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Global Risk Consulting



ISSUE

Energy Security Index
Central and Eastern Europe



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October 2005



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About Onamics LLC

Onamics specializes in assessing the impact of political and security developments, as well as major global trends, on the investment environment and various industry sectors across the world. Through our one-on-one consulting, specialized briefings and reports, we help our clients better understand current and future risks and vulnerabilities.

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Executive Summary



The Onamics Energy Security Index measures the ability of a country to avert or recover from sudden or prolonged energy shocks. The index makes a comparative assessment of the strengths and weaknesses of the energy situation in twelve countries in Central and Eastern Europe. It takes into account energy supply diversity, energy efficiency, and political stability in order to determine the risks and vulnerabilities that each country faces. A subsequent analysis of the findings helps identify the substantial implications that energy security has on internal political stability, regional integration, foreign and domestic investment, and ongoing regional energy development projects.

Volatility in the global energy market can have a direct negative impact on both developed and emerging economies. It is widely accepted that rising energy costs and supply shortages can significantly hamper industrial production, large and small business activity, and even personal finances and life-style. In that respect, the consequences of energy shocks are especially worrisome for emerging market economies where social, political, and economic systems are evolving and fragile.

Key results show both challenges and opportunities for each country and the region, and indicate how, and in what directions, each country's energy sector must develop to serve current and future needs. The findings show how Slovenia, for example, even though it ranks first overall in our index, and has significant advantages in all three of the index's categories, is particularly vulnerable to global price and supply shocks due to its high dependence on imported oil. At the other end of the scale, the index shows that Albania must overcome a range of economic and political challenges in pursuit of energy security, but has a regional advantage, and some foundation for future energy-sector development, across a range of energy efficiency measures. And, importantly, the index and accompanying analysis show how regional integration and cooperation can be expected to have a positive effect on energy security.

The findings show how investors, governments, and the industry can take better advantage of the strengths and weaknesses in each country to build a more reliable, efficient, and secure regional energy infrastructure. Across the region, new power plants and infrastructure are required, old equipment needs to be upgraded, and primary energy distribution networks need to be expanded. However, developing new infrastructure is not a panacea. Energy-sector development must proceed carefully, with investors and policy-makers mindful that each country has unique needs. Money and expertise flowing into the region, from multilateral development institutions and private investors, must be directed to build from the strengths, and address the weaknesses, apparent in each country.



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Introduction

The Onamics Energy Security Index for Central and Eastern Europe provides an up-to-date snapshot of the energy security situation for twelve of the world's most rapidly emerging economies. This report, which is the first in a series of regional and global energy security reports to be produced by Onamics Risk Consulting, points to key areas of regional and country-specific vulnerability, highlights important areas for improvement and cooperation, and points to opportunities for productive energy-sector investment.

Summary of Country Rankings				
Onamics ESI Rank 2005	Central and Eastern Europe	Energy Supply Diversity	Internal Political Stability	Domestic Energy Efficiency
1	Slovenia	1	2	1
2	Italy	8	1	2
3	Slovakia	3	5	4
4	Greece	10	3	5
5	Hungary	7	4	9
6	Bulgaria	2	7	11
7	Croatia	11	6	3
8	Romania	4	8	7
9	Bosnia and Herzegovina	5	12	6
10	Serbia and Montenegro	6	10	10
11	Macedonia	9	9	12
12	Albania	12	11	8

Table 1: Summary of Country Rankings



Our study ranks and rates each country on three different measures: energy supply diversity, internal political stability, and domestic energy efficiency. A weighted combination of these three measures gives an overall energy security ranking for each country (see Table 1 - note that in all of our ranking tables, a lower number represents a better position). Our methodology, which is explained in detail in Appendix I, also provides us with important information about the relative performance of each country in each category of measure (see Chart 1 - note that in the charts, a higher number or higher bar represents a better energy security position).

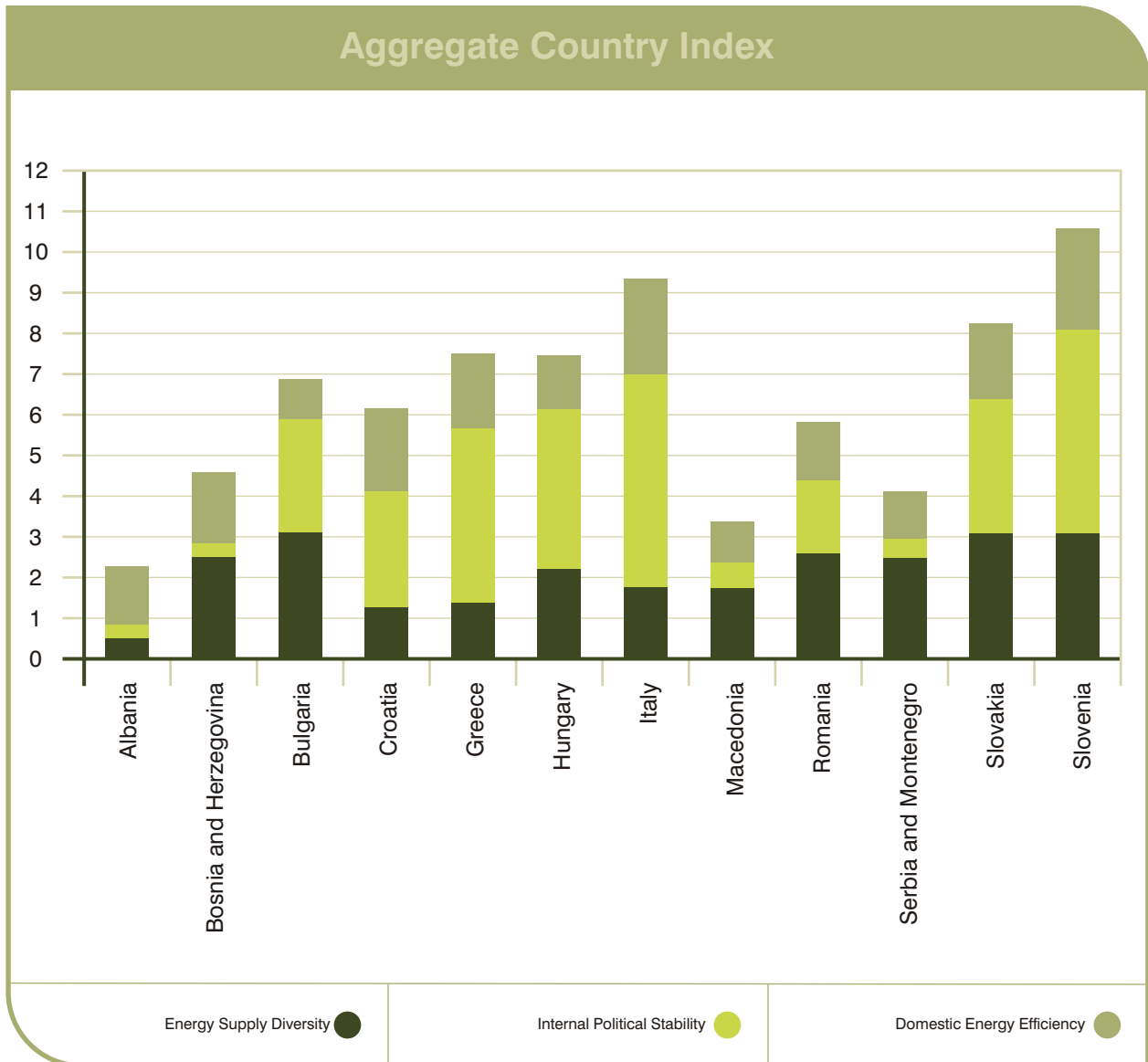


Chart 1: Aggregate Country Index.



Defining Energy Security

Energy security is a highly contested concept. For the purposes of this report, we take energy security to mean *the ability of a country to protect itself from, or quickly recover from, sudden or prolonged shocks to the country's energy supply or infrastructure*. The Onamics Energy Security Index provides, in other words, an assessment of the current *robustness* of each country's energy sector. Comparatively speaking, which of these countries is best prepared, and which is least prepared, for an energy shock?

Shocks to a country's energy sector could come from a number of sources. With exponential global growth in energy demand and what seems to be a stagnating energy supply growth rate - be it because of instability in key supply regions, global resource shortages, insufficient downstream capacity, or lack of investment in research and extraction - it is becoming more and more likely that the global economy will suffer some sort of widespread energy shortage or large-scale price hike in the near future. Some predict that the price of oil could soon hit an historic high of US\$100 a barrel, while the IMF has suggested recently that the world is facing "a permanent oil shock." These are messages that every country must take seriously. Any inability of nation states to meet their domestic energy demands directly impacts economic growth and has negative flow-on effects for political and social stability. For this reason alone, it is no surprise that energy security is once again becoming a major concern for every functioning state.

Ensuring stability of the energy supply, though, is not the only problem countries face. Another threat, either alone or in combination with other factors, comes from potential infrastructural failure due to aging and inefficient systems of energy production, distribution, and use. And all countries have reason to be concerned about supply disruptions or price spikes due to natural disasters or terrorist attacks, whether such events occur in the immediate region or in other parts of the world.

This is to say that developing energy security is a more complicated proposition than simply developing a steady supply of raw or refined fuels. A country must also be concerned with other external and internal threats to supply and distribution stability, including various forms of infrastructural failures or destruction. A reliable and stable supply of imported fuels is basic to the survival of modern economies. Having spare energy storage and generation capacity, system redundancy, and adequate protection of infrastructure should also be seen as major assets for any country.

With these points in mind, we have assumed that countries facing 1) an outdated energy infrastructure; 2) an over-reliance on external energy suppliers; 3) internal political, economic, or social instability; or 4) inefficiencies in energy supply and use, are more likely to experience, or to fare negatively in the face of, an energy shock. A sense of a country's level of energy security can therefore be gained by looking at key economic, political, and energy-related indicators. That insight forms the foundation of this report.



Details of the Index

Our aim with this first issue of the Onamics Energy Security Index is to give a concise, policy and investment-relevant account of the energy security situation within Central and Eastern Europe. To give a sharp picture of regional variation, we have compiled what might be called a “comparative” rather than an “absolute” index. This is an important point. It means that a high overall score or a high score in any of our index's categories does not necessarily indicate that a country is “energy secure” in an absolute sense. It only means that a country is relatively more secure than those countries in our index with lower scores.

One of the implications of this “comparative” focus is that we have avoided speculation about the meaning of absolute energy security. This is because we view energy security as an ongoing series of struggles, compromises, and improvements, rather than as a readily definable endpoint. We have, furthermore, avoided comparing Central and Eastern Europe with other regions or world averages. We have geographically bounded our focus in this way due to the significant differences that exist in terms of, for example, regional environmental conditions, consumer trends, and levels of economic development, between Central and Eastern Europe and other parts of the world.

The mechanics of the index are quite straightforward. We look at the relative strengths and weaknesses of each country by analyzing twelve factors or variables, grouped together into the following three categories¹:

- Energy Supply Diversity;
- Internal Political Stability; and
- Domestic Energy Efficiency

The first category, **energy supply diversity**, incorporates four separate variables. We use this category to determine each country's ability to weather shortages of, or sudden spikes in the price of, key fuel types. The energy supply diversity measure also looks at each nation's ability to fulfill its power needs should some key infrastructural components or energy generation plants suddenly go off-line. In other words, how prepared, in physical terms, is each country to deal with an exogenous or endogenous energy supply or distribution shock?

Next, we measure **internal political stability**. This category incorporates variables that measure levels of corruption, the stableness of the country's political structures and arrangements, the pervasiveness of the rule of law and protection of political rights, and per capita gross national income (GNI). With five distinct variables, this is the category that has the largest influence on our results. We assigned the

¹ A full list of the variables can be found in Appendix II. Further detailed information about each of the variables, including information about the data sources used, can be found at www.onamics.com



greatest weight to this category because we believe political stability to be a precondition for government strategizing and implementation of national objectives, including the ability of a state to respond effectively to sudden changes in a country's energy situation. It is difficult to ensure energy security if a country has a weak internal political structure, is subject to corruption, exhibits non-transparent policy-making, or has frequent changes in governing structures.

Finally, the Onamics Energy Security Index takes account of **domestic energy efficiency**, using three separate variables. Here, we are primarily concerned with the age and quality of existing energy infrastructure. We also look at how efficiently each country uses its existing electricity resources, on the grounds that a more efficient country will be better able to adjust to rapid changes in the global energy environment.

In short, the Onamics Energy Security Index assumes that the more diversified a nation's energy supply, the higher the levels of internal political stability, and the more efficient the existing energy infrastructure, the lower the risk that a country will suffer from a severe energy crisis.

For more information about the index methodology please see Appendix I.

Index Results and Analysis

The easiest place to start in interpreting our results is with general impressions, taken from the summary table and chart. As can be seen clearly in Table 1 and chart 1 above, the region exhibits stark contrasts across each of the three main categories under investigation. A few immediate points stand out. Chart 1 shows us that there are three distinct “energy security blocs” within the region. Slovenia, Italy, Greece, Hungary, and Slovakia are closely grouped at the top (though, that said, Slovenia clearly leads the way - see Text Box 1). Bulgaria, Croatia, and Romania occupy positions 6, 7 and 8 in the index, and form a second clear group of countries. Bosnia and Herzegovina, Serbia and Montenegro, Macedonia, and Albania (in this order) form the last (i.e. least secure) group.

Slovenia Leading the Way

Comparative assessment

- At the level of individual countries, Slovenia stands out, ranking first overall, and first in two of the index's three categories. Table 3 and Chart 3 show that in terms of internal political stability – the most telling of the index's categories – Slovenia ranks slightly below Italy, and slightly above its EU compatriots Greece and Hungary. Much of Slovenia's strong ranking on the aggregate political stability measure can be explained by the fact that Slovenia's small population of around 2 million is relatively wealthy, with a Gross National Income (GNI) per capita of around US\$11,920. This relative wealth is itself a substantial buffer against the negative political, economic, and social effects associated with energy supply shortages.

- In terms of energy supply diversity, Slovenia has the highest ranking, roughly on par with Bulgaria and Slovakia. And in terms of domestic energy efficiency Slovenia is again at the top of the list, with Italy and Croatia close behind and Macedonia (a former Yugoslav republic) in last place, indicating the least efficient sector.

General comments

- Slovenia seems well placed, in both relative and absolute terms, to deal with any major energy shocks in the near term. The country exhibits high political and economic predictability due to relatively high levels of political stability. Stable government and political structures should allow for rapid public-led responses to sudden changes in Slovenia's energy situation. And the energy portfolio is diverse enough to guarantee some security against unexpected alterations of balance in any one particular energy type. Lastly, infrastructure is relatively modern and efficient, mitigating against sudden unexpected failure.

Weaknesses and Challenges

- The proportion of Slovenia's energy production from oil is relatively high when compared with the rest of the group, at around 34.7% of the total energy production. Likewise, Slovenia ranks 7th in the set of 12 countries in terms of how much national income it derives from each unit of energy, which suggests a certain degree of inefficiency in energy use. Slovenia could certainly do more to improve its energy self-sufficiency portfolio – it now ranks in 5th place out of 12 – by for example increasing the percentage of total energy production coming from renewable sources, or doing more to cultivate other domestic energy sources. Of course, Slovenia's membership in the EU provides some insulation against possible energy shocks. As the EU's energy markets become more tightly integrated, they should also become, on the whole, more resilient.

Text Box1: Slovenia Leading the Way

These standings are tied closely to EU membership. An important and noteworthy general finding is that countries in the EU or closer to the EU seem to demonstrate a more stable overall energy portfolio, with lower likelihood of an energy crisis, than is the case for countries further away from EU membership. For example, those countries in the first bloc are all EU members. The second group contains the most likely 'next' candidates for EU membership – Bulgaria and Romania as early as 2007, with Croatia expected to join in 2009. Bosnia and Herzegovina, Serbia and Montenegro, Macedonia, and Albania form the last bloc, and are still on the periphery when it comes to talks concerning EU expansion.

The causal relationship demonstrated here flows, of course, both ways. Those countries that have EU membership receive benefits that positively affect their economic and political stability, as well as their access to energy markets. These same countries also made positive changes in order to be considered for EU membership, as is the case for countries in the second group, waiting for admission to the club. Thus, EU membership acts both as a carrot, compelling positive change, and a buttress, supporting positive changes that take place. These findings show that further expansion of the EU will likely increase regional and country-specific energy security.

EU membership, though, tells just a part of the regional energy security story. To better understand the array of overall standings, it is important to examine the results in each of the three categories described in the preceding section. We can see, for instance, that while some countries in the bottom two groups



perform quite well on the domestic energy efficiency measure, these countries tend to be relatively weaker in terms of energy supply security and the stability of political institutions and processes. Albania, as an example, is ranked a creditable 6th in terms of domestic energy efficiency, but fares poorly in the other two categories. This means that Albania ranks poorly overall.

It should be noted that the index takes account not just of rankings, but also of the relative difference between countries across each of our variables. It is the relative difference in terms of internal political stability that explains much of the gap between the best-performing and the worst-performing countries. Those in the lowest bloc have extremely low scores on the political stability measure, while those countries in the first bloc have, relatively speaking, extremely high political stability scores (see the political stability bar in Chart 1, and also Chart 3, which summarizes the internal political stability results.) The same is true, though to a lesser extent, for the energy supply diversity category.

Energy Supply Diversity Rankings					
	ESD Rank	Per capita Electricity Generation Capacity	TPES per capita	Energy Self - Sufficiency	Energy from Non - oil Sources
Slovenia	1	3	1	5	7
Bulgaria	2	1	6	6	2
Slovakia	3	2	2	10	1
Romania	4	5	8	3	6
Bosnia and Herzegovina	5	6	11	1	3
Serbia and Montenegro	6	8	9	2	5
Hungary	7	10	5	8	4
Italy	8	4	3	12	9
Macedonia	9	11	10	4	8
Greece	10	7	4	11	11
Croatia	11	9	7	9	10
Albania	12	12	12	7	12

Table 2: TPES = Total Primary Energy Supply.



Energy Supply Diversity Index

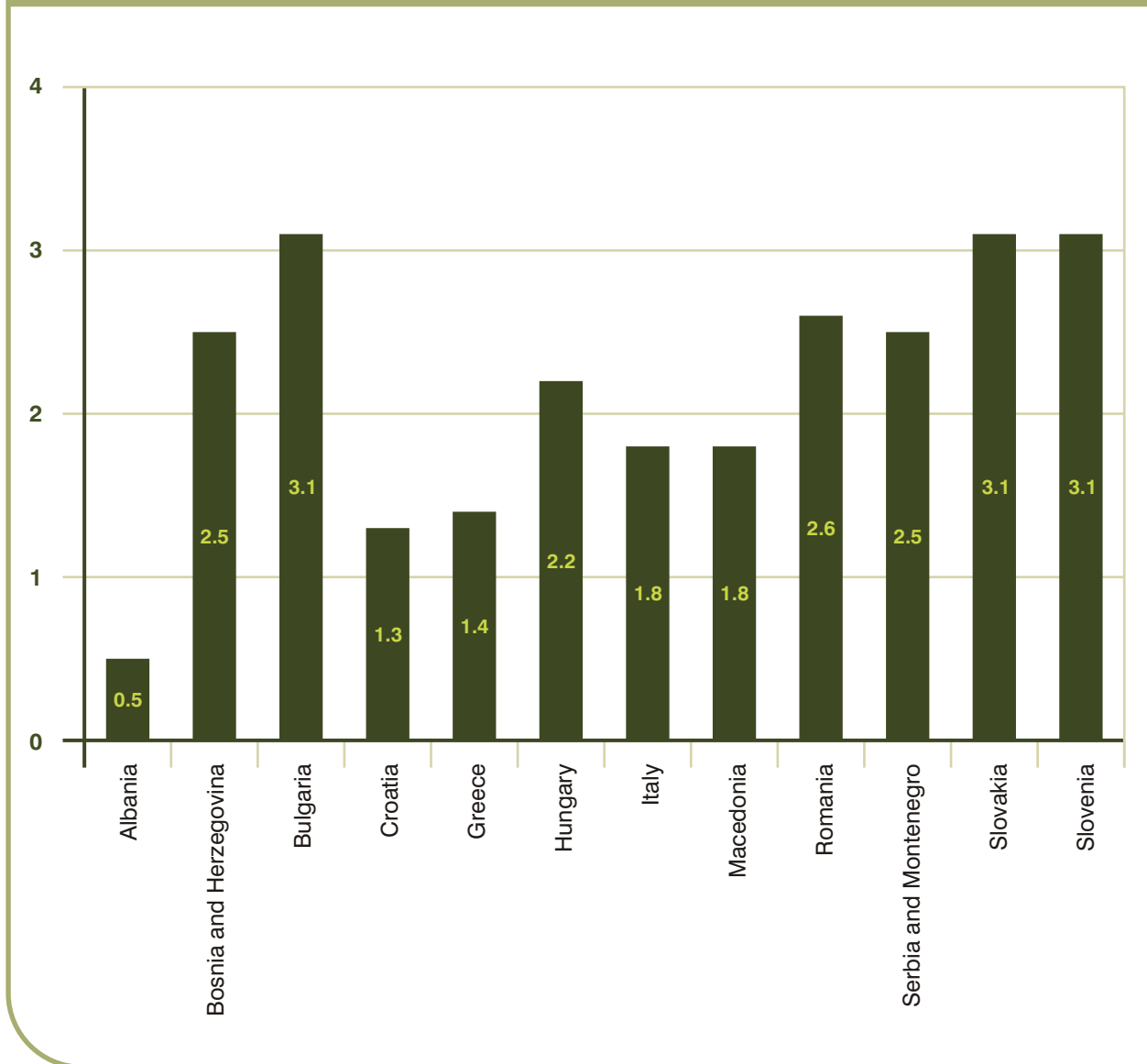


Chart 2: Energy Supply Diversity Index

Energy supply diversity is the most important category in our index for those concerned with supply vulnerabilities. The first point to note here is that Slovenia, Bulgaria, and Slovakia – the top three performers – show almost identical ratings on this measure, and, together, are far and away the best performing countries. This is hardly a surprising result. Each of these countries has a relatively high domestic electricity generation capacity and a high overall primary energy production capability. Slovakia and Bulgaria also have a diverse energy base, relying less, comparatively speaking, on imported oil for their energy needs.

Greece, on the other hand, has a high overall position in our index, but shows vulnerability on this crucial energy supply diversity measure. This is largely because oil is such a high component of Greece's energy mix (the raw figure tells us that 57.5% of Greece's energy comes from oil – of the countries in our study, only Albania has a higher level of oil dependency), and, secondly, because Greece is the most reliant on outside sources of energy of all of the countries studied, having to import 94.5% of its total energy. These figures make apparent that an expansion of domestic energy production should be a policy priority for Greece. This is, of course, a tough proposition for a country that, beyond reserves of lignite, is poorly endowed with traditional energy resources. Greece's attentions should be, and increasingly are, on growing its renewable energies sector, particularly in areas like solar power generation, small-scale hydro, and the conversion of biomass. While Greece currently ranks 10th in our index in terms of renewables production per capita (see Table 4), the Centre for Renewable Energy Sources estimates that by 2008 renewable energy could account for as much as 17% of Greece's total production. This, from an energy security perspective, is a heartening sign.

Internal Political Stability Rank						
	IPS Rank	Political Stability	Corruption	Rule of Law	Political Rights	GNI Per Capita
Italy	1	6	3	4	1	1
Slovenia	2	1	1	1	2	3
Greece	3	4	4	3	3	2
Hungary	4	2	2	2	3	4
Slovakia	5	3	6	7	3	6
Croatia	6	5	7	5	7	5
Bulgaria	7	8	5	6	3	8
Romania	8	7	9	8	7	7
Macedonia	9	12	11	9	10	9
Serbia and Montenegro	10	11	10	10	9	10
Albania	11	10	12	12	10	11
Bosnia and Herzegovina	12	9	8	11	12	12

Table 3: Internal Political Stability Rank



A secondary and related challenge for Greece involves diversification of energy types and sources. Heavy reliance on Russian natural gas, for instance, is a worrying feature of the Greek energy portfolio. Building supply relationships with alternative energy suppliers would provide a buffer against sudden shifts in this primary supply arrangement. Demand-side measures, including greater efficiency in energy production and use, would also help to alleviate Greece's present energy dependency.

Italy and Croatia are experiencing the same mix of supply dependence and demand-side challenges. Macedonia and Albania, in contrast, show particular vulnerability in terms of their energy production capabilities. Both of these countries clearly require substantial energy infrastructural development.

The second category, internal political stability, similarly holds few immediate surprises. There are striking differences between those countries at the top of the stability rankings – countries like Slovenia, Greece, and Hungary – and those at the bottom. Macedonia, Serbia and Montenegro, Albania (see

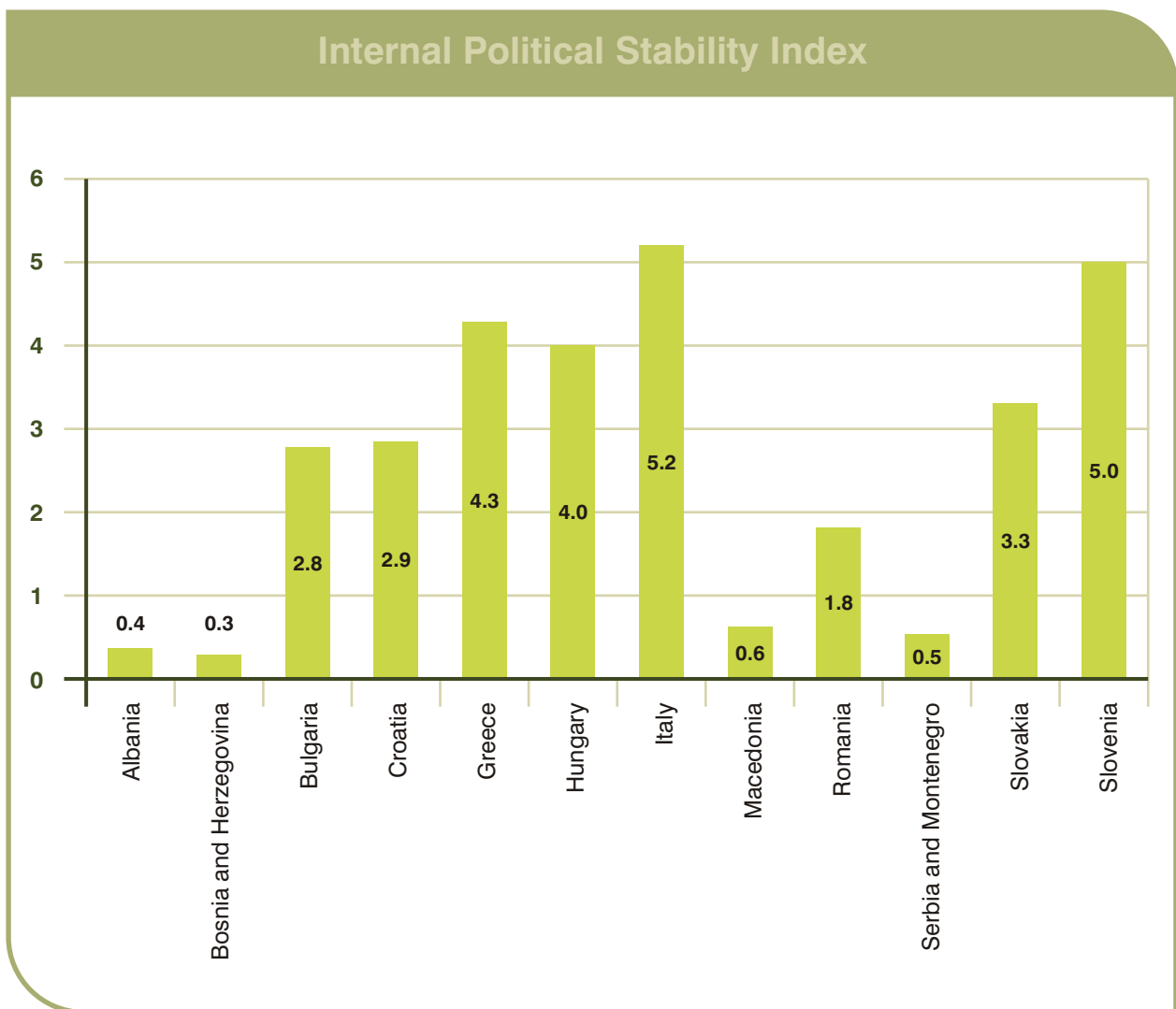


Chart 3: Internal Political Stability Index



Text Box 2), and Bosnia and Herzegovina all score poorly on measures of corruption, rule of law, political stability, protection of political rights, and per capita income. These low scores bode poorly for the relative energy security of these countries, since low political and economic stability translate directly into a low ability to prepare for, and deal with, complex crises.

The different variables tend to be highly correlated – countries that have a few high scores tend to have many high scores, while those countries that are struggling in one or two areas tend to struggle in others. However, this is not always the case. Italy, for instance, performs well in terms of political rights and per capita income, but is in the middle of the pack in terms of our general political stability indicator. This said, the general rule is that countries that score poorly on the internal political stability measure have a lot of work to do in a range of areas.

Albania has Work to Do

Comparative assessment

- Albania fares poorest in the index, with a last-place standing overall, and a relatively weak performance in each category. During its transition to a market economy, Albania, along with a number of other countries in the region, suffered a serious deterioration in its energy infrastructure, as well as with its structures of governance. The problems with Albania's energy infrastructure are indicated, for instance, by its 12th placing on the “electricity line transmission losses” measure, which is indication of a relatively inefficient electricity supply network. And the governance problem is shown by low rankings on measures of political stability, corruption, rule of law, and political rights. The problems don't stop there, however. Albania relies on oil for more than 66% of its energy – the highest dependence in the region. Finally, Albania's relatively low GNI per capita of US\$1,740 sees the country poorly placed economically to respond to sudden energy shocks.

- Albania exhibits the worst energy supply diversity index number of 0.5 (of a possible 4) compared, for example, to Slovenia's 3.1 (Slovenia scores highest) and Macedonia's 1.8. Albania's dramatically poor performance should be of real and considerable concern, especially given climbing oil prices.

General comments

- The energy security risk exhibited by Albania is significant. Given the persistent political uncertainty due to a number of regional and internal factors, Albanian's capacity to engage in long-term strategic planning, which is a prerequisite to improving overall energy security, is limited. At the same time, energy infrastructure in Albanian is outdated and probably highly insufficient to cope with a sudden surge in energy demand. The high level of dependency on the oil sector and the low per capital electricity generation capacity (Albania ranks last on both measures), makes Albania very susceptible to future energy supply disruptions and overall energy supply instability.

Weaknesses and Challenges

- There is only so much we can expect Albania to do in the short - run. However, the high insecurity associated with the energy production and supply could significantly impact economic growth. It is unreasonable to expect significant external green field investments in Albanian amidst the kind of energy insecurities Albania exhibits.

Text Box 2: Albania has Work to Do



Political stability is also tightly tied to economic wellbeing, as shown by the close correlation between GNI per capita and the other variables in this category. Countries in this region are likely to become more politically stable as they become wealthier. Though, at the same time, we must appreciate that political stability is itself a precondition for economic wellbeing – political reform must work side by side with, and in many cases must precede, efforts aimed at economic development. And as discussed above, EU membership, or the possibility of EU membership, clearly has some relationship with political stability and, in turn, energy security.

Our final category is domestic energy efficiency. Here we see a few quite interesting results. Stable, industrialized countries such as Slovenia and Greece perform well, as expected. But countries like Albania and Bosnia and Herzegovina also score relatively highly on these measures. Here is where an analysis of the individual variables used in our study becomes particularly important. Looking more closely at the results we can see that Slovenia and Greece perform well in this category due to

Domestic Energy Efficiency Rank				
	DEE Rank	GDP per Unit of Energy	Renewables Production per capita	Electricity Line Transmission Losses
Slovenia	1	7	1	2
Italy	2	1	7	3
Croatia	3	5	2	8
Slovakia	4	9	6	1
Greece	5	2	10	4
Bosnia and Herzegovina	6	4	4	9
Romania	7	8	8	6
Albania	8	3	3	12
Hungary	9	6	12	5
Serbia and Montenegro	10	12	5	11
Bulgaria	11	10	11	7
Macedonia	12	11	9	10

Table 4: Domestic Energy Efficiency Rank



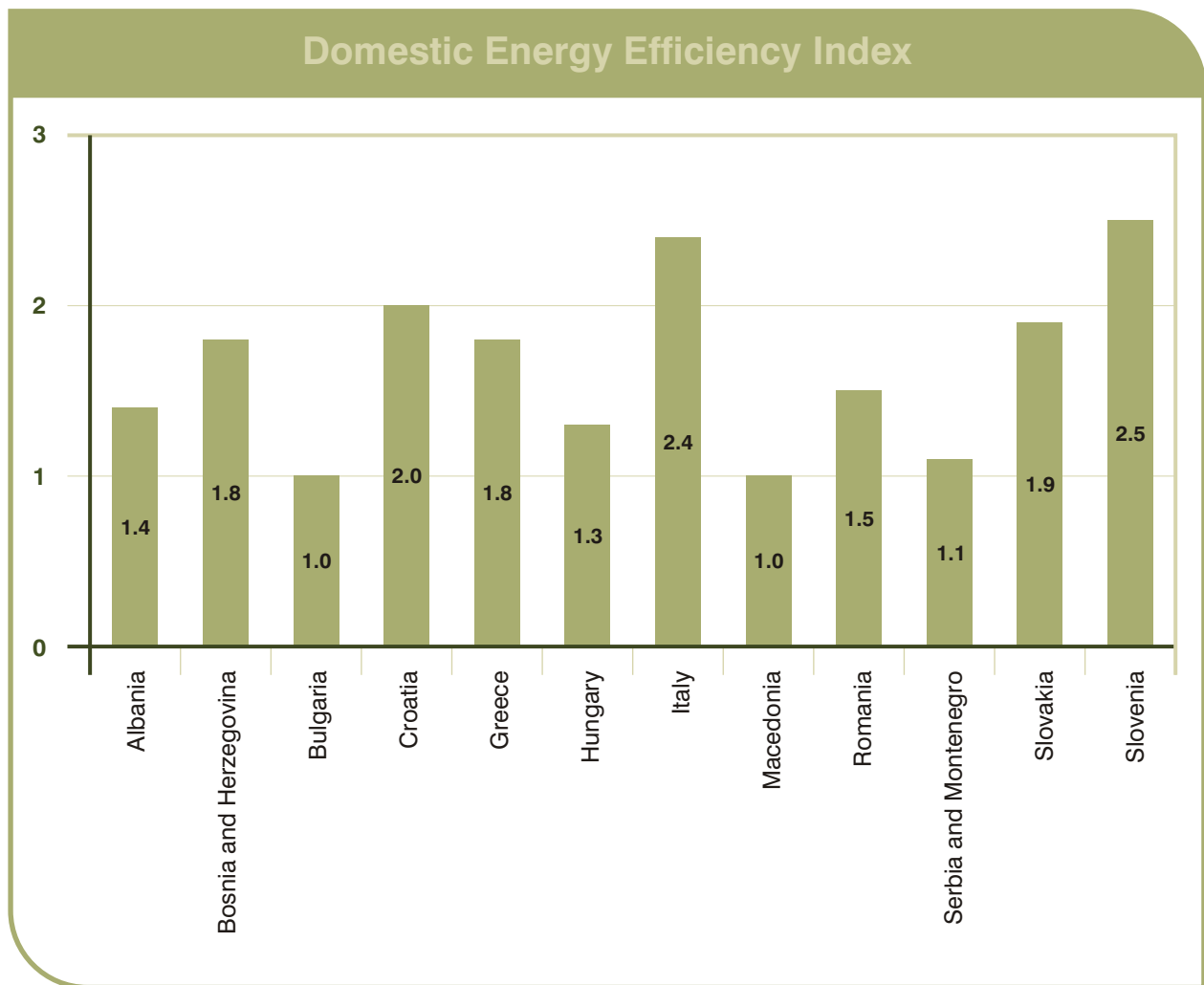


Chart 4: Domestic Energy Efficiency Index

particularly low levels of line transmission loss, indicating a relatively modern and efficient electricity generation and distribution infrastructure. This is an important variable since, all other things being equal, a more modern infrastructure is less likely to suffer catastrophic failure. Albania, on the other hand, fares poorly on this specific measure. The age and condition of infrastructure is clearly something that countries like Albania need to address.

The reason for Albania's relative overall energy efficiency is to be found in the other two Domestic Energy Efficiency variables and, in turn, in the structure of the country's economy. Close to half of Albania's workforce is employed in agriculture, and, correspondingly, Albania's manufacturing sector is relatively small. The collapse of the infamous pyramid schemes of the 1990s and the economic instability that followed have done little to boost Albania's prosperity. Albania scores quite well in terms of overall energy efficiency, then, because its limited economy presently requires relatively little energy in total, and energy-intensive manufacturing is a relatively minor part of the Albanian economy. This energy efficiency gives Albania some small protection against energy shocks, but only because the country presently has tragically little to lose. The same can be said for Bosnia and Herzegovina.



High scores on individual measures, then, must be read in the context of the overall results. Because Albania's energy efficiency score is inflated by its economic conditions, any growth of the Albanian economy, and any increase in industrial demand for electricity, may actually bring about a *decline* in Albania's overall efficiency measure. At the same time, the possibilities for economic growth and long-term energy security are themselves constrained by political instability. We should note that a key opportunity in these emerging economies is to maintain relatively high energy production and use efficiency by installing, as demand allows, the best available generation and infrastructural systems. The region's emerging economies, in other words, are in a position to "leapfrog" to highly modern energy systems, provided investment and aid assistance is also carefully directed toward these countries' most pressing (and mainly political) needs.

➤ Coming Challenges and Opportunities

In this final section of the report we sketch some of the opportunities available to local and foreign investors that are revealed by the index, and we point to some of the challenges ahead for domestic and regional policy-makers.

Energy and Politics in Central and Eastern Europe

Political stability is key to a country's energy security. Unfortunately, political stability was and still is in short supply in parts of Central and Eastern. The tragic and bloody recent history of this part of the world is well known. It is still, however, not well understood. And despite the significant progress made since Yugoslavia was torn apart by nationalism, political opportunism, and sheer barbarism, much could still go wrong.



Map: "Balkan Oil Transit Pipeline Project" - (Source: EIA).

Kosovo's final status is still undefined, which means Serbia remains uncertain of its external border. The union between Serbia and Montenegro is due to expire in 2006, with uncertain consequences. And Macedonians are stuck in a paradoxical situation – they are better off as a result of their Euro-Atlantic integration, but, as is evident from a poll recently conducted by the German Marshall Fund, they express great pessimism about their future.

For Bosnia and Herzegovina, July 2005 marked the 10th anniversary of the Srebrenica massacre, which was the worst case of genocide in Europe since World War II. Even today, Bosnia and Herzegovina is mostly a dysfunctional state held together by international oversight. There will be problems as long as *Republika Srpska* retains its status of a 'country within a country.'

Obviously, Croatia is politically and economically more stable than its southern neighbors, but its economic prosperity and privatization are closely linked to its talks with the EU. Albania, though more stable than at the turn of the century, remains volatile. The new Albanian government is likely to struggle with challenges such as overcoming corruption, establishing effective control over the country, fighting organized crime, and stimulating economic growth. Increasing privatization and attracting foreign direct investment will also be amongst the priorities of this new government, as will joining NATO and the EU. Romania and Bulgaria are politically much more stable, and there are no serious dangers that the progress made in the last few years will be reversed. The rest of the countries - Slovenia, Hungary, Slovakia, and Greece - are all EU and NATO members and exhibit a high level of macro stability, though significant political and economic differences exist on the micro level.

Much of Central and Eastern Europe, then, has been shaped in recent years by political instability and violence. However, the shadow of this violence falls unevenly across the region. Some countries in the region have now gained high levels of political functionality, while others still have a great deal of work to do to improve their levels of stability and general state capacity. Tied to all of this is the prize of EU membership. Future EU expansion, or the increasingly real possibility of a halt to the EU's expansion for a time, is, of course, one of the central political realities which could shape future regional development and impact long-term regional energy security.

Central and Eastern Europe is diverse, culturally, economically, geographically, and politically. That said, there are key similarities across most of the countries in our study. These are generally countries still experiencing economic transition, where economies are expanding at rates averaging 4-5 percent annually, even as any embrace of private equity is still hampered by uneasiness in the face of foreign acquisitions and investments in certain sectors. Since economic well-being is tied closely to a country's energy situation, a key question for the region is whether the current energy base can support such elevated levels of economic growth into the medium and long term – particularly given that most of the states under review are still well below the EU average in terms of gross domestic product.

On a related note, one obvious real challenge is that each of these countries is forced to import a good deal of its energy. This part of the world is relatively poorly endowed with natural energy resources. While some Central and Eastern European countries have sizeable stocks of coal, giving a degree of control and flexibility when it comes to electricity production and heating, the oil and natural gas that are basic to a functioning modern economy must largely be sourced from other regions. This energy dependence hints at important vulnerabilities. Strategies that enable greater energy supply diversity, including development of renewable energy production capacities and demand-side efficiencies, are immensely important.



The (In)secure Gateway for Caspian energy

The Western Balkans and parts of Central Europe – i.e. countries studied by this index – have been earmarked as a gateway of sorts for energy coming out of the Caspian and destined for the Western markets. To a significant degree, the Western Balkans region can be considered the western-most component of the Caspian/Black Sea energy area. A number of projects are under study in the area (see the picture below).

A key problem, however, shown clearly in our study, is that the region in general exhibits a low degree of internal political stability. Current investors are banking on political instability being a relatively short-term condition that will give way as EU accession talks and pre-accession talks begin with the countries of the Western Balkans. Realistically, though, the countries at the bottom of our index will be left out of EU talks for some years. And the structural deficits exhibited by the political systems in these countries will require vast investments of time, expertise, and money to overcome.

Investors should also be concerned about the domestic energy efficiency results in our study. This measure indicates poorly developed infrastructure in places like Albania and Macedonia. Macedonia and Bulgaria have a particularly low efficiency yield, both scoring 1 out of 3 on the Onamics energy efficiency measure. This raises questions if the objective is to increase through-put (i.e. capacity). The low efficiency yield across the region – the exceptions perhaps are Slovenia, Croatia, Greece and Slovakia – indicates a serious capacity weakness that will have to be accounted for in future project planning. That is, the cost of building new energy infrastructure (or upgrading old) will have to be taken into account in any future energy projects. And, ideally, pipeline projects will not simply be seen as exercises in moving energy through these countries, but will also lead to improvements in the efficiency and diversity of these countries' energy systems. Regional energy security ultimately depends on the security of each country in the region – it is important that all countries receive some real benefit from these proposed infrastructural expansions.

Text Box 3: The (In)secure Gateway for Caspian energy

Key Risks and Vulnerabilities

The key challenges to long-term energy security in the region are twofold. On the one hand, the cycle of political transition has to be completed. This means finalizing the undefined status issues, and reviewing the Dayton Agreement in order to make Bosnia and Herzegovina a functioning state. This is largely still a part of the old agenda, which began back in 1991 with the dissolution of Yugoslavia. This is applicable only to Serbia-and-Montenegro, Bosnia-and-Herzegovina, Kosovo (indirectly covered in this index), and to a degree Macedonia.

On the other hand, it means building capacity which will make these states viable and competitive in the long-run. None of the states has quite completed the transition of their economies. The economic transition has been tackled to varying degrees, and with varying levels of success, but in most cases, modernization (often meaning, or at least accompanying, privatization) of so called “strategic assets” remains on the to - do list. Liberalization is the current trend, but it should not be considered a necessary response to energy security concerns. This is because liberalization may, in some instances, actually contribute to greater instability. The impact of particular acts on a country's energy security must be considered. For instance, greater regional energy market integration is likely to add resilience. Simply selling off key energy assets to foreign companies may have the opposite effect.

In the best-case scenario, all the remaining political questions will be resolved in the next two years, allowing the whole of the Western Balkans region to move decisively towards the EU. Once firmly on the EU track – again this applies to states like Serbia and Montenegro, Bosnia and Herzegovina, Croatia, Macedonia, and Albania - making key economic decisions concerning privatization and attracting foreign direct investment (FDI) will be easier.



A short-term challenge will also be sustaining European interest in the region, which has been waning due to, on the one hand, the EU's internal crisis of legitimacy, and on the other hand, the Central and Eastern Europe's somewhat equivocal commitment to reforms.

Business and Investment Opportunities

Investment opportunities in the regional energy market can be divided into four segments:

1. Greenfield investments (new power plants, pipelines and refineries);
2. Acquisitions (buying shares of now nationally-owned utility and energy companies);
3. Infrastructure upgrades (equipment maintenance and replacement); and
4. Investment in energy exploration and drilling, and energy diversity solutions

As made obvious by the index, energy efficiency and energy dependence remain two major problems for most of the countries compared. This probably means that 1) major opportunities will develop in terms of upgrading equipment, and 2) significant opportunities for investment in generation and supply diversification should also emerge. New projects in the renewable energies sector, and drilling and exploration are likely. Further, the local primary energy capacity is unlikely to meet new energy needs due to largely outdated technology and know-how. Foreign companies will thus have opportunities to compete for contracts in developing new capacity, including the renewable energy sector; in exploration and drilling; and in pipeline construction and management.

In the near term certain energy assets, and in some cases whole sectors, may be sold on the global market. Serbia is already selling its national energy firm. Croatia has thus far resisted, but the privatization of INA, Croatia's large state-owned oil and gas company, is coming. The new oil price levels are speeding up this process given that INA is largely a distribution and refining company with limited, if any, investments in production. INA will have to undergo major transformation in the next few years, including diversification of its profit base by investing in third sectors, if it is to become competitive and resilient to global energy shocks. However, it is unlikely that INA can undergo a fundamental restructuring without significant foreign capital allocation. Similarly, Kosovo Trepca mine, which is a high-surface rich lignite coal mine, is set to be privatized and re-commissioned. Other changes of this nature are apparent throughout the region.

Opportunities in the Balkan markets will largely come in the form of Greenfield investment in terms of building new capacity. The danger to FDI should gradually decline or stagnate over the next two years as major political questions are resolved. However, one should not underestimate the fundamental lack of human resources and critical infrastructural capacity, which is necessary to absorb asymmetric shocks. The institutional capacity across the Balkan region remains low, which means risks posed by asymmetric threats like disease pandemics, terrorism, and earthquakes, is significant. The potential for major human and economic losses remains high in the region, precisely because of the low capacity to respond effectively to shocks.

While the political scene remains unpredictable, the potential for violence is declining, and in most of the region is negligible. **The perceived risk of war in the region is probably exaggerated, while political risk is given too little consideration in many investment decisions.**





Conclusion



Developing long-term regional and country-specific energy security requires a sustained focus across a range of related areas. Over the last few years, many countries have been concerned with the stability and diversity of energy supply. This is an important area of focus. It is, though, just one piece of the energy security puzzle. The ability to weather supply shocks and infrastructural failures also depends, crucially, on political stability, and on the development of energy efficiency and sustainability.

Working towards these broader ends will require the cooperation of a range of actors. The international community and the EU in particular, have a great deal to do to ensure the development of workable political frameworks and institutions for Central and Eastern Europe. These are perhaps the most central issues for the region's long-term prospects. At the same time, many countries in Central and Eastern Europe would clearly benefit from investment in energy infrastructure, in alternative forms of energy supply (including, particularly for those interested in EU membership, development of renewable energy systems), and from a shift to more responsive and efficient business models. Private investors within the region and abroad have much to contribute on these fronts.

Energy security, finally, requires cooperative efforts. Achieving better regional cooperation must become the goal. The issues examined in this report are basic to the proper functioning of all countries. It is important that the public and private sectors not work at cross-purposes on matters concerning energy – energy security is a common goal of benefit to all who pursue it. By pointing to key strengths and weaknesses within each country, this index can help investors and policy-makers pinpoint where their interventions can do the most good.





Appendix I

A Note on Methodology

The Onamics Energy Security Index provides a snapshot of the current energy security situation in Central and Eastern Europe, by breaking down energy security into some of its most important constituent parts. We have examined key aspects of energy supply diversity, internal political stability, and domestic energy efficiency to bring the energy security situation into sharper focus².

The **Energy Supply Diversity** measure is comprised of four separate factors: per capita electricity generation capacity; Total Primary Energy Supply (TPES) per capita; the country's ability to use domestically-available resources to cover energy needs; and the percentage of oil in the energy mix. The **Internal Political Stability** measure draws from four current governance surveys and indices developed by the World Bank and other well-established organizations. These measures have to do with political instability and violence; rules of law; corruption; and political rights. We also take note of each country's per capita gross national income in this category.

Finally, we look at **Domestic Energy Efficiency**. There, we examine the productivity achieved from each unit of energy; the percentage of total energy derived from renewable energy sources; and electricity line transmission losses, as a proxy for the age and state of repair of each country's electricity generation and transmission network.

For each factor in our analysis we have relied on an established, authoritative, pre-existing quantitative measure. Our data has been gathered from a range of sources, including various regional and international energy agencies. Where appropriate, we have used per capita figures or otherwise altered the data, in order to allow direct comparison between countries of different sizes. For further information about the nature and sources of our raw data please visit the Onamics website: www.onamics.com

² See Appendix II for a complete list of variables.

To develop the index, the data for each country has been normalized, following a methodology established by A. T. Kearney³. This process involves assigning the value “zero” to the lowest data point for each factor, and the value “one” to the highest data point. All other data points are then assigned a relative value between zero and one. This process enables ready ranking and comparison of each country in terms of each variable and category.

To see how this works in practice, consider the Gross National Income (GNI) per capita data measure, which is part of the Internal Political Stability category. The latest World Bank data tells us that Bosnia and Herzegovina has the lowest per capita GNI in the region, at US\$1,530. Italy has the highest, at US\$21,570. In our index, Bosnia and Herzegovina has therefore been assigned the value zero for this factor, and Italy has been assigned the value one. All other countries have been assigned proportional values somewhere in between.

Each variable has been assigned the same weight in the index, apart from GNI per capita. We have given GNI per capita a double weighting, as a means of accounting for the importance of wealth to issues of infrastructural stability and recovery from price pressures. Since there are twelve variables, and one of the variables has been assigned a double weighting, the maximum possible score on our aggregate comparative index is 13 (see Chart 1).

The Onamics Energy Security Index has been designed to provide an accessible and informative introduction to the Central and Eastern European energy reality. However, the key indicators that are contained in the Onamics ESI merely scratch the surface of the domestic, regional, and global energy situation. An index of this nature cannot capture all of the complexity of political and cultural conditions in particular countries. Many other crucial factors - including domestic and regional energy regulations and the nuances of political and social conditions - defy ready quantification. Moreover, conditions in this part of the world change rapidly.

As such, along with the energy security index, Onamics Global Risk Consulting, based in Washington D.C., offers tailored country reports, and comparative regional reports, that provide in depth political risk analysis in areas of interest to our clients. Our regional experts can develop political risk and security analyses based on individual energy sectors, and provide other valuable information for those wishing to understand the business and political climates in some of the world's fastest growing economies.

For more information please contact Onamics LLC or visit www.onamics.com

³ See www.foreignpolicy.com/story/cms.php?story_id=2455.



Appendix II

Full List of Variables

- 1. Energy Supply Diversity.**
 - a. Per Capita Electricity Generation Capacity
 - b. Total Primary Energy Supply (TPES) per capita
 - c. Energy Self-Sufficiency (Percentage of energy from domestic sources)
 - d. Energy from Non-oil Sources

- 2. Internal Political and Economic Stability.**
 - a. Political Stability
 - b. Corruption
 - c. Rule of Law
 - d. Political Rights
 - e. Gross National Income (GNI) Per Capita

- 3. Domestic Energy Efficiency.**
 - a. Gross Domestic Product (GDP) per Unit of Energy
 - b. Percentage of Total Energy from Renewable Energy Sources
 - c. Electricity Line Transmission Losses

For more information, visit www.onamics.com





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