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# Electrifying integration: Electricity production and the South East Europe regional energy market

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ABSTRACT

The paper provides an overview of the generation of electricity in 10 countries in South East Europe during 1995–2004. Using the latest available statistics, we explore the potential of the nascent integration of the electricity markets in South East Europe. We conduct a cross-country analysis of electricity production based on different types of fuel used. The region has a low level of gasification combined with few nuclear power generation facilities, while some countries heavily rely on hydro electric generation. Differences in countries' resource endowment and the possibility of intertemporal substitution between electricity generated from various fuels could stimulate a regional trade in electricity. As an alternative to nationally independent energy policy, regional trade could displace a proportion of the substantial investment in generation facilities required to avert serious supply shortages. Finally, we consider the environmental impact of electricity generation, and identify some of the key trade-offs between different policy objectives.



## 1. Introduction

During the last decade South East Europe (SEE) has witnessed the collapse of the socialist system as well as several wars, which deeply affected the social and economic life of people in the region. The last conflict ended in 1999 and was followed by peacekeeping operations in Bosnia, Kosovo and by a limited NATO engagement in FYR Macedonia. The years of war damaged and in places completely destroyed electricity generation and transmission infrastructure that was already suffering degradation due to economic decline. Finally, after a long period of turbulence, the South East Europe (SEE) region has entered a period of economic growth and investment opportunities. Significant attention is now focused on the energy sector and, particularly, on electricity, which is vital to economic growth and the prosperity of the region.

The history of regional integration in SEE has been outlined earlier in this volume.[1] Critically, in 2005 the nations and territories of the region entered a legally binding agreement, the Energy Treaty, which established the Energy Community of South East Europe (ECSEE), and committed the parties to the formation of a regional electricity market. All members are new or aspiring members of the European Union (EU), and are therefore implicitly or explicitly required to implement EU Energy Policy, and to pursue its three fundamental objectives: competitiveness, security of supply and sustainability.

This paper provides an overview of electricity generation in 10 countries[2] in SEE between 1995 and 2004. We conduct a cross-country comparison of electricity production based on fuel type, then consider the environmental impact of electricity generation, and outline some of the key trade-offs between different policy objectives. This enables us to explore regional as well as national questions and to discuss potential demand and supply risks that the region and each country separately might face in the near future.

Economic development in SEE has been and remains a focus of activity by several international organizations including the World Bank, European Commission (EC), European Bank of Reconstruction and Development, as well as development agencies in the USA, Germany and Canada. The energy sector has been the subject of particularly active engagement and a series of influential studies has ensued.

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[1] Forthcoming in Utilities Policy, 2008. See also EPRG0725 Michael Pollitt "Evaluating the evidence on electricity reform: Lessons for the South East Europe (SEE) market" – http://www.electricitypolicy.org.uk/pubs/index.html?year=2007.

[2] Albania, Bosnia, Bulgaria, Croatia, Greece, FYR Macedonia, Romania, Serbia and Montenegro, Slovenia, Turkey.

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A World Bank working paper by Kennedy and Besant-Jones (2004) sets out the strategy of the Bank with respect to the development of the SEE regional electricity market, focusing on risks the region as a whole might face, and possible ways to deal with them. The South East Europe Generation Investment Study (GIS, 2005) and the subsequent updated version (GIS Update, 2007) present forecasts of demand and generation to 2020 for several plausible scenarios, and from their simulations generate estimates of required investments in electricity infrastructure in the region. The reports cover nine territorial entities: Albania, Bosnia, Bulgaria, Croatia, Kosovo, FYR Macedonia, Montenegro, Romania, and Serbia. Kennedy and Besant-Jones (2004) and GIS (2005) report that there was very limited investment in generation capacity during the 1990s; currently the average age of electricity generation plants is around 30 years. Without significant investment in refurbishment and new plants, and without the improvement of interconnections between countries, the region will become increasingly dependent on imported electricity or even face shortages. Indeed, in late 2005 Tirana, Albania, experienced widespread power cuts of up to 18 h duration due to poor reliability and particularly dry hydrological conditions (Economist, 2006).

Academic studies of the restructuring of electricity markets in both developed and developing countries are numerous. Davies et al. (2005) outline various privatization and regulation issues that developing countries may face, with a particular focus on the sequence of reforms. Both Tompson (2004) and Pittman (2007) provide a detailed description of the restructuring of the electricity sector in Russia. Other studies identify useful lessons which could be drawn from the developed countries that recently liberalized, privatized and restructured their electricity sector. Arocena and Waddams (2002) empirically assess differences between state and private electricity generating companies in Spain. Using data on physical units, the authors show that privately owned generating companies are moving faster towards the efficiency frontier. Jamasb (2002) and Jamasb et al. (2005) review different reform experiences in developing countries, and stress the importance of effective institutions in achieving desirable outcomes.

In this analysis we used the International Energy Agency (IEA) data on annual national electricity production and consumption for OECD and non-OECD countries for the period of 1995–2004.[3]

We briefly consider examples of electricity market integration in Europe, and against this background, provide an overview of the rationale for electricity market integration, an exploratory analysis of electricity generation in the region, and consider the potential environmental impact of pursuing a generation expansion plan of the required magnitude to meet demand growth.

## 2. Integrating national markets

In 1991 Norwegian electricity markets were deregulated and competition was introduced in generation and supply.[4] In 1996 Sweden took up the challenge of deregulation; a common spot-market, NordPool, became the first multi-national power exchange and steps were taken to reduce barriers to cross-border trade. Finland completed the deregulation process in 1997, and finally in 2000 the Nordic market was fully integrated when Denmark East became a NordPool power exchange area.

There are several important things to note about this process and local conditions. First, it took almost 10 years to accomplish complete integration, and as late as 1998 the Nordic Electricity Market was regarded as an 'emerging' market (Amundsen et al., 1998). Second, prior to 1991, trade between Norway and Sweden was conducted through bilateral contracts, and while NordPool Spot is now a liquid market and trading volumes are over 60% of total electricity consumption in the Nordic countries,[5] in 1998 less than 20% of total electricity consumption of Norway, Sweden and Finland was traded in the spot-market. Third, although the received wisdom holds that the key driver for integration was legislation by the European Commission, there is increasing recognition of the view that the establishment of the Nordic market was the outcome of a 'gentleman's agreement': it suited the strategic plans of the market participants and governments concerned. Fourth, the integration of the Nordic market was initiated at a time of relative surplus in generating capacity and transmission constraints were not generally binding since transmission capacity was adequate relative to the volumes of trade.

Integration of electricity markets in Belgium–France–Netherlands, the so-called trilateral coupling (TLC) started in November 2006. By early 2007 these markets were already exhibiting a considerable degree of price convergence, and for the period November 2006–August 2007, the region shared a single price for 58% of hours (APX, 2007). In February 2007 proposals were announced for Germany and Luxembourg to join, to form the Central West European market. It is worth noting that the time taken to operationalize integration appears to be significantly different in the two cases considered. A single price area in the Nordic market was established over many years, while it apparently evolved in a matter of months in the TLC. There may be many reasons for this difference, but critically, the TLC involved the integration of markets where actors were already accustomed to trading electricity; wholesale market competition was introduced in 1998, and perhaps more importantly, the market infrastructure and rules were well established and market participants had built up a body of experience. It is therefore arguable that the integration process took place over a comparable period of time.

The fundamental motivation for trade is to minimize costs by dispatching the cheapest plant available for each period, and the rationale for integrating national electricity markets is to maximize cross-border capacity and adopt rules and procedures for efficient cross-border trade such that the consumers of the nations concerned benefit. Benefits accruing from the effects of market integration can be thought of as falling into three groups. The first benefit concerns the development of competitive (cost-reflective) prices. Where vertically integrated systems are too small for intra-national competition to be workable, integrating national networks inevitably reduces market concentration and may constrain the potential to exercise market power. Amundsen et al. (1998) find that in the presence of market power and monopolistic pricing, free trade in electricity between nations might provide an effective substitute for competition at the national level, particularly where there is considerable variation in prices. Additionally, larger markets can support more liquid wholesale markets which discipline market participants and encourage cost-reflective pricing.

A second group of effects concerns security of supply. Centrally coordinated dispatch over a region with a non-synchronous peak requires, on average, a lower reserve margin than is required under national operation. Similarly, diverse resource endowments and generating technologies across the region could offer greater resilience to external shocks, given adequate interconnection capacity. For example, a system in which a substantial proportion of electricity is generated from hydro may be vulnerable to persistent dry hydrological conditions, as in the case of Albania mentioned above. Lastly, the failure of a reasonably sized generator in a small

[3] The access to the IEA database was kindly provided by the UK Economic and Social Data Service (www.esds.ac.uk).

[4] Transmission and distribution remained regulated monopolies.

[5] http://www.nordpoolspot.com/about/.