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Appendix 1: Review of econometric studies into the relationship between GDP per capita and electricity demand

Table A1.1: Previous economic studies that have examined the relationship between electricity demand, income and prices

Year	**Paper** Author(s) *Source*	Summary
1999	**Electricity Demand by the Commercial Sector in Kuwait: An Econometric Analysis,** Eltony,-M-Nagy; Hajeeh,-Mohammad, *OPEC Review*	This paper models and estimates electricity demand by the Kuwaiti commercial sector, using an error correction model. It also simulates the estimated model under three scenarios and presents an analysis of the results. The empirical results indicate that short- and long-run electricity consumption and the level of economic activity are interrelated. The forecasts show that electricity consumption varies directly with economic growth.
2000	**An econometric analysis of electricity demand in Turkey,** Bakirtas,-Tahsin; Karbuz,-Sohbet; Bildirici,-Melike, *Middle East Technical University Studies in Development*	The aim of the paper is twofold: first, to investigate the long-run economic relationship between electricity demand and income in Turkey for the period 1962-96 using the concept of cointegration and error correction modelling. Second, to model the electricity consumption using univariate ARMA process and to make forecast for the years 1997-2010. The results indicate that electricity consumption and income are cointegrated, i.e., they tend to move together in the long run. Using error correction specification, the short- and long-run elasticities of income are estimated. The results show that income elasticity of electricity consumption is very high and electricity consumption in the future will continue to grow at higher rates.
2001	**Electricity consumption and economic growth in China,** Kui-yin Cheung, Elspeth Thomson, *Pacific and Asian Journal of Energy*	This study examines the causal relationship between the consumption elasticity and economic growth in China during the period 1952-2000. Through the use of cointegration techniques it is found that the long-run income elasticity was 1.1. The error correction model showed that there exists bidirectional causality between the gross domestic product and electricity consumption. In other words, there is a Granger-type causal relationship between the electricity consumption and economic growth.
2001	**The Relationship Between Energy Consumption and Economic Growth in Pakistan,** Anjum Aqeel and Mohammad Sabihuddin Butt, *Asia Pacific Development Journal*	This paper investigates the causal relationship between energy consumption and economic growth and employment in Pakistan. By applying techniques of co-integration and Hsiao's version of Granger causality, the results infer that economic growth causes total energy consumption.

Earlier studies also suggested a strong relationship between electricity demand and GDP. These studies cover different groups of countries – thus giving different estimates of the elasticity of electricity consumption with respect to GDP.

Table A1.2: Earlier studies in which the income elasticity of demand for electricity was estimated

Year	**Paper,** Author(s), *Source*	Summary
1981	**The energy - GDP relationship in developing countries,** Ben-Zion Zilberfarb, *Energy Economics*	This study uses cross section and pooled cross section time series data to find that the elasticity of energy consumption with respect to GDP in developing countries is in the neighbourhood of 1.35, and significantly above one. Over the period covered, 1970 to 1976, the relationships appear to have remained stable. There are significant differences between areas of the world, but the differences in the elasticities between different continents are not large
1985	**Demand elasticities in the OECD: dynamical aspects,** Richard D. Prosser, *Energy Economics*	Four models with different lag structures are used to express final energy demand in OECD from 1960–1982 as a function of real GDP and average energy price. The income and long-run price elasticities are not significantly dependent on the model specification, but the Koyck lag scheme, estimated in its distributed lag form, is found to give the most satisfactory results. The statistical properties of the data together with evidence of trends in the elasticities both suggest that the period of falling real prices prior to 1971 is not comparable to the present period. For the period after 1971, an income elasticity of 1.02 is obtained.
1986	**Energy-GDP relationship and capital intensity in LDCs,** Dinesh Desai, *Energy Economics*	This study provides an updated estimate of the GDP elasticity of energy consumption for LDCs. It uses a production function approach in determining this elasticity. Energy consumption is explained in terms of economic activity, capital intensity and structure of economy. The elasticity is found to be less than unitary.

Co-integration relationship between electricity demand and GDP

The co-integration approach is commonly employed for estimating the long run relationship between electricity consumption and GDP. The articles listed below provide support for our chosen methodological approach in the absence of sufficient reliable price data.

Table A1.3: Demand forecasting studies using co-integration analysis

Title	Author	Year Published	Relevance
Demand Forecasting for Electricity	Meetamehra	Unknown	• Co-integration is useful for estimating long-run relationships. • Difficult to estimate the price elasticity due to administered tariffs and supply bottleneck (in India).
Electricity Demand Analysis Using Co-integration and Error-Correction Models with Time Varying Parameters: The Mexican Case	Yoosoon Chang, Eduardo Martinez-Chombo	2001	• Specification test for model suggest time varying coefficient cointegrating model • Electricity price coefficient not significant in the regression. This suggests that electricity prices do not significantly affect in the long run the residential and commercial demand for electricity in Mexico.
Electricity Demand in the People's Republic of China: Investment Requirement and Environmental Impact	Bo Q. Lin	2003	• Co-integrating approach to electricity demand forecast. • Problems in getting price data due to administrated prices and differences in tariffs within and between provinces. • Used the fossil fuel price indexes published by the National Statistics Bureau of China as a proxy of electricity prices.
Modelling the causal relationship between energy consumption and GDP in New Zealand, Australia, India, Indonesia, The Philippines	K. Fatai, Les Oxley, F.G. Scrimgeour	2004	• Causality test using different approaches and tried bivariate vs multivariate (including price data) for several countries. • Concluded that approaches (which exclude price data) could explain electricity demand even when using

Title	Author	Year Published	Relevance
and Thailand			different methodologies. • Multivariate approach (including prices and/or ECM term variable) gave similar results as bivariate approaches. • Consequently, the relationship between GDP and electricity consumption could be estimated in the absence of price data.

Appendix 2: Details of the econometric analysis of the relationship between GDP per capita and net electricity consumption

We have undertaken a review of the economic analysis of the relationship between national income and demand. Most studies tend to suggest that for each 1% increase in GDP per capita, electricity demand increases by between 0.9% and 1.2% depending on the country and time period under consideration.

Our own analysis of transition economies suggests that a 1% increase in GDP per capita results in a 1.2% increase in net electricity consumption in the long term.

We extend the simple national/income electricity demand relationship by also examining the impact of:

- The relative electricity intensity (measured as GWh per US$ of GDP in 1995 terms) of the jurisdictions under consideration when compared with other economies that have been through transition; and also

- The lagged effect of electricity demand in the previous year.

This is done by applying a standard co-integration model, which models the return to 'equilibrium' of electricity intensity of the jurisdictions under consideration. The 'equilibrium' level is proxied by the experience of transition economies in Eastern Europe, and therefore suggests the reform of electricity pricing towards economic, cost-based levels, as occurred in these countries. By doing this, the model also implicitly includes the impact of changing economic structure towards that of the transition economies we modelled.

Using a simple long term model, the long-term relationship between the GDP per capita and electricity consumption would be estimated as the following:

$$LELCO(i) = Constant(i) + \alpha\, LGDPPC(i)$$ for each country *i*.

Where:

	LELCO(i)	Log of electricity consumption per capita for country *i*
	Constant(i)	Constant term adjusting for departure from trend for country *i*
	LGDPPC(i)	Log of GDP per capita in the year 2000[1] for country *i*

We estimated this model for data on comparative countries in conjunction with the Balkans countries. Our data sample included Central Eastern European (CEE) countries such as the Czech Republic, Hungary and Poland, as these countries are similar in historical background. However, the Eastern European countries have made progress in their transition to market economies, and may therefore provide an indication of the transformation the Balkan countries could achieve. Some other European Union countries, for example, Ireland, Portugal and Spain were also considered. Other comparators included were the South East Asian economies and selected South American countries, which have achieved substantial growth in recent decades.

[1] Stated in 1995 prices.

The long term electricity demand relationship we estimate for each jurisdiction is:

$$LELCO(i) = Constant(i) + 0.889\ LELCO\ (-1) + 0.133\ LGDPPC(i)$$

Where:

LELCO(i)	Log of electricity consumption per capita for country *i*
Constant(i)	Constant term adjusting for departure from trend for country *i*
LGDPPC(i)	Log of GDP per capita in the year 2000[2] for country *i*

The coefficient of the lag term (0.889) in the model reflects the degree of persistence in electricity demand – the degree of dependence of current electricity demand on the previous period's demand. This coefficient regulates the rate at which the model will predict that electricity demand returns to its assumed long run trend level relative to GDP.

The treatments of the lag term for Bulgaria and Serbia (excluding UNMIK) differ from the rest of the countries. These two countries have significantly higher electricity intensity than the other countries. As such, the degree of electricity intensity levels returning to 'equilibrium' is affected by the ability to reform, which in turn would be affected by the extent of over-usage. Estimating the rate of reform for different jurisdictions is extremely problematic, particularly when the distance from 'equilibrium' is so great. We therefore model the inability to correct the over-usage by giving these two countries different lag terms, which are more appropriate for countries with relatively very high levels of electricity consumption.

The constant varies by jurisdiction. The variation represents the amount of adjustment required by each jurisdiction to reach long term trend levels of electricity intensity.

Standard specification tests have been carried out to ensure that the model does not suffer from biases. Each regression is checked for

- Co-integration –The residuals of the regressions were tested for non-stationarity (known as unit root test). Stationary residuals would suggest that the variables in the regression are co-integrated, i.e. there exists a long term relationship between the variables. Regressions that fail the co-integration tests would not be included in the sample.

- Omitted variables – Our approach is "general to specific", where lag terms of variables were included in the initial regression. The lag terms were then tested to see if they were significant, and those that fail to be significant were removed, to obtain the final regression equation for each country.

- Coefficient of lag term – The lag term is tested as to whether it differed significantly from 1. It was found that the lag term was significantly different than 1 for each regression, and therefore calculation of the long-term GDP coefficient is possible.

- All of the estimated models for the comparator countries passed these tests to the standard 95% confidence level.

[2] Stated in 1995 prices.

Appendix 3: Basis for long term GDP per capita growth forecasts

We have included the jurisdictions included in the Study into three categories:

- Category 1: The higher income SEE jurisdictions i.e. Croatia;
- Category 2: Middle income jurisdictions that has embarked on the economic reform process (FYR of Macedonia, Romania, Bulgaria, Bosnia and Herzegovina);
- Category 3: The lower income countries in the region (Albania, Serbia and Montenegro, UNMIK)

For each of the three categories we review in turn:

- Recent developments in each of the economies included in the Category;
- Economic outlook for the economies;
- External economic growth forecasts for the economies;
- Performance of other economies in the Category income range; and
- Medium term scenarios for the economies.

Category 1

Category 1 includes only one of the southeastern Europe economies under consideration: Croatia.

Croatia

Recent developments

Background: The period from 1992 to 2000 for Croatia was marked by war and economic hardship created by the costs of accommodating refugees. The Government that took office in early 2000 embarked on a reform process that has achieved closer international integration and further liberalisation of trade and prices, and has introduced laws to liberalise the infrastructure sector. Other economic objectives include macroeconomic stabilisation, imposing budget constraints on loss-making public enterprises, restructuring the business sector, accelerating privatisation and facilitating foreign investment.

Growth: Real GDP growth per capita averaged 4.0% between 1996 and 2001. More recently, household consumption growth has decelerated steadily, a result of the HDZ's (the central bank of Croatia) liquidity-tightening measures. In contrast, fixed investment has been growing rapidly, driven by continued heavy spending on the national motorway construction programme. Prices have remained generally stable and inflation in 2003 was just 1.7%. Wage growth and strong domestic demand, along with expected price liberalisation for electricity, gas and water in 2004 should lead to a rise in inflation.

External conditions: Croatia has become a member of WTO, has signed a Stabilisation and Association Agreement (SAA) with the European Union and has joined NATO's Partnership for Peace Programme. The current account deficit (denominated in USD) has been widening, partly due to the currency strengthening. The trade deficit is expected to continue widening but at a much slower rate, held back by the effects of monetary policy measures to restrain import growth.

Foreign Direct Investment: Since 2000, the government has focused on attracting foreign investments, through the introduction of investment incentives, reduction of payroll and corporate taxes and accelerating privatisations. As a result, the investment climate has been gradually improving, with higher inflows of FDI. The bulk of FDI so far is connected to privatisation deals, although other inflows have been increasing.

Economic reform: The government has been successful in privatising some key sectors of the economy, such as the financial services industry and telecommunications. The government has also taken important steps to tackle alleged administrative shortcomings in the public sector.

Economic Outlook & External forecasts for Croatia

Croatia is expected to maintain a healthy economic growth rate over the next two years, of around 4-5% per annum. The desire to join the EU suggests that structural changes will occur, but the pace will be determined also by the political conditions of the jurisdiction - which have been fragile. Inflation has been maintained at low levels, but the liberalisation of prices in utilities may exert some upward pressure on inflation.

Table A3.1: EIU *Feb 2004*

	2003	2004	2005
Real GDP (% change)	4.6	4.2	4.6
Retail prices (% change; av)	1.5	2.2	2.6
Current-account balance (% of GDP)	-6.0	-4.2	-3.4

Table A3.2: IMF Nov 2003

	2003	2004
Real GDP (% change)	4.7	4.5
RPI inflation (% change; av)	1.7	3.5
Current-account balance (% of GDP)	-5.9	-5.2
External debt (% of GDP)	68.4	67.8

Performance of other Category 1 economies

A number of the CEE and EU economies fall within the Category 1 income range, as detailed in Table A3.3 below. With the exception of the Czech Republic, these economies have achieved relatively robust GDP growth of around 4-5% per annum since their economies ended their post-communism decline in 1993. The average growth rate across

all of these economies is 4.0%, which indicates the potential growth rate of post-communist transition economies aiming for EU accession.

Table A3.3: Eastern European transition economies

	GDP pc (1993)	*GDP pc (2001)*	*Average annual growth rate*
Czech Republic	$4,610	$5,580	2.4%
Hungary	$4,150	$5,540	3.7%
Estonia	$3,150	$4,710	5.1%
Slovak Republic	$3,210	$4,410	4.0%
Poland	$2,560	$3,720	4.8%
Average annual GDP per capita growth rate			**4.0%**

Some other economies within Category 1 have achieved more rapid economic growth. As detailed in Table A3.4, both Chile and Malaysia achieved average GDP per capita growth of around 4-5% per annum during the 1986 to 2001 period (which was generally a period of robust economic growth performance by emerging markets). It should be noted that both of these economies have suffered economic recessions within this period, but nevertheless on average maintain a healthy level of growth.

Table A3.4: Selected Category 1 "tiger" economies

	GDP pc (1986)	*GDP pc (2001)*	*Average annual growth rate*
Chile	$2,680	$5,390	4.8%
Malaysia	$2,540	$4,710	4.2%
Average annual GDP per capita growth rate			**4.5%**

Table A3.5 details the GDP per capita performance of Category 1 economies in Latin America and Turkey over the period 1990 to 2000. These economies did not achieve average growth rates as high as those in CEE or the "tiger" economies, as their economies were mired by sharp financial crises and currency instability. On average, they achieved GDP per capita growth of 2.3% over this period.

Table A3.5 Latin America and Turkey

	GDP pc (1990)	*GDP pc (2000)*	*Average annual growth rate*
Argentina	$5,780	$7,910	3.2%
Brazil	$4,080	$4,630	1.3%
Mexico	$3,190	$3,810	1.8%
Costa Rica	$2,950	$3,930	2.9%
Panama	$2,520	$3,280	2.7%
Turkey	$2,580	$3,150	2.0%
Average annual GDP per capita growth rate			**2.3%**

Medium-term scenarios for Category 1 countries

We have developed three scenarios for the Croatian economy, based on the information presented above. The main scenario seeks to present the most-likely central forecast for the economy, while the high and low scenarios seek to highlight the uncertainties surrounding the economic outlook.

Main Scenario

In the main scenario, Croatia would experience growth of 4%[3] per annum, similar to the Eastern European average. The commitment of the government to economic reform and the desire to join the EU suggest that structural changes would continue to occur. Privatisation of public utilities and large enterprises as well as price liberalisation for utilities prices are expected to be carried out.

High Scenario

In a high growth scenario, Croatia would be able to outpace the Eastern European economies and grow at about 5% per annum. The government would manage to carry out further fiscal consolidation, and acceleration of structural reforms. Sectors such as agriculture would also receive attention in restructuring. The comparable economic status with EU countries like Hungary and Estonia would make successful accession into the EU extremely plausible.

Low Scenario

The downside-risk comes from regional underperformance caused by instability in other South Eastern European countries. Incomplete reform or political uncertainty within the jurisdiction may also hamper growth expectations. In this scenario, we would expect Croatia to attain growth of only 3% per annum. This scenario would be more in line with the growth performance of economies in Latin America and Turkey over the past decade.

Category 2 – FYR of Macedonia, Romania, Bulgaria, Bosnia and Herzegovina Introduction

The Category 2 countries in general have been growing modestly at around 3-5% per annum. Substantial progress in economic reform has been made, in the form of privatizations of small and medium sized enterprises, and some improvement in macroeconomic stabilisation. Privatizations of larger state-owned enterprises have been much slower, albeit in progress, and improvement in the general business environment (creating greater transparency and regulations) is still needed.

Below, we review recent developments and the short term economic outlook for the four countries separately, and then review medium term prospects for these Category 2 economies based on a review of the performance of other Category 2 economies

[3] We have used 4.2% pa in the demand forecast as it is recommend by the government of Croatia

Macedonia

Recent developments

Background: In 2001, inter-ethnic violence prompted the signing of the Stabilisation and Association Agreement (SAA) with the EU on 9th April 2001 to establish a Europe Committee to enhance political and inter-ethnic dialogue. The situation deteriorated nevertheless, resulting in Macedonian Albanians fleeing the country to southern Kosovo and Serbia whilst ethnic Macedonians moving to other parts of the country. NATO finally negotiated a cease-fire in June and successfully reduced the violence in the country whilst the political situation improved.

Growth: In 2000, notable progress was made in transition and in laying the foundations for sustainable economic growth, and significant reforms were introduced, including the acceleration of large-scale privatisation and better banking supervisory standards. These achievements have been, however, seriously jeopardised by the 2001 conflict. Economic activity declined sharply and key reforms were put on hold. The economic costs of the conflict have included trade disruption, the collapse of business confidence, both foreign and domestic, and the heavy fiscal burden of security expenditures.

External conditions: The continued engagement of international organisations in Macedonia will help to reduce the risk of a relapse into inter-ethnic conflict, at least in the short term. EU's military peacekeeping mission that took over from NATO is likely to be extended until the end of 2004 at least, focusing on combating organised crime, setting up a border police and co-operating more closely with other police forces. EU is also the country's main trade partner and account for about half of its foreign trade.

Foreign Direct Investment: As of end 2001, cumulative foreign direct investments since 1991 amounted to little more than USD 800 million, while domestic investment is constrained by the low savings rate and lack of access to capital and by administrative and legal barriers to investment. FYR of Macedonia has benefited over the last decade from access to loans on favourable terms from the international community, and the external debt burden, at around 40% of GDP, is relatively moderate. However, the scope for incurring new sovereign loans is limited.

Economic reform: The EBRD identified several significant transition challenges for FYR of Macedonia, in particular: (i) improving the business environment for investors, (ii) privatising or liquidating large loss-making companies and promoting post-privatisation enterprise restructuring and the development of institutional and financial support for SMEs; (iii) commercialising and privatising utilities, building upon the earlier success of the telecom privatisation, and developing critical regional infrastructure; and (iv) strengthening and consolidating the banking sector and developing non-bank financial institutions.

Economic Outlook & External forecasts for FYR of Macedonia

The short-term outlook for the economy of FYR of Macedonia suggests GDP growth of around 4% per annum in 2004 and 2005. Continued international engagement and the bi-ethnic composition of the ruling coalition should help to reduce the threat of a return to the

conflict experienced in 2001, but the risk of inter-ethnic violence remains at least in the short term. FYR of Macedonia is expected to apply formally for EU membership, but there is no indication that the EU will look favourably on such an application at this stage. Although EU accession remains a distant prospect, FYR of Macedonia has realistic hopes of joining NATO in the next few years (FYR of Macedonia signed the US-Adriatic Partnership Charter in May 2003, with a view to increasing co-operation with NATO). The stand-by arrangement with the IMF has brought about some official financing, although the policies that the agreement entails could lead to social unrest. The economic recovery is expected to accelerate in 2004-05, reflecting increased foreign funding and a pick-up in both investment and private consumption. Despite an expected recovery in merchandise exports, the current-account deficit is likely to remain large in 2004-05, at nearly 7% of GDP.

Table A3.6: EIU *Feb 2004*

	2003	2004	2005
Real GDP (% change)	3.0	3.8	4.5
Retail prices (% change; av)	1.2	2.4	2.5
Current-account balance (% of GDP)	-7.5	-6.7	-6.7

Romania

Recent developments

Background: The reform in post-communist Romania has focused on gradualism. Successive macroeconomic stabilisation programmes have been undermined by a persistent failure to undertake difficult structural reforms. The main policy tasks facing the government are further fiscal consolidation, and the restructuring and privatisation of large state enterprises and utilities.

Growth: GDP growth has been driven by high rates of investment in fixed capital formation, while the growth in public consumption moderated due to a tightening in fiscal policy. Periods of positive growth have however been accompanied or superseded by high inflation and macroeconomic imbalance. The present government, however, has been more committed to macroeconomic stabilisation and structural reform, through an 18-month stand-by arrangement with the IMF in 2001, and a public sector adjustment loan with the World Bank.

External Conditions: The country's international standing has strengthened with better macroeconomic conditions and enhanced market sentiment toward Romania. Improved regional political stability has led to the signing of bilateral free trade agreements with most of Romania's neighbours and the planning of a regional energy market. Romania has two main foreign policy priorities: to become a member of NATO in 2004; and to sign an accession treaty with EU by the end of 2005 so as to have a chance to join by the target date of 2007 (along with Bulgaria). However, Romania was not granted recognition by the European Commission as a “functioning market economy” (FME). Nevertheless, the EC has been positive about Romania’s progress, evidenced by the detailed road maps to Romania’s membership and increased pre-accession funding.

Foreign Direct Investment: Comparatively low wages, rising productivity, attractive market size and location, and the prospect of EU accession are key factors for foreign investors willing to relocate production facilities into Romania. However, the country's poor investment climate and the high level of bureaucracy and other administrative barriers remain major obstacles to further private sector development and higher net foreign direct investment (FDI) inflows.

Economic reform: Although most of small and medium-sized public enterprises have been privatised, large-scale privatisation have been slow. A major problem in Romania is weakness in the rule of law. Transparency International considers Romania as one of the most corrupt countries in the world. Property rights are weak. There are serious concerns by the EC on its judicial independence. The EBRD has committed to support the privatisation momentum in the energy sector, the required regulatory reforms as well as focus on the affordability issues raised by privatisation and reforms.

Economic Outlook & External forecasts for Romania

The economy is expected to grow around 4-5% per annum in 2004 and 2005, driven by new investment activity. Strong import growth is expected, which will make it difficult to reduce the current-account deficit. Increases in real wages and continued rapid credit growth will continue to boost consumption. Fall in inflation levels is forecast to continue. However, the inflation level will remain high, generated by a continuation of the consumer credit boom. This will also lead to real effective appreciation of the currency at least for the short term.

Table A3.7: EIU *Feb 2004*

	2003	2004	2005	2006	2007	2008
Real GDP (% change)	4.8	4.9	5.1	5.0	4.5	4.3
Consumer price inflation (% change; av)	15.4	12.7	9.8	8.2	6.7	5.8
Current-account balance (% of GDP)	-6.3	-5.5	-5.2	-5.2	-5.2	-5.1

Bulgaria

Recent developments

Background: Following the 1996-97 economic crash, reforms initially focused on stabilising the economy, with the help of a currency board, support from the IMF, tight budgetary policy, strict banking supervision, structural reforms and privatisation. Reducing the high level of unemployment has become a policy priority for the government. Future reforms will focus on the commercialisation or privatisation of utilities and on adapting Bulgaria's legislation to EU standards.

Growth: The loss of protected markets under communism led to a steep decline in output in the 1990s. The recovery since 1997-98 has been slow and partial in industry, and almost non-existent in agriculture. A rise in the importance of services indicates a move towards

modern, service-oriented economy. In recent years, robust GDP growth has been attributed to strong domestic investment growth, fuelled by a rapid expansion of credit to the private sector and further progress in structural reforms.

External Conditions: Improved political stability on a regional level has led to signing of free trade agreements with all neighbouring countries and an increasing role for Bulgaria as a regional energy hub. Bulgaria is broadly on track to join the EU in 2007, and recognised as having a functioning market economy. A lower trade deficit, higher receipts from a booming tourism sector, and lower interest payments on debt, have contributed to a significant reduction in the current account deficit in 2002.

Foreign Direct Investment: FDI remains low compared to the more advanced accession countries, partly due to Bulgaria's weak, albeit improving, investment climate.

Economic reform: Privatisation and structural reform have been slowing down. There is also the need to proceed further with judicial reform and combating corruption. Other key transition challenges identified for Bulgaria are to: accelerate the deregulation and privatisation of the energy sector; strengthen the administrative and implementation capacity of the public administration; and focus on social issues and sustainable improvement of living standards while maintaining macroeconomic stability.

Economic Outlook & External forecasts for Bulgaria

The economy is expected to grow by around 4% per annum in 2004 and 2005. Economic policies are expected to focus on EU accession requirements and on completing a number of major privatisations. The current-account deficit rose sharply in 2003 but is forecast to narrow gradually as a share of GDP, though still be around 7% of GDP by 2005.

Table A3.8: EIU *Feb 2004*

	2003	2004	2005	2006	2007	2008
Real GDP (% change)	4.5	4.2	3.8	4.6	4.6	4.4
Consumer price inflation (% change; av)	2.3	4.6	4.2	3.8	3.7	3.4
Current-account balance (% of GDP)	-8.3	-7.5	-6.9	-6.6	-6.1	-5.9
Foreign Direct Investment (US$ bil)	0.65	0.70	0.65	0.68	0.68	0.68

Bosnia & Herzegovina

Recent developments

Background: Macroeconomic stabilisation and structural reforms have been moving forward, supported by low inflation and continued rapid GDP growth. The acceptance of the new currency is achieved through fiscal restraint and strict adherence to the currency board rules, and has led to an increase in official reserves.

Growth: The economy has grown at double digits after the conflict of 1992-1995, reflecting recovery. It has begun to slow since 2000, and the real GDP has only reached about half the pre-war level. The economy is still very fragile, GDP per capita at around US$ 1,400 is among the lowest in Europe, and unemployment and poverty are widespread. Pent-up demand fuelled high levels of private consumption in the latter half of the 1990s, matched by high public-sector consumption largely financed by international donors. Investment, on the other hand, has been modest in absolute terms and mainly externally funded. By late 2001 and early 2002 there was some indication of a pick-up in domestic savings, although this was not strong enough to back up more robust investment activity.

External Conditions: As foreign assistance and post-war reconstruction aid will continue to decline, the country will increasingly be obliged to take control of its own destiny. The international community expects the new governments at State and Entity levels to implement a new reform drive.

Foreign Direct Investment: The investment climate is poor and the rule of law is not yet fully entrenched. However, FDI is increasing, at about USD 117 million in 2000, but the level is still fairly low and private capital inflow needs to increase to deal with the pressure of declining international assistance. The problem with BiH is its recent history, the weak economy and the amount of legislation and bureaucracy. Efforts are slow but under way with the help of international financial institutions to improve the investment climate.

Economic Reform: Small-scale privatisations have been moving forward, but large state-owned enterprises continue to dominate the economy. However, the pace of progress is increasing. Trade liberalisation is gradually being implemented to promote domestic competition and establish a transparent and non-discriminatory trade regime. Reforms in social benefits and taxation still face difficulties. Key challenges include: the introduction of a single customs administration and VAT to create a single economic space across Bosnia and Herzegovina; improving the business environment via strengthening of the legal framework, accelerating large-scale privatisation and improving corporate governance; and improvements to physical infrastructure through utility restructuring and privatisation.

Economic Outlook & External forecasts for Bosnia & Herzegovina

Some economic growth is expected to continue, at around 4% per annum in 2004 and 2005, putting the country towards recovery but still significantly poorer than its pre-war standards. The entity and state-level governments concluded several key reforms in 2003, which will strengthen the role of the central government and open the door for Bosnia and Herzegovina to join Euro-Atlantic structures. BiH's foreign policy will revolve around relations with the US, the EU and its regional neighbours. Economic policy trends will be guided by the priorities set out in the recently adopted poverty reduction strategy paper (PRSP), which will probably be accompanied by a three-year poverty reduction and growth facility with the IMF. The PRSP puts the reforms necessary to initiate eventual EU membership, which is at the centre of the overall reform programme. Reforms will include acceleration of the privatisation process, improving the business environment, combating corruption and organised crime, and promoting foreign investment and strengthening BiH's export sector. Exports look set to grow steadily. Implementation of BiH's recently signed free-trade agreements with several of its neighbours is also likely to improve regional

prospects for trade. With exports strengthening, and imports moderating as a result of an anticipated slowdown in consumer demand, the merchandise trade deficit and the current-account deficit are likely to narrow.

Table A3.9: EIU *Feb 2004*

	2003	2004	2005
Real GDP (% change)	3.5	3.8	4.0
Retail prices (% change; av)	0.2	0.4	N/a
Current-account balance (% of GDP)	-24.7	-20.7	N/a

Performance of other Category 2 economies

Several former Soviet Union states have comparable GDP per capita with the countries in Category 2. These economies have generally experienced healthy growth with an average growth rate of 4.4% Table A3.10. Latvia and Lithuania have recently joined the EU, another suggestion of achievable growth rates for pre-EU accession countries.

Table A3.10: Category 2 Former Soviet Union states

	GDP pc (1994)	*GDP pc (2001)*	*Average annual growth rate*
Latvia	$1,940	$2,820	5.5%
Lithuania	$1,710	$2,310	4.4%
Russia	$2,210 (1996)	$2,610	3.4%
Average annual GDP per capita growth rate			**4.4%**

Thailand, despite suffering an economic recession in 1996-97, achieved average growth rate of 5.0% over the 1986-2001 period, as shown in Table A3:11. It has successfully progressed from a primarily agrarian country to an industrializing economy, with a long period of steady growth before the recession. This gives an indication of the degree of industrialisation the Category 2 countries can potentially achieve.

Table A3.11: Category 2 "tiger" economies

	GDP pc (1986)	*GDP pc (2001)*	*Average annual growth rate*
Thailand	$1,380	$2,853	5.0%
Average annual GDP per capita growth rate			**5.0%**

Table A3:11 shows the performance of other Category 2 countries in the last decade. While some economies achieved mild growth, others had in fact a negative average growth rate in the 10-year period. The average growth rate of the selection of economies is a meagre 1.6%.

Table A3.12: Other Category 2 economies

	GDP pc (1990)	*GDP pc (2000)*	*Average annual growth rate*
Lebanon	$1,720	$2,890	5.3%

	GDP pc (1990)	*GDP pc (2000)*	*Average annual growth rate*
Peru	$1,910	$2,340	2.1%
Tunisia	$1,820	$2,470	3.1%
Jamaica	$2,240	$2,150	-0.4%
Dominican Rep.	$1,380	$2,050	4.1%
El Salvador	$1,380	$1,760	2.5%
Paraguay	$1,820	$1,700	-0.7
Iran	$1,290	$1,660	2.5%
Jordan	$1,520	$1,620	0.6%
Algeria	$1,650	$1,610	-0.3%
Guatemala	$1,360	$1,560	1.4%
Ecuador	$1,480	$1,430	-0.3%
Morocco	$1,310	$1,370	0.4%
Average annual GDP per capita growth rate			**1.6%**

Medium-term scenarios for Category 2 countries

We have developed scenarios for the Category 2 economies (FYR of Macedonia, Romania, Bulgaria and Bosnia & Herzegovina), based on the information presented above and the likelihood of EU accession. The main scenario seeks to present the most-likely central forecast for the economies, while the high and low scenarios seek to highlight the uncertainties surrounding the economic outlook.

Importantly, both Romania and Bulgaria are broadly on track to join the EU in 2007 as planned, whereas Macedonia and Bosnia & Herzegovina are unlikely to join for a number of years thereafter. We believe this has substantial implications for the likely rate of structural change and foreign direct investment, and therefore has implications for the likely pace of economic growth. Our growth scenarios are therefore higher for Romania and Bulgaria.

Main Scenario

In the Main Scenario, the economies of Romania and Bulgaria are expected to experience GDP growth of around 4.5% per annum over the 2006-2020 period. The progress in economic reform and the drive to join the EU will continue to fuel growth, drawing in foreign investments and local development of infrastructure. Privatisation of large state-owned enterprises is expected to be the main focus of reform in the near future.

In the Main Scenario, FYR of Macedonia and Bosnia & Herzegovina could be expected to achieve a similar rate of growth if they pushed for early EU accession through rapid structural change. There is a risk that this will not be the case, however, so in this scenario average GDP growth is forecast to be somewhat lower, at around 4.0% per annum over the 2006-2020 period.

High Scenario

Successful large-scale privatisation and the creation of a functioning market economy will give a positive outlook for these countries. Accession into the EU will be looked favourably upon, and the amount of foreign direct investments could pick up. Sustained growth of 5% could be achieved by Romania (although for the demand forecasts the high/case 3 scenario draws a growth assumption from the Ministry of Economy) and Bulgaria as the economies catch up with their Central Eastern European counterparts. The risk of later EU accession for FYR of Macedonia and Bosnia & Herzegovina suggests a slightly lower growth rate, of 4.5%.

Low Scenario

The downside risk unsuccessful or partial economic reforms, and the inability to attract further investments from abroad will all pose a limit to growth. In the low scenario for all four countries, growth hovers around 3%, privatisation remains limited to small and medium sized enterprises, foreign direct investments do not grow favourably, and local conditions add uncertainty to the general business environment. The risk of the low scenario is perhaps greater for Macedonia and Bosnia & Herzegovina.

Category 3 – Albania, Serbia (excluding UNMIK) & Montenegro and UNMIK

The countries within this category are amongst the poorest in Europe, and are highly dependent on agriculture. Recent conflicts left the countries trying to recover – giving high growth rates that are attributed to reconstruction, aid or transfers from abroad rather than improved economic environment. Some reforms have been carried out, but the grey economy, corruption levels and lack of regulatory and enforcement bodies continue to discourage large foreign investments.

Albania

Recent developments

Background: Despite several setbacks in the last few years, including the pyramid scheme collapse of 1997 and the influx of refugees from the conflict in neighbouring UNMIK in 1999, Albania's firm commitment to economic reform has resulted in encouraging macroeconomic results - for example growth rates of 7-8% in the last 5 years (not including the grey economy). The country appears to be politically stable, with improving national security and with external help, infrastructure is being restored and trade is boosted. Agriculture accounted for almost 50% of GDP in 2002. Industry accounted for 24% of GDP in 2002 (at current prices), down from an average of about 40% in the late 1980s. This shift reflects the reduced importance of the mining and manufacturing segments since the communist period, when the authorities pursued a policy of aggressive industrialisation. The service sector is a smaller part of the economy than in most other post-communist countries in Central Eastern Europe. This reflects the fact that Albania is at a less advanced stage of transition than many other countries in the region.

Growth: Albania's growth performance has been stable and rapid since 1998, driven mainly by private consumption, which is in part attributed to strong private transfers (especially remittance from Albanians abroad). Growth is further fuelled by construction, services, agriculture and increased productivity. The constraints lie in the decline in public and private investment, the problems of large privatisations and electricity supply, and the difficulty in keeping government expenditure and investment under control as part of its IMF agreement.

External Conditions: Trade deficit has been high but falling. However, as structural changes would be needed to improve this significantly, it will only be reduced slowly. Albania is highly dependent on EU that takes up 90% of the country's exports and provide for 70% of its imports.

Foreign Direct Investment: With greater regional stability, Albania's foreign direct investments have been increasing. It is however still at a low level and dependent on internal factors such as reductions in corruption and infrastructure improvements especially road construction.

Economic reform: Privatisation has been moving forward, mainly for state-owned SMEs. The government has turned its attention to larger enterprises and utilities, but these would be harder to conclude and may pose a strain to the general economy's growth. Key challenges identified are: combating corruption and strengthening law enforcement; accelerating energy sector reform and liberalisation of tariffs; and completing the privatisation for state-owned banks.

Economic Outlook & External forecasts for Albania

GDP growth of 6-7% per annum is expected over the next two years. The authorities would be mainly focusing on tackling low living standards, widespread poverty and high unemployment. Privatisation of state-owned large enterprises would be promoted. Public investment will concentrate on improving infrastructure, healthcare and education. Closer integration with the West is likely to remain the central tenet of foreign policy in 2004-05. Average annual inflation is expected to be about 3% in 2004-05, with inflationary pressure kept in check by IMF-endorsed fiscal constraints and lower global oil prices.

Table A3.13: EIU *Feb 2004*

	2003	2004	2005
Real GDP (% change)	6.0	6.0	7.0
Inflation (% change; av)	3.0	3.0	3.0
Current-account balance (% of GDP)	-7.3	-6.3	-6.3

Serbia & Montenegro

Recent developments

Background: Following a decade of conflict after the dissolution of the Socialist Federal Republic of Yugoslavia, in March 2002 an agreement was signed to form a loose union

between Serbia and Montenegro. In February 2003, a Constitutional Charter was adopted, under which the Federal Republic of Yugoslavia became Serbia[4] and Montenegro. They now share a common foreign and defence policy, and operate under a common market.

Growth: Real GDP growth in 2003 is about 2%, due to the weak performance in industry and agriculture. Growth in 2004-2005 is forecasted to be 4-5% p.a., driven by inflows of FDI from privatisation, government infrastructure investment, supply-side reforms that encourage enterprise creation and improve the overall business environment, and some pick-up in external demand. The priority for the new Serbian government, as well as the authorities in Montenegro, will be to encourage investment and stimulate stronger economic growth, not least in order to ensure popular support for reform. The parties in the new Serbian government broadly agree on the general direction of reform. Serbia will remain dependent on external funding, and IMF requirements will greatly limit the scope for any deviations from the present macroeconomic policy stance.

External conditions: The FRY made great efforts in rebuilding the ties with the international community that were damaged during the conflict. Serbia & Montenegro is working towards reintegration into the Euro-Atlantic structures, and has joined various international organisations including the UN and the IMF. Trade deficit in Serbia and Montenegro's balance of payments reached about US$4.5bn in 2003, reflecting the lack of international competitiveness among Serbian exporters and weak import demand across much of the EU.

Economic reform: Serbia has made much improvement in macroeconomic stabilisation since 2000, at the same time carried out liberalisation of market access to the EU. Small-scale privatisation has been progressing ahead of the IMF projected level, but large-scale privatisation remains slow. The parliament in Serbia has approved measures to ensure companies insiders cannot block sales and existing owners/managers cannot artificially raise cost to buyers due to redundancy packages. In Montenegro, some large scale privatisations have been initiated or carried out. However, efforts of the government to open tenders for 11 hotels in February 2003 has attracted little interest from foreign investors. The overhaul and strengthening of banking sectors in both republics have made significant progress, with sales of several major banks and greater supervisory powers given to the Central Banks. Key challenges are: greater legislative reforms on bankruptcy and competition, acceleration of privatisation programmes for large enterprises in an open and transparent manner, and further strengthening of the financial sector.

Economic Outlook & External forecasts for Serbia and Montenegro

External forecasts suggest that Serbia ad Montenegro should achieve GDP growth of around 4% per annum over the next two years, although considerable uncertainties exist for even the short-term economic outlook. Continued growth in the services sector is hoped to offset weak performance in industry and agriculture in the near future, with further acceleration in growth further on, driven by inflows of foreign direct investment (FDI) from privatisation; government infrastructure investment; further reforms; and some pick-up in

[4] A part of Serbia (Kosovo) is now administered under a UN mandate (UNMIK.) All references to Serbia in this section exclude UNMIK.

external demand. The broad deflationary trend is set to continue in 2004-05, as macroeconomic policy remains within the bounds of the IMF agreement. The IMF has been urging Serbia to satisfy counter-inflationary as well as competitiveness goals in its exchange-rate policy, but the Fund's increasing concern at the external imbalance could lead it to put greater emphasis on the competitiveness factor. Export performance is forecast to improve in 2004-05, as restructuring, privatisation and other supply-side reforms take effect and the external environment gradually improves. Serbia and Montenegro, however, will continue to run large trade deficits, fuelling protectionist sentiment and calls for state-financed "export promotion". Serbia and Montenegro will continue to rely on external assistance to finance the current-account imbalance, especially if delays in state asset sales and heightened perceptions of political risk cause levels of FDI to be lower than currently forecast.

Table A3.14: EIU *Mar 2004*

	2003	2004	2005
Real GDP (% change)	1.5	3.0	5.0
Retail prices (% change; av)	11.2	7.6	6.2
Current-account balance (% of GDP)	-10.4	-8.9	-7.9

There are significant downside risks to this forecast because of the threat of political instability, lower official inflows, and the possibility that FDI may drop sharply if privatisation stalls.

UNMIK

Recent developments

Background: Post-war UNMIK economy has experienced high GDP growth, but the income level in the country remains one of the lowest in Europe (some 40% of Macedonia's level). Unemployment rate is one of the highest in the region at an estimated 50%. Political tensions still exist.

Growth: The main sources of income for a UNMIK household are remittances from relatives in Western Europe (with one in six Kosovar living outside the country), and contributes to 30% of GDP. The strong growth in 2001 at 11% is fuelled by large official transfers of around 70% of GDP through consumption and investment. The international aid has been essential in meeting the post-war humanitarian and reconstruction needs, thus making UNMIK highly aid-dependent. However, donors' transfers have been declining as the situation stabilises and international organizations are leaving the country. Agriculture and private services sector have been doing well, but industrial production has largely failed to recover.

External Conditions: Estimates for 2001-2002 indicated that the country has a trade balance deficit of half of the GDP, giving pressure on the need to improve export performance in the years to come. This huge external imbalances are being covered by remittances and official transfers – hence a relatively low current account deficit.

Foreign Direct Investment: FDI only plays a minor role but is expected to rise along with the beginning of privatization.

Economic reform: The process of privatization of the socially owned enterprises (SOEs) was delayed for a long time due to property rights issue, only beginning to take off in June 2002 when the UNMIK established the Kosovo Trust Agency in charge of the privatization or liquidation of the 350 SOEs. Public enterprises run by UNMIK have not yet been included on the privatization scheme. The grey economy is still widespread and cigarettes and fuel smuggling rampant and difficult to control.

Economic Outlook & External forecasts for UNMIK

With decreasing foreign aid, it will be necessary to ensure successful reforms especially in increasing tax revenues and fighting smuggling and corruption. Unemployment is unlikely to fall as major international organizations pull out of the country. Growth is projected to be about 4-5% per annum over the next two years. Price stability is expected to improve. Trade deficit will remain high, funded by remittances from Kosovans abroad.

Table A3.15: UNMIK *May 2003*

	2003	2004	2005
Real GDP (% change)	4.5	4.5	5.5
Inflation rate (%)	4.0	3.5	2.5
Current-account balance before grants (% of GDP)	-37	-23	-16
Current-account balance after grants (% of GDP)	0	-1	-1
Workers' remittances (% of GDP)	23	19	17

Performance of other Category 3 economies

The selected former Soviet Union states in Table A3:16 have GDP per capita similar to the economies within this category. However, long term data were not available as period before 1996 include bouts of hyper-inflation. For the five-year period of available data, these economies record an average of 5.4% annual growth for GDP per capita. This is a fairly high rate of growth, which may be an indication of catching up to its other European neighbours. However, the range of growth rates varies across the countries, with Ukraine only having a 2.7% average growth but Belarus at 7.0%.

Table A3.16: Category 3 Former Soviet Union states

	GDP pc (1996)	*GDP pc (2001)*	*Average annual growth rate*
Belarus	$1,070	$1,490	7.0%
Kazakhstan	$1,260	$1,710	6.4%
Ukraine	$ 860	$ 990	2.7%
Armenia	$ 810	$1,070	5.7%
Average annual GDP per capita growth rate			**5.4%**

The Category 3 "tiger" economies grew by an impressive average rate of 7.2% in the period 1986-1996. After 1996, Indonesia suffered an economic recession which also led to political unrest – a marked contrast from the period of sustained high growth before that.

Table A3.17: Category 3 "tiger" economies

	GDP pc (1986)	*GDP pc (1996)*	*Average annual growth rate*
China	$ 280	$ 630	8.5%
Indonesia	$ 630	$1113	5.9%
Average annual GDP per capita growth rate			**7.2%**

Other category 3 economies have shown mild average growth in the last 15 years. The average annual GDP per capita growth rate for these countries is 2.0%.

Table A3.18: Other Category 3 economies

	GDP pc (1986)	*GDP pc (2001)*	*Average annual growth rate*
Philippines	$ 980	$1,170	1.1%
Egypt	$ 890	$1,230	2.2%
Bolivia	$ 800	$ 940	1.1%
Sri Lanka	$ 570	$ 880	3.0%
Average annual GDP per capita growth rate			**2.0%**

Medium-term scenarios for Category 3 countries

We have developed three scenarios for the Category 3 economies (Albania, Serbia & Montenegro and UNMIK[5]), based on the information presented above. The main scenario seeks to present the most-likely central forecast for the economies, while the high and low scenarios seek to highlight the uncertainties surrounding the economic outlook.

Main Scenario

In the Main Scenario, the Category 3 economies are expected to continue with recovery – with a period of high growth for the near future, then stabilising at around 4% per annum. For the 2006-2020 period, the scenario therefore envisages average growth of 4.5% per annum. Remittances from abroad or foreign assistance would continue to be important. Some achievement in economic reform would be expected – privatization of state-owned enterprises, the establishment of basic business laws and enforcement bodies, and some crackdown on the grey economy.

High Scenario

A more optimistic scenario might envisage growth averaging 6.5% per annum over the 2006-2020 period, reflecting political stability and strong economic recovery, which allow

[5] While the PwC Consortium has investigated these scenarios, our demand forecasting is based on scenarios suggested by utilities for Albania, Serbia (excluding UNMIK) and UNMIK.

the Category 3 economies to begin catching-up with the rest of the South Eastern European countries in Categories 1 and 2. Stable political conditions and structured economic reforms would begin to attract foreign investments, thus reducing the dependency on remittances and aid. Some progress includes: careful privatization of state enterprises, especially large enterprises and alleviation of poverty and inequality.

Low Scenario

The political uncertainty or social unrest remains the largest threat to economic progress. Low economic growth would be expected in this scenario – an average growth of about 3%, with considerable dependence on foreign aid and remittances rather than locally generated growth. The grey economies remain sizable, and little progress happens in economic reforms. Failure to industrialize and being highly agriculture-dependent will also cause difficulty in eventual integration with the rest of Europe.

Appendix 4: Load shape adjustments

Historical electricity consumption and load shapes

Wherever possible we have sought to source our historical data regarding electricity demand and load profiles from the utilities. Given the importance of the electricity sector to the jurisdictions concerned, in a number of instances, we have also received inputs regarding historical data and assumptions for projections from Government and electricity sector regulators.

The Consortium has also engaged in an extensive contact programme with utilities, governments and regulators in the region to clarify issues arising from the data provided to ensure that as far as possible consistency between the data for each jurisdiction can be achieved. In the first phase of data collection, historical electricity demand data for each country was initially sourced from data provided by EKC [24], KfW [5], ESTAP [6] and publicly available data from utility annual reports. Further hourly electricity demand data from 2001 was provided by MWH, a firm in the PwC consortium, from a previous hydropower study [22].

The data from existing studies and sources was collected during February 2004 and a request for additional missing data was made, through our local experts, in early March, 2004. A first, preliminary demand forecast, based on incomplete datasets for most countries, was circulated to all countries on April 17, 2004 with an invitation to comment. Comments were incorporated in a presentation via video conference to the Donor Group on May 4, 2004, a revised forecast was circulated to all countries on May 27, 2004 and presented to all countries at the 4th Athens Forum on June 2, 2004. Following comments and discussions during and after the Forum a Final Demand forecast was circulated to most countries (except those with some missing data) on June 11, 2004. At the request of the donors, ECA Consulting reviewed the approach to the demand forecasting in June, further comments and data were received from the utilities in June and July and the demand forecast was submitted for use in the preliminary GTMax runs in August, 2004 presented in a draft interim report submitted at the end of August, which incorporated the preliminary generation investment plan for South East Europe. The results of these preliminary GTMax runs were revised in September and presented on October 12th, 2004 to the Donor Group and again on October 25th, 2004 at the 5th Athens Forum to all countries.

Following review by the utilities of the results of the preliminary investment plan, some countries requested further changes to their demand forecast in the Base Case and Cases 1& 3. The subsequent changes to these countries were agreed with the countries during November and final GTMax runs were made in December 2005.

In Section 2.5.3 we describe some of the adjustments we have made to jurisdiction specific data to reflect the situations of those jurisdictions. Table A4.1 provides a summary for each jurisdiction of the main data sources.

Table A4.1: Summary of sources for historical data

Jurisdiction	Sources for historical demand data and population	Year	Availability of load shape data
Albania	KESH, Population: Albanian Statistical Office. Population	2000	Data from MWH, 8760 hours
		2001	Not available

Jurisdiction	Sources for historical demand data and population	Year	Availability of load shape data
	Growth rate from "First part of the national strategy for energy"	2002	Data from SEETEC, 8760 hours
		2003	Data from SEETEC, 8760 hours
Bosnia and Herzegovina	ZEKC, US Census Bureau	2000	Not available
		2001	Not available
		2002	All 3 utilities combined, 8760 hours
		2003	All 3 utilities combined, 8760 hours
Bulgaria	NEK	2000	Not available
		2001	Data from MWH, 8760 hours
		2002	Not available
		2003	Data from utility NEK, 8760 hours
Croatia	HEP, Hrvoje Pozar [3]	2000	Data from MWH, 8760 hours
		2001	Not available
		2002	Not available
		2003	Available for 30 representative days from HEP
UNMIK	ESTAP report	2000	Not available
		2001	Data from utility KEK, 8760 hours
		2002	Data from utility KEK, 8760 hours
		2003	Data from utility KEK, 8760 hours
FYR Macedonia	ESM US Census Bureau	2000	Data from MWH, 8760 hours
		2001	Data from utility ESM, 8760 hours
		2002	Data from utility ESM, 8760 hours
		2003	Data from utility ESM, 8760 hours
Montenegro	KfW [5][6], Serbia and Montenegro Statistical Office US Census Bureau	2000	Data from MWH, 8760 hours
		2001	Data from utility EPCG, 8760 hours
		2002	Data from utility EPCG, 8760 hours
		2003	Data from utility EPCG, 8760 hours
Romania	Electricity demand and losses: National Institute of Statistics (Romania) Population: Ministry of Economy and Commerce 2003. GDP forecasts: Ministry of Economy and Commerce.	2000	Data from MWH, 8760 hours
		2001	Data from utility EPCG, 8760 hours
		2002	Data from utility EPCG, 8760 hours
		2003	Data from utility EPCG, 8760 hours
Serbia (excluding UNMIK)	EPS, GDP and Population figures from 2002 Census: Serbia and Montenegro Statistical Office growth rate	2000	Not available
		2001	Data from utility EPS, 8760 hours
		2002	Data from utility EPS, 8760 hours

[6] Numbers in square brackets refer to publications listed in Chapter 4 of this report.

Jurisdiction	Sources for historical demand data and population	Year	Availability of load shape data
	from "Least Cost Investment Plan for Serbia Electricity Sector. Workshop III Demand and Least Cost Models" [7]	2003	Data from utility EPS, 8760 hours

Country specific assumptions and data adjustments

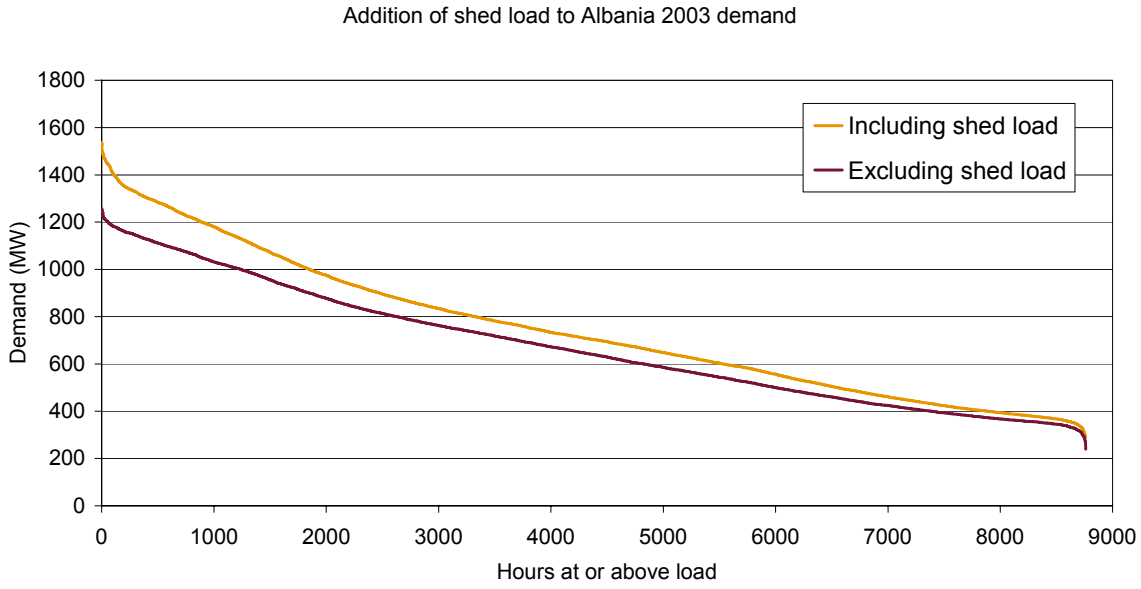
Albania

Load shedding

We have adjusted the Albanian hourly demand profile we received from KESH through SEETEC by adding shed load back to the profile. We do this as the analysis undertaken by WASP and GT Max will perform its own calculation of shed load in the forecast period. We were provided with monthly total shed load data for 2003 and 2002 by KESH which showed that shed load amounted to 662GWh in addition to the 5,894GWh demand in 2003 (an 11% increase).

The actual hourly shed load profile was not made available to us by KESH, so we have assumed that the load shedding profile can be added to the demand profile in a similar manner to the UNMIK actual data presented later. The UNMIK data shows that load is shed over almost the entire year, in proportion to the system demand at the time. We have estimated a value of shed load for each hour such that the amount of shed load for each hour summed over the month equals the actual historical figure given to us by KESH. The result of our estimated adjustment for shed load is shown in the following figure.

Figure A4.1: 2003 Albania system load curve correction for shed load



The Albanian shed load demand has been added to our demand forecast as we aim to forecast unconstrained demand for each jurisdiction. If transmission or generation constraints forecast by WASP and GTMax then mean that load cannot be met, it is shed in our forecasts once the WASP and GTMax runs have been made. We therefore avoid estimating 'pent up demand' in our forecasts. We tabulate below the annual demand with and without shed load.

Table A4.2: Historical impact of load shedding in Albania

	Gross consumption (GWh) (from 8760 demand profile)	Shed load (GWh)	Shed Share of Gross (%)	Forecast start point (Gross + shed) (GWh)
2002	5,348	847	16%	6,195
2003	5,746	662	11%	6,408

Technical Losses

The surge in domestic demand on the electricity system in Albania has had a significant impact on the location and profile of electricity demand. The original transmission and distribution system was not designed to service the load centre, which have become dominant following this shift from industrial to domestic demand and the changing location of demand. Substation capacity and design flows have been completely altered following this shift, and there has been little investment in the networks since this change in flow patterns to alleviate bottlenecks and pinch points. The Tirana area in particular has seen demand far outstrip the network capacity required to reliably supply it. As a consequence, and in combination with the fact that most generation is in the north and most load is in the south around Tirana, we understand that technical losses have risen to exceptionally high levels, even without considering non-technical losses. While the commissioning of the Vlora 135MW CCGT in the South by July 2007 will help to reduce this problem, major investment is required to reconfigure the network and flow patterns to alleviate the high amount of technical losses, and we do not forecast this to occur in the short term. So while we forecast technical losses to decrease in most other countries to about 10% by 2010, in Albania, we target 14% in 2015 (based on the Government of Albania publication "*First Part of the National Energy Strategy*").

Non-technical Losses

As for the other countries in this study, we have added historical estimates of non-technical losses in Albania to net demand and used this figure in our econometric analysis. In Albania, 2003 data from the utility suggests that non technical losses were 12.2% of net consumption. We consider that non-technical losses, although not paid for, are nevertheless utilised and therefore contribute to the gross domestic product. Were non-technical losses excluded from the electricity intensity, the figure for Albania would be understated. We assume that non-technical losses will reach a level of 5% by 2015 (similar to UNMIK.)

Table A4.3: Assumed adjustment for losses to demand in Albania

	Sales (GWh)	Shed load (GWh)	Non-technical losses (GWh)	Net demand forecast start point (GWh)
2002	3,130	847	777	4,753
2003	3,492	662	708	4,862

Bosnia & Herzegovina

We were provided with hourly demand data for 2002 and 2003 for each of the three BiH utilities, EP HZHB, EP BiH and ERS by ZEKC. We added these hourly demand values together for each hour of the year. We confirmed with ZEKC that the demand data did not include pumped storage or auxiliary demand, we have assumed that shed load is negligible and therefore no adjustments were made to the data. Total losses were running at 18% in 2003, with non-technical losses running at an estimated 5.4%[7]. We have assumed in our forecast that these non-technical losses reduce to zero by 2010.

Bulgaria

We were provided with hourly demand data for 2003 by NEK. The demand data included pumped storage and auxiliary demand, and we have corrected the data according to the technique and assumptions described in Appendix 4. The correction applied had the following effect on the start point from which we began our forecast.

Table A4.4: Impact of pumping and auxiliary demand in Bulgaria

	Generation from hourly profile (GWh)	Pumping demand (GWh)	Auxiliary demand (GWh)	Forecast start point (Gen-pump-aux) (GWh)
2001	37,044	767	4,351	31,926
2002	36,406	837	4,106	31,463
2003	37,057	483	4,230	32,344

We have assumed zero non-technical losses in Bulgaria.

Croatia

In creating a base year shape for the daily load profiles, the technique applied to Croatia differs from other countries in this study in that a complete set of 8760 hours of demand for recent years was not available. Instead, hourly demand profiles for thirty representative days were provided by HEP for the 3rd week of January, April, July and October and the maximum and minimum days in 2003. We have used these representative profiles to reconstruct a 2003 annual hourly demand profile. We have assumed zero non-technical losses in Croatia.

UNMIK

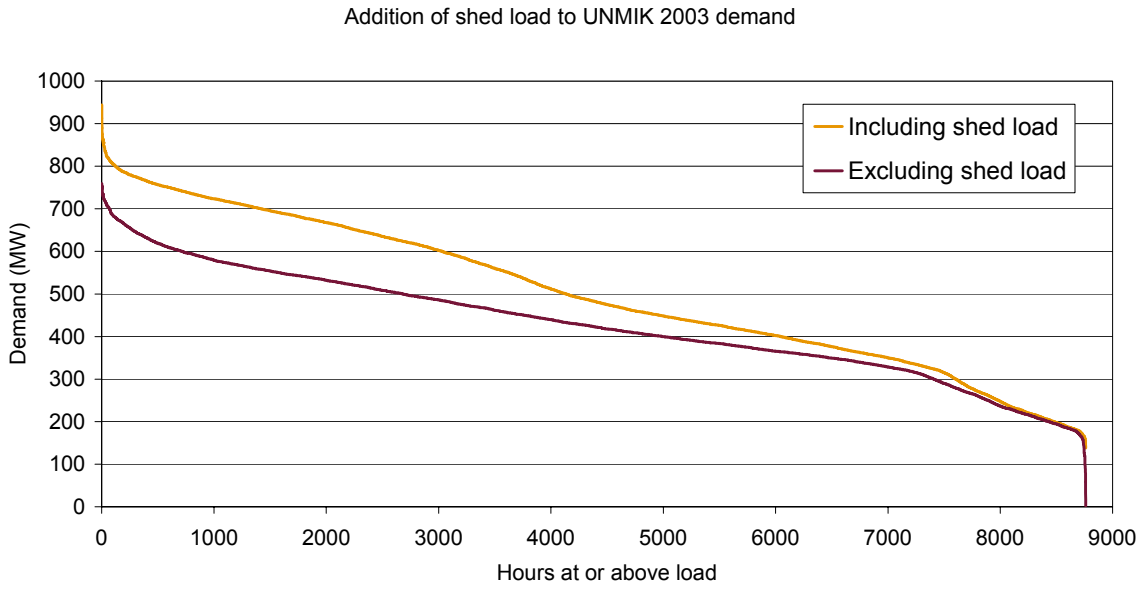
Load shedding

[7] Based on correspondence with World Bank staff and the three utilities, EPBiH, EPRS and EPZHB.

We have adjusted the UNMIK demand profile by adding shed load back to the profile. We do this as the analysis undertaken by WASP and GT Max will provide information regarding shed load for the forecast period. The shed load profile amounts to a substantial amount of energy; 650GWh in addition to the 3,746GWh demand in 2003 (a 17% increase).

KEK have provided us with the hourly shed load for 2003 and we have added each hour back to the system demand load curve. We show the result of this addition in the following graph, which shows that load has been shed in UNMIK over more than 90% of the duration of the year 2003.

Figure A4.2: 2003 UNMIK system load curve showing effect of shed load



The UNMIK shed load demand has also been added to our demand forecast for the same reasons described under the section on Albania. We tabulate below the annual demand with and without shed load as per these tables and how we arrive at the starting 2003 value for the UNMIK demand forecast.

Table A4.5: Impact of load shedding UNMIK

	Gross consumption (GWh)	Shed load (GWh)	Shed Share of Gross (%)	Shed load losses (GWh)	Forecast start point (Gross + shed) (GWh)
2001	3,345	552	17%	130	4,027
2002	3,546	705	20%	166	4,418
2003	3,746	651	17%	153	4,551

However, even adding the shed load to the UNMIK hourly electricity demand profile does not produce a profile through the year which would be expected to represent the stable and efficient electricity system which will characterise the future UNMIK system. We have therefore not used the 2003 KEK actual hourly demand profile as a basis for forecasting the hourly electricity demand. We have instead substituted an 'idealised' demand profile for UNMIK which has been morphed to reflect the monthly actual profile of demand in UNMIK but exhibits smoother daily and hourly demand fluctuations than has historical been the case in UNMIK.

Data adjustments for losses

In addition to the significant component of shed load in UNMIK, the system is characterised by a high degree of losses, both technical and non-technical. The last year for which net demand is available is 2001 (although KEK have supplied us with data on gross demand up to 2003) and therefore the latest estimate of total losses in UNMIK is 2001 and amounts to 50% [5], broken down into 19% technical losses and 31% non-technical. We have assumed this level of losses has remained constant in 2002 and 2003. We show in the following table the calculation of the starting point of our forecast demand.

Table A4.6: Assumed adjustment for losses to demand in UNMIK

	Sales (GWh)	Technical losses (GWh)	Non-technical losses (GWh)	Net demand forecast start point (GWh)
2001	1,676	639	1,030	3,345
2002	1,777	678	1,092	3,546
2003	1,877	716	1,153	3,746

For the projections, non-technical losses are reduced linearly from 23% in 2003 to 5% in 2015. Technical losses are reduced from 22% in 2003 and fall to 15% by 2020[8].

Following comments received from KEK, the Ministry and ERO on 8 November, 2004, we have added additional demand resulting from increases in usage at Trepca mines and a new Feronikel company as shown Table A4.7. We have assumed these customers will follow the same profile as the system demand.

Table A4.7: Forecast additional UNMIK large consumer demand

	2003	2004	2005	2006	2007 and beyond
Trepca, MW	5	22	44	44	44
Trepca GWh	35	193	385	385	385
Feronikel MW	0.3	0.3	50	50	80
Feronikel GWh	47	195	635	635	925

[8] These figures were provided to the consortium by the Prime Minister's office in Kosovo on 12 November 2004. Our forecast is based on this updated losses data. The new information however has not been included in the 2003 data shown in Table A4.6 as it would have no material impact on the demand forecast for the SEE region.

FYR Macedonia

We were provided with hourly demand data for 2001, 2002 and 2003 by ESM. We confirmed with ESM that the demand data did not include pumped storage or auxiliary demand, we have assumed that shed load is negligible and therefore no adjustments were made to the data. We have assumed zero non-technical losses in FYR Macedonia.

Montenegro

We were provided hourly demand data for 2001, 2002 and 2003 by EPCG. We confirmed with EPCG that the demand data did not include pumped storage or auxiliary demand, we have assumed that shed load is negligible and therefore no adjustments were made to the data. We have assumed zero non-technical losses in Montenegro.

Romania

We were provided with hourly demand data for 2003 by Transelectrica. The demand data included auxiliary demand, and we have corrected the data according to the technique and assumptions described in Appendix 4. We show in the table below the reconciliation between the hourly demand profile and the forecast starting point. We have assumed zero non-technical losses in Romania.

Table A4.8: Impact of pumping and auxiliary demand in Romania

	Generation from hourly profile (GWh)	Auxiliary demand (GWh)	Forecast start point (Gen-aux) (GWh)
2001	51,002	4,670	46,332
2002	52,335	4,700	47,635
2003	54,454	4,760	49,694

Serbia

The latest year for which consistent historical annual demand data is available for Serbia is 2002 [2]. Only the gross demand provided by EPS from the sum of the hourly demand was available for 2003. We have therefore assumed that losses remain at the same level in 2003 as in 2002 (19.7%) giving net demand a value of 24,998GWh for 2002[9]. We have assumed zero non-technical losses in Serbia.

[9] EPS did submit 2003 estimated gross consumption, net demand and losses data in June 2004 (including UNMIK) and November (excluding UNMIK) 2004. However, the data was not reconcilable with the 8760 hourly demand profiles we had previously received for Serbia subtracting UNMIK. The issue was raised with EPS. Given project timescales, and the difficulty of reconciling the new data, this data has not been factored into the demand forecast presented in this report. However, we note that while the gross consumption has been revised upward, the 2003 net demand of 25,102GWh is within 0.5% of the net demand we had previously assumed.

Load shape adjustments

We have confirmed with most of the utilities that the hourly load profiles they provided us with were equal to the total net consumption as we define it in Figure 2.1; that is inclusive of all technical and non-technical losses, but exclusive of auxiliary demand (power station consumption) and pumping demand. We separately describe our correction for the addition of shed load for Kosovo and Albania in Section 2.5. The reason we have defined net consumption in this way for this study is that the demand forecasts are used by GTMax which calculates independently the own consumption by power stations (which will vary depending on the plant mix) and pumped storage (which will vary depending on reservoir levels and wholesale price differentials).

However, the hourly demand data from NEK for Bulgaria included auxiliary and pumping demand and the hourly demand data from Transelectrica for Romania included auxiliary demand. We describe here the correction we applied to the 2003 hourly demand profiles in order to correct the profiles, which are the basis for the entire forecast period, to be consistent with the other countries.

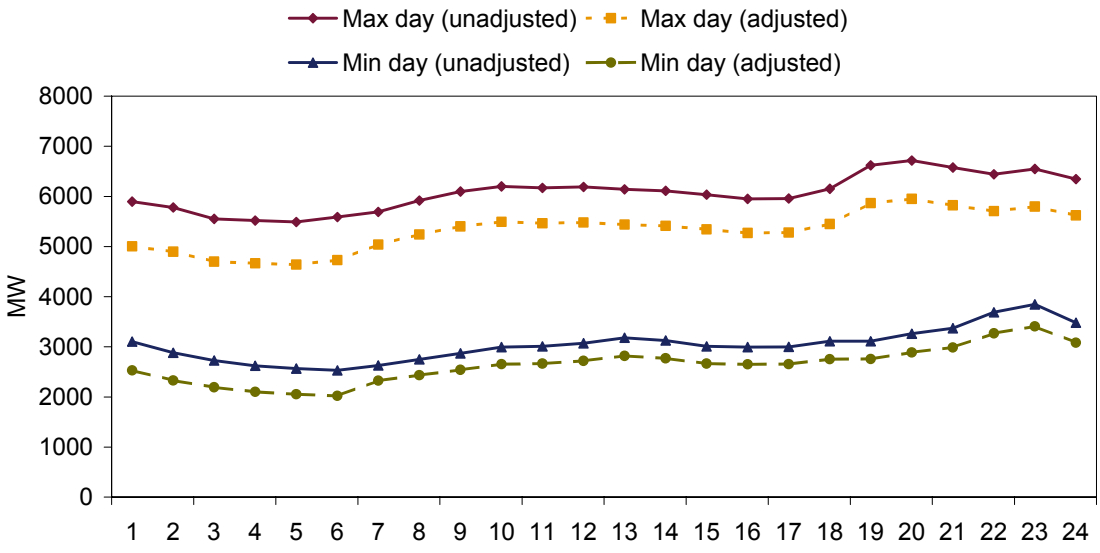
For Bulgaria, NEK informed us that auxiliary consumption was 4,230GWh (11.6%) and pumping was 483GWh (1.3%) of total generation (37,057GWh) in 2003. However, profiles of how this demand varied for each hour of the year were not available from NEK, and we have therefore adjusted the hourly load profiles as follows:

1. For auxiliary demand, we have assumed that the total annual demand is spread over each hour of the year in proportion to the demand at that time. So at peak demand times, the auxiliary demand is highest and a minimum system demand, we assume auxiliary demand is lowest.

2. For pumping demand, we have assumed that the annual pumping demand is spread equally each night across the hours of 1am-6am throughout the year. These six hours of pumping per day equate to a pumping factor of about 25%, which is broadly consistent with pumping profiles in other countries.

To illustrate the effect of this correction, we show in the following graph the unadjusted and adjusted maximum and minimum day for the 2003 Bulgarian data.

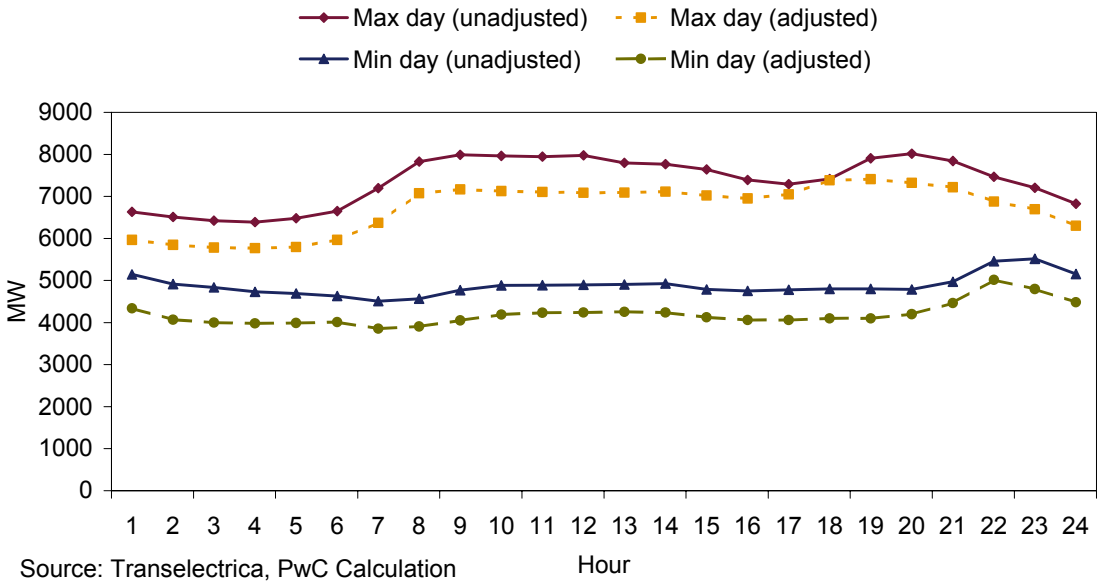
Figure A4.3:- Adjustment of Bulgarian daily load profiles to subtract auxiliary & pumping demand



Source: NEK, PwC Calculations

For Romania, Transelectrica informed us that auxiliary consumption was 4,760GWh (8.7%) of total generation (54,454GWh) in 2003. Again, profiles of how this demand varied for each hour of the year were not available from Transelectrica, and we have therefore adjusted the hourly load profiles in the same manner as described for Bulgaria above. To illustrate the effect of this correction, we show in the following graph the unadjusted and adjusted maximum and minimum day for the 2003 Romanian data.

Figure A4.4:- Adjustment of Romanian daily load profiles to subtract auxiliary demand



Source: Transelectrica, PwC Calculation

Developing annual load profiles

Estimating demand for the GIS requires an understanding of how demand profiles will change over time. Increasing peakiness in demand, for example, may result in a need to commission additional plant earlier than projected[10] if demand was growing in the off peak times of the day.

Historical load profiles

Our approach to developing annual load profiles has depended upon the level of historical data available. We have attempted to collect detailed electricity demand data for the last four years for each of the jurisdictions, and have succeeded in collecting one complete data set of hourly demand for each hour of the year 2003 for all jurisdictions except Croatia (HEP who provided 30 representative days.) This data provides the basis of our load shape projections for the forecast period. Table A4.9 summarises the completeness of the historical load profile data we have been able to gather by jurisdiction.

Table A4.9: Summary of available historical load shape data

Jurisdiction	*Year*	*Availability of load shape data*
Albania	2000	MWH with 8760 hours
	2001	Not available
	2002	Data from SEETEC, 8760 hours
	2003	Data from SEETEC, 8760 hours
BiH	2000	Not available
	2001	Not available
	2002	All 3 utilities combined, 8760 hours
	2003	All 3 utilities combined, 8760 hours
Bulgaria	2000	Not available
	2001	MWH with 8760 hours
	2002	Not available
	2003	Data from utility NEK, 8760 hours
Croatia	2000	MWH with 8760 hours
	2001	Not available
	2002	Not available
	2003	Available for 30 representative days from HEP
UNMIK	2000	Not available
	2001	Data from utility KEK, 8760 hours
	2002	Data from utility KEK, 8760 hours

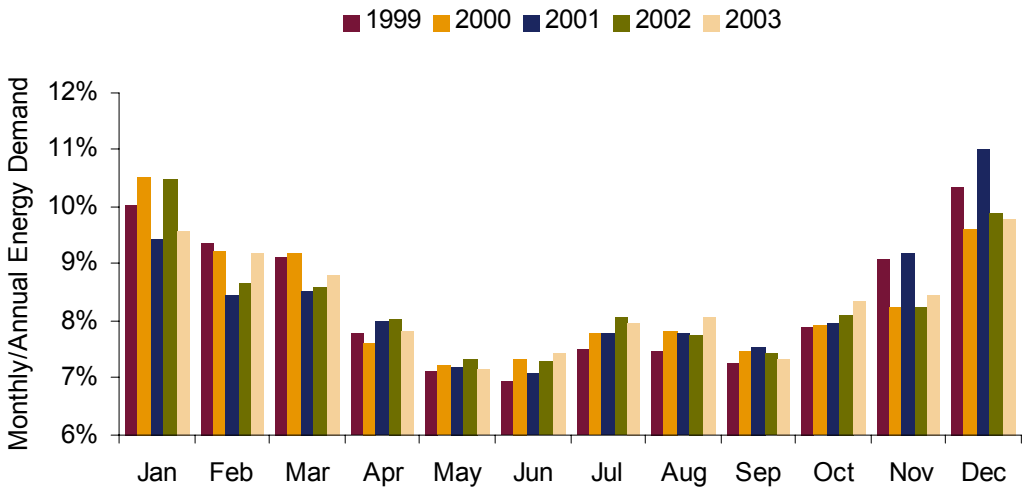
[10] This point also allows us to define our materiality threshold with demand forecasting. For some of the larger systems, the incremental generating unit is likely to have a capacity of approximately 300MW. Assuming a load factor of 50% implies a variation in demand of approximately 1,300GWh in a year would result in a material impact on the generation investment study. For smaller systems, the incremental unit may be smaller, for example 100MW in which case the material variation in demand is +/-400GWh in a year.

Jurisdiction	*Year*	*Availability of load shape data*
	2003	Data from utility KEK, 8760 hours
FYR Macedonia	2000 2001 2002 2003	MWH, 8760 hours Data from utility ESM, 8760 hours Data from utility ESM, 8760 hours Data from utility ESM, 8760 hours
Montenegro	2000 2001 2002 2003	MWH, 8760 hours Data from utility EPCG, 8760 hours Data from utility EPCG, 8760 hours Data from utility EPCG, 8760 hours
Romania	2000 2001 2002 2003	MWH, 8760 hours Data from TRANSELECTRICA, 8760 hours Data from TRANSELECTRICA, 8760 hours Data from TRANSELECTRICA, 8760 hours
Serbia	2000 2001 2002 2003	Not available Data from utility EPS, 8760 hours Data from utility EPS, 8760 hours Data from utility EPS, 8760 hours

Changes to seasonal demand patterns

All of the South East European and indeed Central Eastern and Western European countries are experiencing changes to the seasonal demand for electricity. Figure A4.5 shows the example of Croatia. It is clear that monthly electricity demand as a percentage of total annual demand throughout SEE is increasing in summer months (chiefly June, July and August) and decreasing in winter months (chiefly November, December and January). Spring and autumn monthly demand is relatively more stable.

Figure A4.5: Historical change in monthly energy demand for Croatia



Source: UCTE

We assume that there are two reasons for this shift in seasonal demand patterns (although we note that (b) is not a necessary condition, as winter share of annual demand will decrease even if winter load does not decrease, as long as summer demand increases):

1. Increased air-conditioning & refrigeration load in summer, dependent on two factors:

    a. Increased consumer wealth and spending on luxury goods such as air-conditioning & refrigeration.

    b. A sufficiently high average temperature during summer to drive demand for air-conditioning & refrigeration.

2. Decreased space heating load in winter, dependant on two factors:

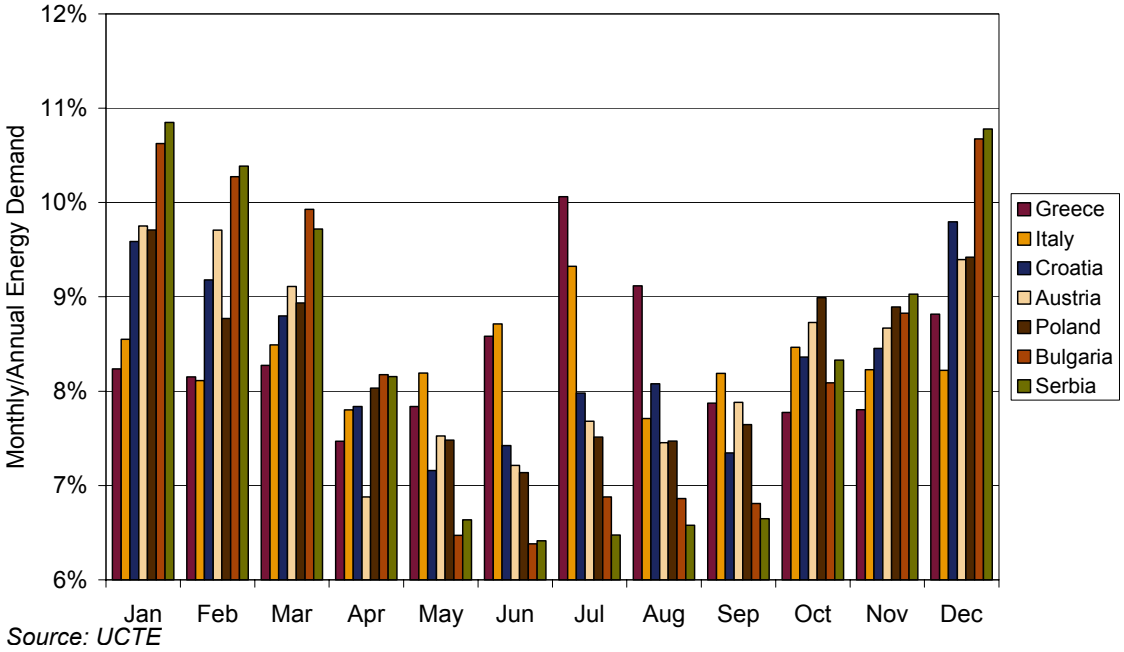
    a. The availability of alternative fuels such as gas (as in Romania) or oil which are more efficient at heating than electricity and therefore of overall benefit to the economy.

    b. A properly functioning electricity market which sends the correct price signals to the domestic customer to enable them to make the correct economic decisions and switch winter heating from electricity.

Given this recent and continuing shift in energy demand from winter to peak in all jurisdictions, the forecast must take into account (a) when this trend might stabilise and (b) how fast the monthly demand will vary in each jurisdiction until it reaches this stable point.

To enable us to estimate (a), we have compared in Figure A4.6 several neighbouring countries in the region.

Figure A4.6: Comparison of 2003 monthly energy demand for European countries



Source: UCTE

From the figure above, we have drawn several conclusions:

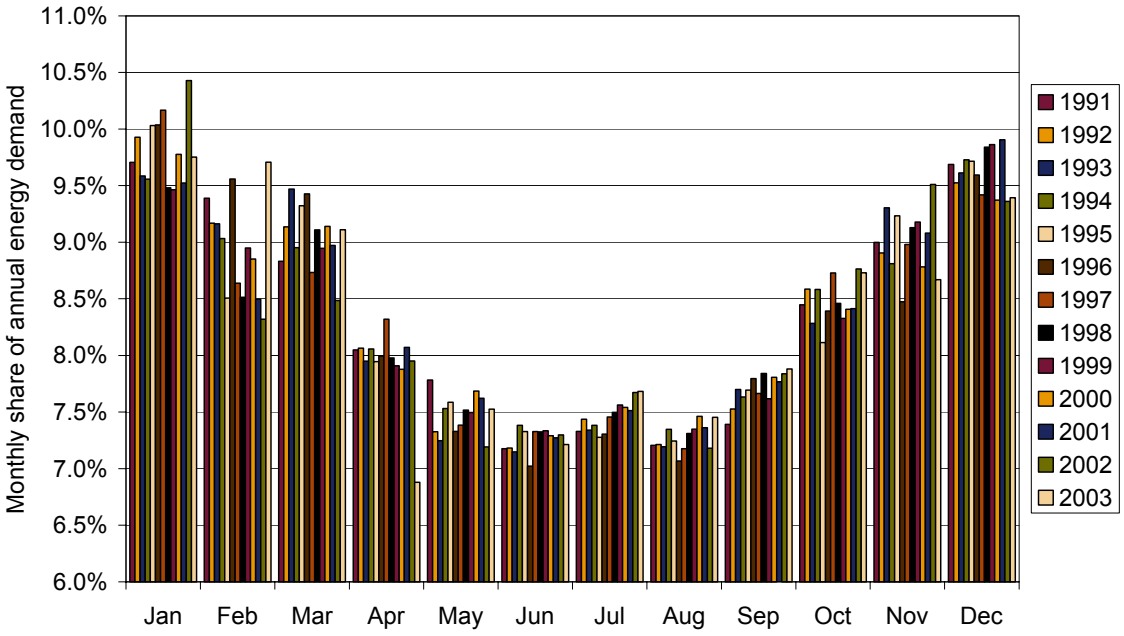
1. Greece and Italy experience the annual peak energy demand in July, not during the winter as for SEE countries. This is largely the result of a temperature effect with milder winters and hotter summers in these two countries than in SEE countries. July demand is 10.1% and 9.3% of annual demand in Greece and Italy respectively.

2. Croatia, Austria and Poland still experience their peak monthly demand in winter, Croatia and Austria (Figure A4.6) both have a greater share of demand in July (8.0% and 7.7% respectively).

3. Bulgaria and Serbia are taken as examples of the remaining SEE countries (i.e. excluding Croatia) being studied but are representative of all the others. These countries have very high winter demand and very low summer demand, amounting in July to just 6.9% and 6.5% respectively.

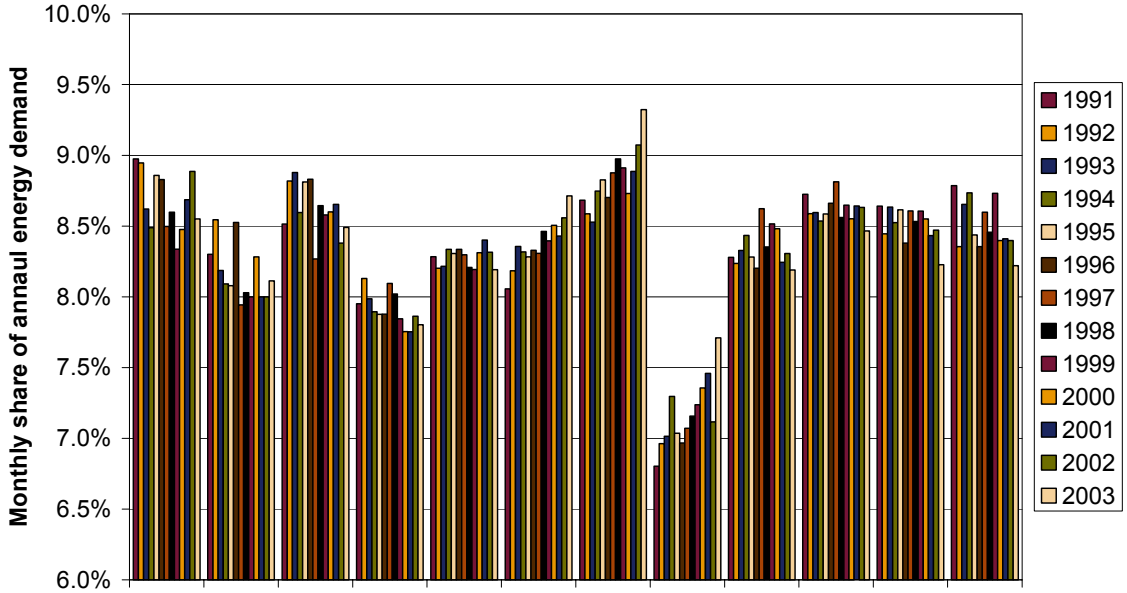
We assume that the trend in increasing summer demand is being driven by increasing consumer wealth which maybe expected to continue. Therefore, we assume that the seasonal variation in demand in SEE countries including Bulgaria and Serbia will tend toward Croatia and Austria. However, Croatia, with its relatively high share of summer demand, is not yet showing signs of stabilising as seen in Figure A4.5. Furthermore even Austria is still experiencing increasing share of demand in summer as shown in Figure A4.6, albeit at a slower rate than Croatia.

Figure A4.7: Historical change in monthly energy demand for Austria



Also shown on the following page is the evolution of seasonal demand in Italy which is also seen to be changing rapidly and continues to do so. Therefore, all of the immediately surrounding countries to SEE which could be considered as models due to their relatively higher consumer wealth and hence summer air-conditioning load with associated final seasonal energy demand distribution model cannot be used, as they are either too different in temperature (Greece), or still themselves evolving (Austria, Italy). We note that Greece does in fact seem to have stabilised at it's high levels of summer energy demand.

Figure A4.8: Historical change in monthly energy demand for Italy



Source: UCTE

We must therefore turn to a country outside the region to determine the potential final seasonal demand profile of energy demand in SEE. This target country must possess the following criteria:

1. Has achieved economic transformation;

2. Has a similar temperature profile to SEE;

3. Well developed in terms of air-conditioning and summer electricity demand patterns.

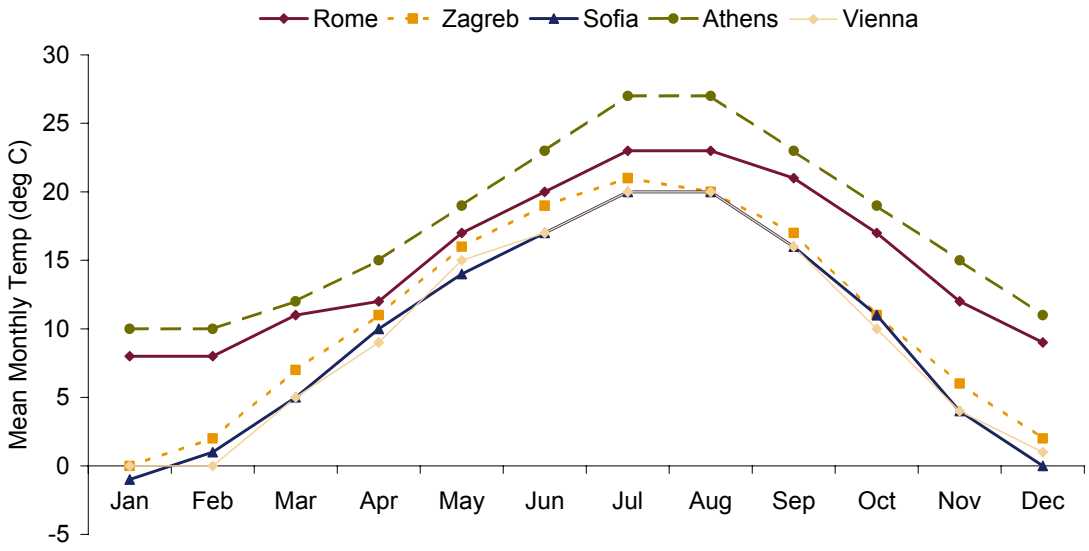
The comparison of capital city average monthly temperatures in Figure A4.9 shows that:

- The SEE region can be considered to be approximately isothermal for the purposes of this study, and therefore all countries can be expected to evolve to a similar profile of monthly electricity demand as a share of annual.

- Greece, with 10.1% of annual demand in July, appears too hot be a model for SEE; and

- Italy is closer to SEE in terms of temperature profile but it's 9.2% of annual demand in July is still growing.

Figure A4.9: **Monthly average temperatures in comparator country cities**



Source: awikcast.com

Vienna is clearly the closest temperature profile to the SEE countries. While it's share of July energy demand is still increasing, it has approached that of Croatia in recent years (7.7% vs 8.1%). We have therefore conservatively assumed that Austria and the other SEE countries will increase their July share of annual energy to 8% in the medium to long term. We show, in Figure A4.10, the historical evolution of monthly energy demand in Croatia, and the assumption we have made that it remains the same after 2003.

Figure A4.10: Transformation of load shapes based on monthly ratios to annual system peak demand; Example of Croatia

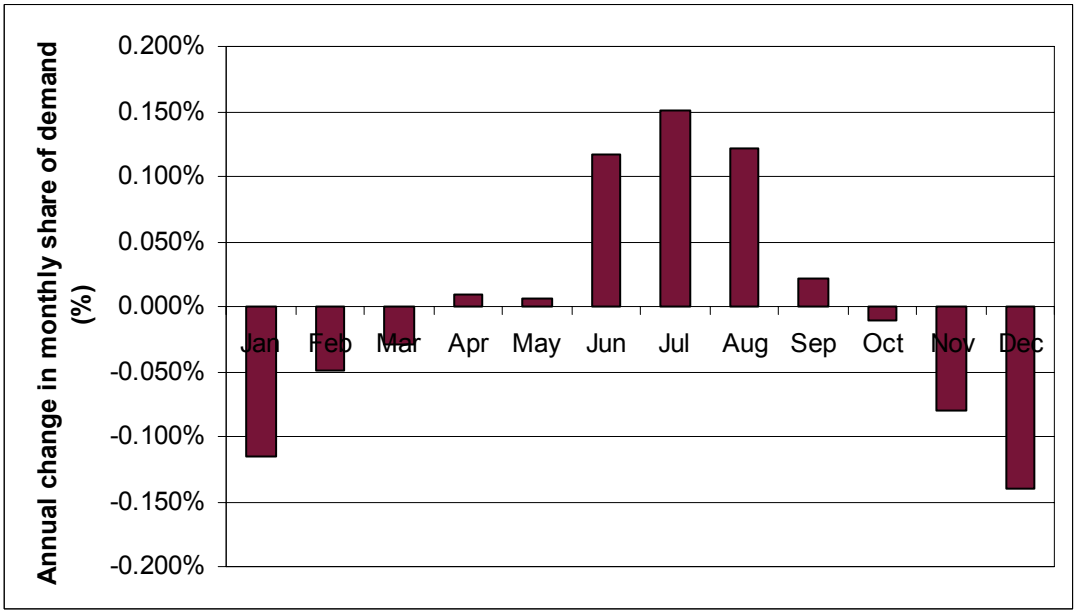
	Monthly GWh/Annual GWh											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1999	10.0%	9.4%	9.1%	7.8%	7.1%	7.0%	7.5%	7.5%	7.3%	7.9%	9.1%	10.4%
2000	10.5%	9.2%	9.2%	7.6%	7.2%	7.3%	7.8%	7.8%	7.5%	7.9%	8.2%	9.6%
2001	9.4%	8.4%	8.5%	8.0%	7.2%	7.1%	7.8%	7.8%	7.6%	8.0%	9.2%	11.0%
2002	10.5%	8.7%	8.6%	8.0%	7.3%	7.3%	8.1%	7.8%	7.5%	8.1%	8.3%	9.9%
2003	9.6%	9.1%	8.8%	7.8%	7.2%	7.5%	8.1%	8.1%	7.4%	8.4%	8.4%	9.8%
2004	9.6%	9.1%	8.8%	7.8%	7.2%	7.5%	8.1%	8.1%	7.4%	8.4%	8.4%	9.8%
2005	9.6%	9.1%	8.8%	7.8%	7.2%	7.5%	8.1%	8.1%	7.4%	8.4%	8.4%	9.8%
2006	9.6%	9.1%	8.8%	7.8%	7.2%	7.5%	8.1%	8.1%	7.4%	8.4%	8.4%	9.8%
2007	9.6%	9.1%	8.8%	7.8%	7.2%	7.5%	8.1%	8.1%	7.4%	8.4%	8.4%	9.8%
2008	9.6%	9.1%	8.8%	7.8%	7.2%	7.5%	8.1%	8.1%	7.4%	8.4%	8.4%	9.8%
2009	9.6%	9.1%	8.8%	7.8%	7.2%	7.5%	8.1%	8.1%	7.4%	8.4%	8.4%	9.8%
2010	9.6%	9.1%	8.8%	7.8%	7.2%	7.5%	8.1%	8.1%	7.4%	8.4%	8.4%	9.8%
2011	9.6%	9.1%	8.8%	7.8%	7.2%	7.5%	8.1%	8.1%	7.4%	8.4%	8.4%	9.8%
2012	9.6%	9.1%	8.8%	7.8%	7.2%	7.5%	8.1%	8.1%	7.4%	8.4%	8.4%	9.8%
2013	9.6%	9.1%	8.8%	7.8%	7.2%	7.5%	8.1%	8.1%	7.4%	8.4%	8.4%	9.8%
2014	9.6%	9.1%	8.8%	7.8%	7.2%	7.5%	8.1%	8.1%	7.4%	8.4%	8.4%	9.8%
2015	9.6%	9.1%	8.8%	7.8%	7.2%	7.5%	8.1%	8.1%	7.4%	8.4%	8.4%	9.8%
2016	9.6%	9.1%	8.8%	7.8%	7.2%	7.5%	8.1%	8.1%	7.4%	8.4%	8.4%	9.8%
2017	9.6%	9.1%	8.8%	7.8%	7.2%	7.5%	8.1%	8.1%	7.4%	8.4%	8.4%	9.8%
2018	9.6%	9.1%	8.8%	7.8%	7.2%	7.5%	8.1%	8.1%	7.4%	8.4%	8.4%	9.8%
2019	9.6%	9.1%	8.8%	7.8%	7.2%	7.5%	8.1%	8.1%	7.4%	8.4%	8.4%	9.8%
2020	9.6%	9.1%	8.8%	7.8%	7.2%	7.5%	8.1%	8.1%	7.4%	8.4%	8.4%	9.8%

In addition to changing the load profile, the demand modelling ensures that the total GWh electricity demand for the profiled year equal the projected GWh target produced by the forecast demand econometric analysis is described in Section.

The rate of change of seasonal demand patterns

The next issue is how fast the monthly demand will progress towards the stable point. We have observed a variation profile in Croatia in recent years shown in Figure A4.10. We assume Croatia to be the system others in the region will follow because of it's higher per capita income, and is a suitable proxy for what other countries in the region will do in future provided their incomes increase in future also.

Figure A4.11: **The historical average of monthly variation in Croatia as applied to other countries in the region in demand forecast**.



The resultant monthly variations are applied to each of the countries in different ways following consultation with the utilities and consideration of factors unique to those countries

Jurisdiction	***Assumed seasonal demand profile change***
Albania	Continue historical level (7.3%) to 2007. Post 2007 increase July share to 7.8% which is reached by 2010 then stable.
Bosnia and Herzegovina	Reaches 8.0% in 2007 from the present level of 7.4%.
Bulgaria	Increases from the current level of 6.7% to 7.9% by 2010 (following discussions with NEK).
Croatia	Remain at 2003 monthly demand profile with 8% demand in July.
UNMIK	We forecast UNMIK demand using a demand profile corrected for shed load (described in section 3.5.3.5). We forecast the corrected July share (7.0%) to 2007, and increase this share to reach 8.0% by 2014.
Macedonia	Modify each month from 2004 until July reaches target of 8.0% in 2010.
Montenegro	No change because of a very high system load factor dominated by single industrial user. Domestic demand changes not expected to influence profiles in future.
Romania	Continuation of historical average.
Serbia (excluding UNMIK)	Increases to 7.6% by 2010[11].

[11] Following discussions of these assumptions with EPS who have noted that the summer air conditioning load in Balkans countries may not be the same as in the Mediterranean/Adriatic coast (which tends to have electricity demand reflecting tourism patterns in part of the country) and therefore may not expect to see the full extent of the changes in load shape experiences in Croatia.

Appendix 5: Findings from ECA methodology review

At the request of the World Bank, Economic Consulting Associates (ECA), undertook a review of the methodology used by the PwC Consortium to undertake the electricity demand forecasting for the SEE region.

PwC Consortium representatives met with Paul Lewington of ECA on the 18 June 2004 and have subsequently corresponded regarding the demand forecasts. The main points arising from the ECA review are described below:

1. **Methodology**

   The approach to demand forecasting adopted by the PwC Consortium is appropriate for the purpose of the study and will produce a consistent set of results.

2. **Estimate of the long run responsiveness of electricity demand to GDP per capita growth**

   Economic Consulting Associates noted that the sample of income elasticities of electricity demand used in the PwC Consortium data set had a wide range. ECA suggested the removal of coefficients from Central and Eastern Europe. The impact of the different sample on the value of the income elasticity co-efficient is shown in the table.

Figure A5: 1: Effect on the long term GDP coefficient of a revised data set

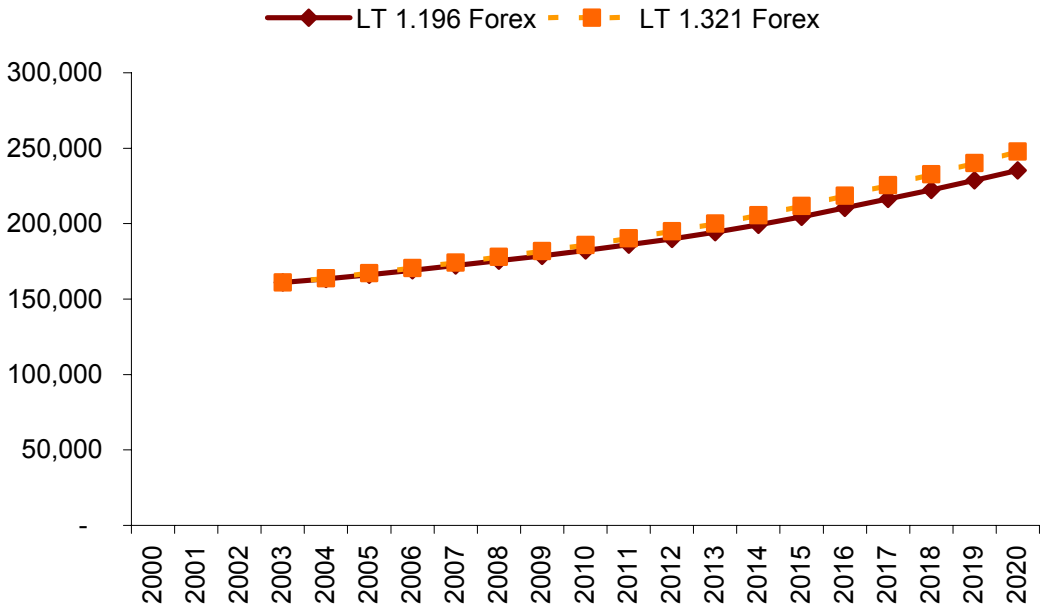
	Long term coefficient of net electricity demand per capita on GDP per capita	Restricted sample of long term coefficients based on ECA suggestions
Romania	2.413	
Albania	1.987	
Bosnia	0.336	
Croatia	0.868	
Hungary	1.110	1.110
Czech	0.913	0.913
Poland	0.189	
Slovakia	0.427	0.427
Slovenia	0.581	0.581
Estonia	0.490	0.490
Portugal	1.418	1.418
Turkey	2.783	2.783
Greece	1.281	1.281
Spain	1.536	1.536
Ireland	0.909	0.909
Indonesia	2.550	2.550
Malaysia	2.139	2.139
Philippines	1.007	1.007
Thailand	1.637	1.637
Brazil	1.524	1.524
Chile	1.361	1.361
Mexico	0.394	
Average of Comparators	**1.236**	**1.534**
Median of Comparators	**1.196**	**1.321**

Using a long term elasticity of 1.321 makes only minor changes to our findings

The figure compares the PwC Consortium Case 2 demand forecast for the region under three scenarios:

a. Using the long term GDP elasticity of electricity demand of 1.196 converting the starting electricity intensities using exchange rates (LT1.196 Forex);

b. Using the long term GDP elasticity of electricity demand of 1.321 converting the starting electricity intensities using exchange rates (LT1.321 Forex);



3. **Combined effect of adopting PPP conversions and the higher income elasticity of demand**

The PwC consortium analysis of electricity intensity is based on intensity being defined as:

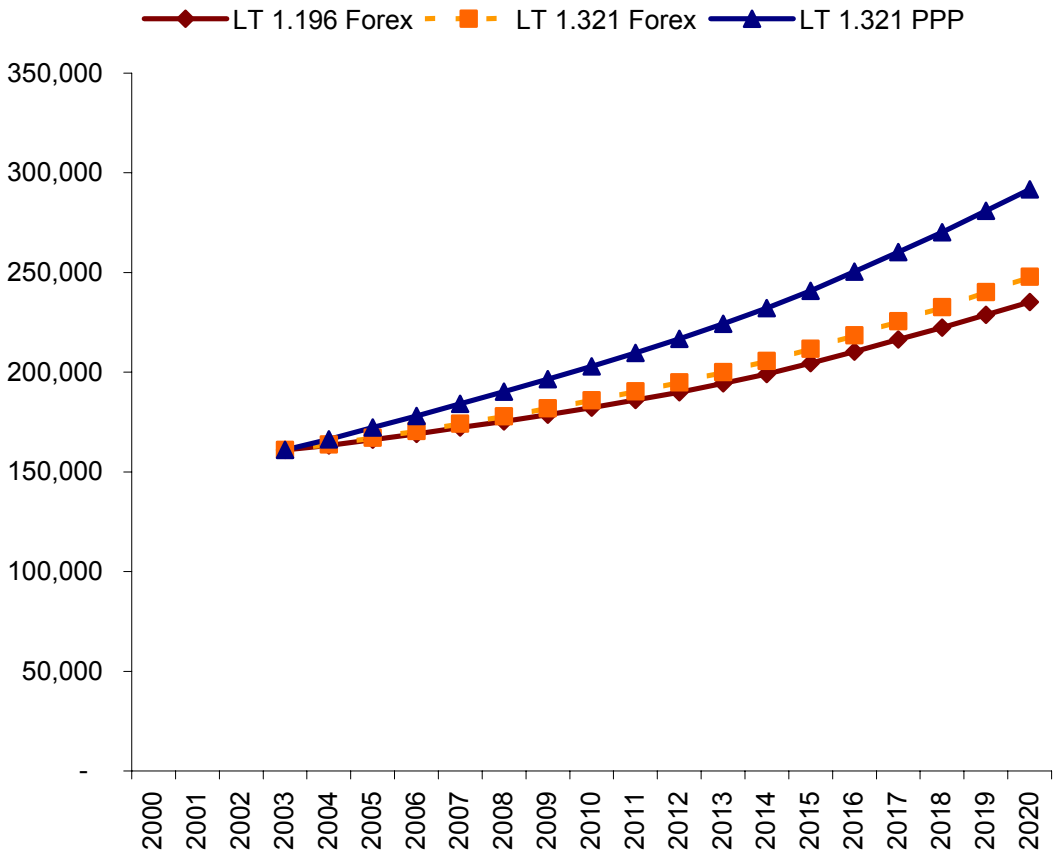
$$\frac{\text{Electricity Consumption in the jurisdiction}}{\text{GDP per capita (in 1995 terms) in the jurisdiction}}$$

for each of the jurisdictions considered in the study.

The GDP per capita figures for each country are all stated in US Dollars and are converted from national currencies using appropriate exchange rates.

ECA have suggested that the Consortium consider converting the initial electricity intensity calculations based on GDP per capita figures converted using Purchase Power Parity figures rather than exchange rates and test the sensitivity of the forecasts to that type of conversion.

We have tested the sensitivity of our conclusions regarding demand forecasts in each of the jurisdictions our findings are shown in the figure below:



The figure compares the PwC Consortium Case 2 demand forecast for the region under three scenarios:

a. Using the long term GDP elasticity of electricity demand of 1.196 converting the starting electricity intensities using exchange rates (LT1.196 Forex);

b. Using the long term GDP elasticity of electricity demand of 1.321 converting the starting electricity intensities using exchange rates (LT1.321 Forex);

c. Using the long term GDP elasticity of electricity demand of 1.321 converting the starting electricity intensities using PPP (LT1.321 PPP);

The PPP based conversion of the electricity intensity calculations leads to a substantial shift in the demand forecast for the region and also some significant shifts in the data for particular jurisdictions (most notably Romania.) Our analysis of the PPP data suggests that it is unclear how reliable the PPP data for the economies in the region is at present and this is likely to be a significant driver of inaccuracy in the data and therefore undermine the reliability of the regional demand forecast.

4. The impact of prices on electricity demand

ECA reviewed the method adopted by the Consortium to reflect prices in the model. ECA concurred with the Consortium that it is impossible to discern the impact of prices on electricity demand from historical data from the 1990s for the countries of Central and Eastern Europe and that the impact of prices is lost in broader impact of overall restructuring and reform. ECA therefore accepted that the Consortium's approach, in which price impacts are captured in the shift in electricity intensity to a comparator level is appropriate.

Appendix 6: Country demand forecasts