnia and Herzegovina	+ costs for existing network	108	164	

The extent of price reduction at the Turkish border needed to make new pipelines viable depends on the price in western Europe, assuming that gas can potentially be exported there from Turkey. The question arises whether Caspian gas exports would lead to price reductions in western Europe. This is unlikely for volumes currently being talked about (exports of up to 11 bcm/year into a market with total consumption around 130 bcm/year).

As competition in the western European market intensifies, however, through competition from other sources (e.g. North African gas), prices there should fall, and this would have downward pressure on the Turkish export price. Thus in the medium – long term, the export price from Turkey could move towards the low case scenario in Table 9 above, which would support increased gasification.

To reiterate, work undertaken for the Bank *vis a vis* the gas market in SEE is only preliminary, and much follow up work is required to better understand the economics of SEE gasification. In particular, more work on the critical gas price as regards the viability of deeper penetration in gas distribution is required, as is work on the critical gas price for viability of gas fired power generation in

the region, together with detailed feasibility studies for alternative new gas pipeline routes. Together these would allow net back analysis to calculate an appropriate Turkish gas export price, which would in turn serve to inform the Turkish import price of Caspian gas.

**ANNEX 5. TECHNICAL ASSISTANCE INITIATIVES IN THE SEEREM CONTEXT.**

	<b>REGIONAL ELECTRICITY MARKET/ INTER-CONNECTIONS</b>	<b>POLICIES</b>	<b>LEGISLATION</b>	<b>REGULATORY AGENCY</b>	<b>RESTRUCTURING, UNBUNDLING, AND TSO DEV.</b>	<b>MARKET RULES AND FINANCIAL SETTLEMENTS</b>	<b>PRIVATIZATION</b>
<b>Regional level</b>	<p><b>EC:</b> Planned contracts for Monitoring, Technical Support and Action Plan</p> <p><b>CIDA:</b> Simulation of the Potential Benefits of a Regional Electricity Market</p> <p><b>CIDA:</b> Options for Balkan REM; Preliminary Market Design for REM; Regional Market Simulation/Software for Energy Trade</p> <p><b>EC:</b> Athens Process Secretariat (to Dec 2004)</p> <p><b>EC/WB:</b> Generation Investment Study (start '03, 12 months)</p> <p><b>UCTE:</b> Reconnection of SEE grid</p> <p><b>Seco:</b> Secondment of energy market specialist to the Stability Pact for SEE/Brussels (for implementation and follow-up of Athens Memorandum)</p>	<p><b>KfW:</b> Overall Supply/Demand Study</p> <p><b>USAID:</b> Role of Hydro Study</p> <p><b>IEA:</b> National energy balances and statistics (yearly) Energy Reviews (Black Sea Energy Survey, 2000) see also website.</p> <p><b>KfW:</b> Energy efficiency (implementation 0.4 MEuros)</p> <p><b>UN-ECE:</b> Regional Network for Efficient Use of Energy and Water Resources in SEE (RENEUER)</p> <p><b>USAID:</b> Energy Efficiency</p>		<p><b>CEER:</b> Benchmarking for regulators</p>	<p><b>France:</b> Study of Regional Grid and Commercial Codes</p> <p><b>ETSO:</b> Benchmarking for TSOs;</p>	<p><b>CEER:</b> Standard Market Design by Oct 03</p> <p><b>ETSO:</b> CBT mechanism by Dec 03</p> <p><b>ETSO:</b> Network Access and Congestion Management</p>	
<b>Albania</b>	<p><b>USAID:</b> Will sponsor workshop to discuss implementation of regional market with other small countries in the region</p> <p><b>WB:</b> Feasibility for interconnection to Kosovo (Oct 03 to Aug 04)</p>	<p><b>USAID:</b> National Energy Strategy (completed) Policy Statement has been approved and is being implemented.</p> <p><b>CIDA:</b> TA in Restructuring of Dept of Energy and National Energy Agency</p>	<p><b>USAID:</b> Preparing of New Law (Power Sector Reform Law is effective and Energy Policy Law has been drafted)</p>	<p><b>USAID:</b> TA and Partnership (continues; regulations and draft licenses prepared in part; tariff methodologies are being developed and tariff model calculations are in process )</p>	<p><b>USAID:</b> Management Training (Course completed and will continue this year.)</p> <p><b>EBRD/Italy:</b> ENEL Management Contract</p> <p><b>CIDA:</b> Assistance in the unbundling of the power transmission functions (Gridco, ISO, MO.</p>	<p><b>USAID:</b> TA to develop Market Design and Rules followed by development of grid, metering and distribution codes; simplified Uniform System of Accounts is being developed by ERE</p>	<p><b>IFC/Seco:</b> Under consideration: TA in privatization strategy and implementation</p>

	REGIONAL ELECTRICITY MARKET/ INTER-CONNECTIONS	POLICIES	LEGISLATION	REGULATORY AGENCY	RESTRUCTURING, UNBUNDLING, AND TSO DEV.	MARKET RULES AND FINANCIAL SETTLEMENTS	PRIVATIZATION
<b>Albania (cont.)</b>		<b>CIDA:</b> Review of the Vlore Thermal Power Plant Environmental Assessment Study		<b>WB:</b> General Tariff Review <b>CIDA:</b> Institutional strengthening of ERA	<b>KfW:</b> Electricity Supply South Albania (education and training) (implementation 0.5 MEuro)		
<b>Bosnia and Herzegovina</b>		<b>CIDA:</b> TA in Establishment of Dept. of Energy in Ministry (Study Completed, Implementation Pending) <b>CIDA:</b> TA in Integrated Power Sector Reform Action Plan and ad hoc support for Restructuring and Privatization (completed)	<b>USAID:</b> Preparation of State and Entity Laws for Regulation, Transmission co. and ISO	<b>USAID:</b> TA for State and Entity Regulatory Agencies for Inst. Development, Licenses, Tariffs and Monitoring	<b>USAID:</b> TA for Entities on Restructuring Plan <b>DFID:</b> TA for ISO Development <b>CIDA:</b> TA in Establishment of Transmission Company <b>EU:</b> Company commercialization	<b>CIDA:</b> TA in Development of Market Conceptual Design; Market Rules and Pricing	<b>USAID:</b> Initial Strategy Development
<b>Bulgaria</b>		<b>CIDA:</b> TA for Further Liberalization of the Electricity Sector <b>CIDA:</b> TA in National Energy Efficiency Strategy and Implementation Plan	<b>USAID:</b> Assistance on New Law	<b>USAID:</b> Regulatory Partnership, Inst. Development and Accounting/ Tariff Assistance <b>EC:</b> Planned <b>CIDA:</b> TA in development of initial contracts, assistance revision tariff ordinance.	<b>EC:</b> Support of EBRD TSO Loan; <b>CIDA:</b> TA for the establishment of the independent TSO <b>CIDA:</b> Assessment of distribution losses	<b>CIDA:</b> Market Design; Preparation of Open Access Ordinance Development of market rules. (On going assistance) <b>CIDA:</b> TA in use of SDDP & Bulgaria Market Simulation Study (Completed for market design)	<b>EC:</b> Investment Advisor for Discos <b>EBRD:</b> TA for the Privatization of Power Distribution Companies <b>CIDA:</b> TA in Privatization Strategy for Power Generators (completed) <b>USAID:</b> Assistance on Private Sector Options for Sofia CHP/Heat Company
<b>Croatia</b>	<b>CIDA:</b> Regional training in the use of SDDP at the Energy Institute Horje Pozar (completed)	<b>CIDA:</b> TA for the Establishment of an Environment Protection Agency and an Energy Efficiency Fund (on hold until further notice)	<b>USAID:</b> Energy Law was prepared and passed by the Parliament on July 2001; Assistance on Secondary Legislation	<b>USAID:</b> TA on tariffs, licensing, rule books, and Commission development and Regulatory Partnership Program	<b>USAID:</b> TA on transmission and distribution grid codes, assisting on unbundling, utility partnership	<b>USAID:</b> Possible assistance on market rules and ISMO development <b>CIDA:</b> Market design and development of market rules.	

	REGIONAL ELECTRICITY MARKET/ INTER-CONNECTIONS	POLICIES	LEGISLATION	REGULATORY AGENCY	RESTRUCTURING, UNBUNDLING, AND TSO DEV.	MARKET RULES AND FINANCIAL SETTLEMENTS	PRIVATIZATION
Croatia (cont.)						CIDA:TA in use of SDDP & Croatia Market Simulation Study	
MACEDONIA		<p><b>CIDA:</b> TA for the preparation of the National Energy Policy. (on hold)</p> <p><b>WB:</b> Support for development of an energy strategy (in progress to June 04)</p> <p><b>Seco:</b> Assistance in PCB-handling and Energy Efficiency</p>	<p><b>USAID:</b> Assistance on Law and planning for regulatory agency</p>	<p><b>USAID:</b> TA on tariff methodology and calculation and Regulatory Partnership Program</p> <p><b>EC/EAR:</b> Development of Energy Regulatory Commission. (Start 22 July 2003, 9 months)</p>	<p><b>USAID:</b> TA, assisting on regulatory issues for unbundling of ESM.</p>	<p><b>USAID:</b> TA on market design</p>	
SAM			<p><b>USAID:</b> Assistance on New Law (completed)</p>	<p><b>USAID:</b> Planned Support for one year, after passage of law</p>	<p><b>USAID:</b> TA for EPCG in unbundling of accounts and asset valuation</p> <p><b>WB:</b> Introduction of FMS for unbundled companies (in progress to June 05)</p> <p><b>EC(EAR):</b> Unbundling of EPCG (in progress to end 04)</p> <p><b>CIDA:</b> TA for the restructuring of power transmission functions and assistance to interface SO function with Serbia</p>		
SAM	<p><b>CIDA:</b> As part of the use of SDDP for the Simulation at regional level, simulation of the Potential Benefits of an Integrated Serbia, Montenegro, Kosovo Electricity Market (Under discussion)</p>	<p><b>WB:</b> Support for development of an energy strategy/policy (in progress to end of 04)</p> <p><b>WB:</b> Support for Serbia gasification strategy (start '03, 5 months)</p>	<p><b>USAID:</b> Assistance on New Law (completed)</p>	<p><b>EC:</b> TA and financing of Regulatory Agency (contingent on passage of Energy Law)</p>	<p><b>USAID:</b> Restructuring Study and Follow-up – restructuring seminar (completed); design of the IEM and blueprint for the SO function</p> <p><b>CIDA:</b> Business Plan for Telecommunication Project (Completed – Financial closing underway)</p>	<p><b>USAID:</b> TA for the Design of the Internal Electricity Market (Interface with CIDA ISMO)</p> <p><b>EC(EAR):</b> support for market operator</p>	

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<b>SAM (cont.)</b>		<p><b>EC:</b> Proposal for institutional strengthening of Ministry TA and financing of Regulatory Agency</p> <p><b>EC:</b> Least Cost Investment Plan for Serbia will commence shortly</p> <p><b>CIDA:</b> Support to EPS for Environmental Impact Assessments Studies</p>			<p><b>CIDA:</b> TA in review of EMS (Completed)</p> <p><b>CIDA:</b> TA in Live Line Maintenance (On hold)</p> <p><b>CIDA:</b> TA in Unbundling of Transmission Functions (GridCo + ISMO)</p> <p><b>WB:</b> Introduction of FMS for discos (in progress to June 05)</p> <p><b>EC:</b> Under discussion: TA and support for investments required for creation of ISO/ MO</p> <p><b>EC:</b> Training and skills development for restructured industry</p> <p><b>Seco:</b> Assistance for modernization of dispatch center</p>		
<b>Romania</b>	<b>CIDA:</b> Under Discussion: TA for the Creation of an Ancillary Services Market		<p><b>USAID:</b> Review of Draft Law and regulations; new TA on draft renewables law; and regulations aimed at market liberalization and market monitoring</p>	<p><b>USAID:</b> Institutional strengthening and partnerships</p> <p><b>EC:</b> Various</p> <p><b>CIDA:</b> TA on Establishment of a Compensation Fund for equalization payments to maintain uniform tariff structure under an open market.</p>	<p><b>EC:</b> Support of EBRD TSO Loan</p>	<p><b>USAID:</b> New TA on market implementation (vesting contracts, long term contracts, price caps, power exchange rules)</p> <p><b>CIDA:</b> Development of Guarantees for Market Participants.</p> <p><b>CIDA:</b> Under Discussion: TA for the fine Tuning of the National Electricity Market</p> <p><b>WB:</b> Romania electricity market project (implementation period 2003-08)</p>	<p><b>USAID:</b> Generation Strategy Study and due diligence for sale of Turceni and Rovinari TPPs (completed). New TA for continued support of sale of energy sector assets (TPPs, municipal power plants)</p> <p><b>EC:</b> Preparation for Disco Tenders</p>



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Turkey	<b>EC:</b> Technical studies for the synchronous interconnection of the Turkish power system to the UCTE network			<b>EC:</b> – Institution building of the energy regulator - Establishment of a regulatory information system  <b>WB:</b> Energy Sector Reform programme (the institutional part of the National Transmission Grid Project)	<b>WB:</b> National Transmission Grid Project: support to the TSO, trading and distribution companies		
UNMIK-Kosovo	<b>KfW:</b> Emergency Aid Energy III (implementation 5.1 MEuro)  <b>KfW:</b> Emergency Aid Energy Program UNMIK/DANIDA (implementation 4.5 MEuro)	<b>KfW:</b> Emergency Aid Energy III (implementation 5.1 MEuro)			<b>USAID:</b> TA for tender and selection of KEK management contract  <b>CIDA:</b> Needs assessment study to be conducted in September 2003		
Slovenia		<b>CIDA:</b> Strategy for the application of the Kyoto Protocol to the power sector  <b>CIDA:</b> Development of power sector performance indicators to assess the impact of national energy policies.			<b>CIDA:</b> Review of revision and balancing market rules		







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