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Green Growth and Sustainable Development for Bulgaria: Setting the Priorities

■ The current pattern of energy use in Bulgaria (including both households and industry) is unsound. The country's energy intensity is striking, when compared to other European countries, thus, Bulgaria's overriding priority is stimulating energy efficiency by sufficiently utilizing EU funds. Measures to boost energy efficiency mean more jobs and revenues for Bulgarian SMEs, while measures promoting energy savings mean utilizing the existing capacity at a low or no extra cost.

■ Sustainable environment is a key component of sustainable economic development. Provided that the level of air pollution with particulate matter in Bulgaria is a persistent problem on the entire territory of the country, a need to focus on reducing emissions that are major health risks is evident. Establishing the source of the problem and crafting all future policies in line with the objective of reducing harmful emissions is essential.

■ The development of renewable energy sources (RES) in Bulgaria is rather slow-paced, while vast amounts of energy are lost during distribution, transformation, etc. processes. The energy grid is in need of substantial upgrade and sizeable investments, as it is currently unable to accommodate either an expanding urbanization, or a significant amount of additional energy produced from RES. Developing the production of energy from RES cannot forego technical issues with grid capacity.

■ The development of green technologies and businesses is utterly dependent on the availability of highly qualified specialists. Thus, a clear need arises for building up a suitably educated human capital.

■ Overall, Bulgarian energy policy-making seems to omit the role of behavioral change. In order to achieve certain objectives like improvements in energy efficiency and savings, the participation of municipalities in transforming individual consumers' behavior should be a priority. A sustainable economy unavoidably necessitates changes in consumer behavior and internalizing the concept of energy efficiency and savings. A legacy of excessive and wasteful use of energy should be interrupted through targeted and well thought-out stimuli and public awareness campaigns.

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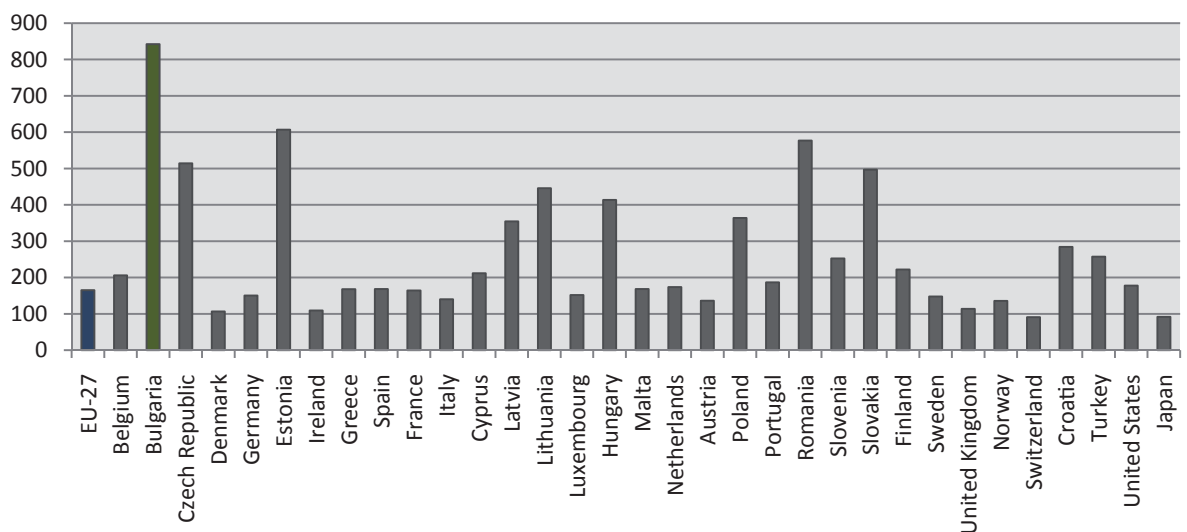
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1. Environment

Bulgaria's approach toward climate change in the last decade wanders between the demanding policies of the EU and its own economic development challenges. The country's dilemma with the climate change discourse lies in its association with the rich industrial countries' club (expected to dramatically cut their emissions), while having an economy that is still dependent on low cost energy from locally produced coal. Over the past two decades, Bulgaria has continued to rely on a centralized energy system highly dependent on imported resources and predominantly fossil fuel- and nuclear-dependent methods for electricity production.

Bulgaria is both more CO₂ intensive per capita, compared to China and India, and more CO₂ intensive per dollar of GDP than the US.¹ Moreover, the country has consistently ranked as the most energy intensive economy in the EU: it uses much more energy than other Member States to produce equivalent units of output. This makes the Bulgarian economy and its competitiveness more vulnerable to energy price swings. While the country's actual energy intensity may be somewhat lower, as official data do not account for the existing sizeable hidden economy,² even when we add this hidden part of the economy, it is clear that Bulgaria remains highly energy intensive.

Figure 1. Energy Intensity of the Economy (gross inland consumption of energy/GDP), kgoe per EUR 1,000.



Source: CSD, based on Eurostat data for 2009.

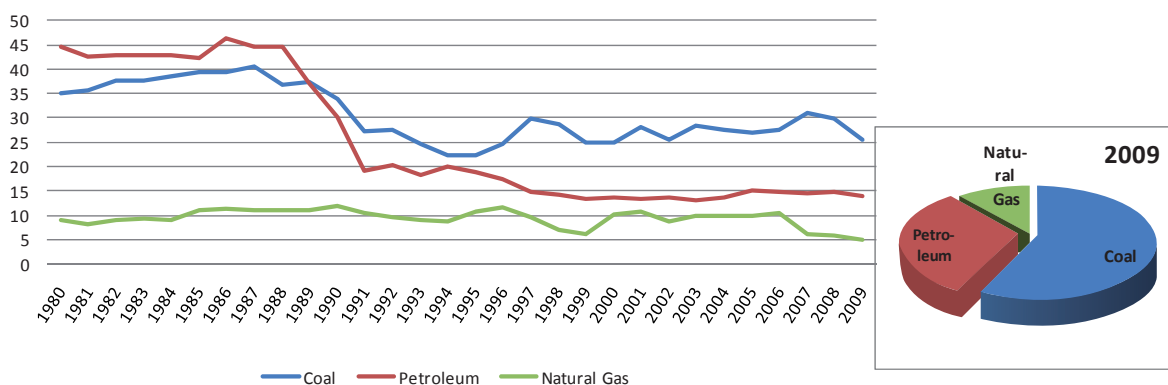
¹ Center for the Study of Democracy (CSD), 2011, "Green Energy Governance in Bulgaria: at a crossroads".

² According to most recent assessments, hidden economic activity could add up as much as 25% to Bulgaria's GDP: CSD, 2011, Policy Brief No 28 "The Hidden Economy in Bulgaria after the Economic Crisis".

In terms of the amount of CO₂ emitted from the consumption of energy, the country ranks 66th out of 216 countries.³ Drilling down to the different sources of consumption, coal appears as the biggest emitter of CO₂ in the country, followed by petroleum (Figure 2). Thus, there is **a vast potential in expanding gasification** in the country as a means to pur-

sue a low-carbon economic development. An increased use of gas, especially for heating and cooking purposes, would reduce Bulgaria's CO₂ emission footprint. However, expanding gasification poses serious issues of diversifying the country's gas supply routes and sources, as well as the adopted gas pricing policy.⁴

Figure 2. Bulgaria: CO₂ Emissions by Source of Consumption (million metric tonnes).



Source: EIA, International Energy Statistics.

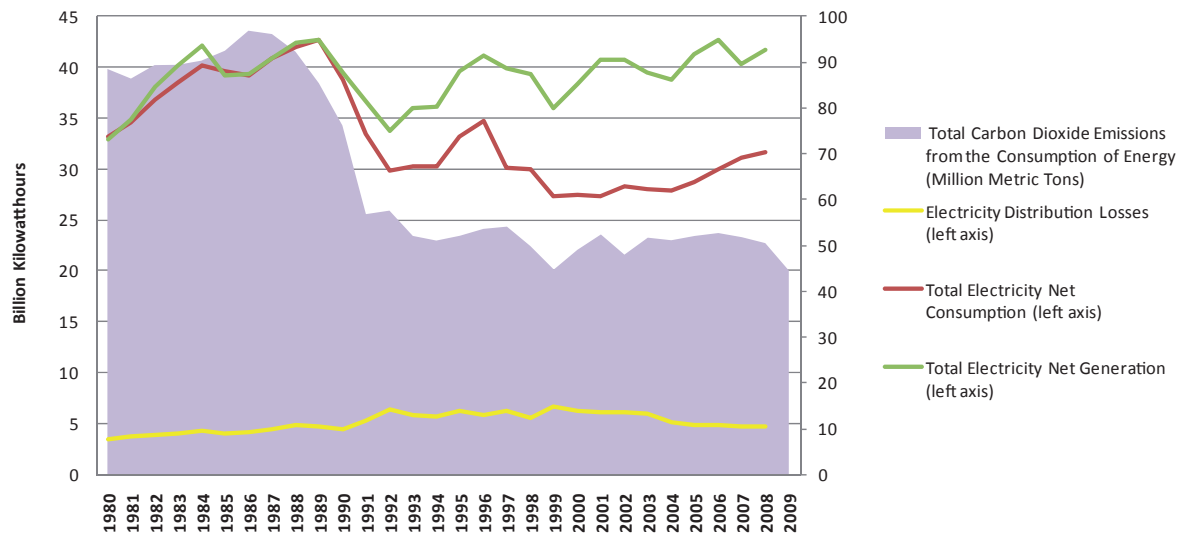
Both the energy intensity and the amount of CO₂ emitted have been on the decrease, respectively, since the late and the early 1990s. The observed decrease is primarily a result of a restructuring of energy demand in the country owing to the closure and privatization of inefficient and energy intensive industries (notably metallurgy and the produc-

tion of chemicals). As metallurgy's share in the industrial portfolio of Bulgaria decreased, so has heavy industry's share in final energy consumption. Additional reason for a "windfall" decrease in energy intensity and CO₂ emissions is the high fleet renewal rate in commercial transportation pushed by the introduction of EU vehicle standards to Bulgaria.

³ Energy Information Administration (EIA), 2011, International Energy Statistics. Data is for 2009. EIA focused on CO₂ emissions from energy consumption, as the latter accounts for the vast majority of CO₂ produced.

⁴ Already, the current price of gas is unappealing for consumers, while future prices are projected to increase in relation to introducing excise on gas.

Figure 3. Future Reductions of CO₂ Emissions (right axis) Will Have to Come from Energy Efficiency.



Source: EIA, International Energy Statistics.

As the drop in CO₂ emissions corresponded to a drop in industrial activity, rather than being a result of specific targeted policies, such a drop does not seem conducive to sustainable economic growth. The latter requires a sustained energy policy that stimulates economic growth and emissions reduction simultaneously. Similarly, there is a need to address energy intensity through a targeted policy on energy efficiency. However, successive governments have chosen to focus on large energy generation projects, rather than on promoting energy efficiency more vigorously. Supply management is preferred to demand optimization for a variety of reasons, yet, this policy choice appears to be well influenced by bigger short term political and economic gains from procuring new generation capacities and a lack of clear interest or lobby group behind energy efficiency endorsement. Energy efficiency is perceived as a public good, offering low immediate tangible benefits. Thus, while electricity generation currently exceeds demand/electricity consumption (Figure 3), and while final energy consumption has been

on a general trend of decrease,⁵ with no objective estimations pointing to an expected increase in demand/consumption, Bulgaria continues to pursue an extensive generating capacities discourse. Meanwhile, electricity distribution losses have increased, as the latest energy-saving technological developments seem to be skipping the Bulgarian grid. Bulgaria ranks at the top among EU countries in terms of energy distribution and transformation losses.⁶ Moreover, Figure 8 in the appendix shows that electricity distribution losses have even surpassed the total electricity produced by all RES in the country. Thus, a sustainable economic development strategy for Bulgaria demands that the construction of large generating capacities should give way to investments in the outdated and worn-out grid, and invest in energy-saving and efficiency-improving technologies.

⁵ CSD, 2011, "Green Energy Governance in Bulgaria: at a crossroads".

⁶ Eurostat, Energy Statistics: Supply, transformation, consumption - all products - annual data, http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=nrg_100a&lang=en.

Furthermore, a key component of every sustainable/"green" economic development strategy is sustainable environment. The latter embraces not only CO₂ emissions, but also emissions of a number of substances harmful to human health. For example, processes burning coal and oil release carbon dioxide, sulfur dioxide, nitrogen oxides, mercury compounds, and (in the case of oil) methane into the atmosphere. In addition, burning municipal solid waste (MSW) releases nitrogen oxides, sulfur dioxide, and trace amounts of toxic pollutants like mercury compounds and dioxins. Tables 3, 4, and 5 in the appendix present information on emissions of key harmful substances in Bulgaria during 2008 and 2009.⁷ Furthermore, the Bulgarian Executive Environment Agency (ExEA) gathers information on the different components of the Bulgarian environment and the factors affecting it through a National System for Environmental Monitoring. The system monitors the following sources of harmful emissions: sulfur oxides (SO_x), nitrogen oxides (NO_x), non-methane volatile organic compounds (NMVOC), ammonia (NH₃), carbon monoxide (CO), heavy metals (mercury - Hg, cadmium - Cd, lead - Pb), polycyclic aromatic hydrocarbons (PAH) dioxins and furans (DIOX), polychlorinated biphenyls (PCBs), particulate matter (PM), and others. An important indicator of air pollution is the level of the emissions of the so-called acidifying substances - SO₂, NO_x, and NH₃. There are national emission ceilings for these pollutants, as per Directive 2001/81/EC, thus, levels are constantly monitored. Also estimated is the share of the population affected by emissions of harmful substances. The share of the population in different regions throughout the country,

which has been subjected to excessive levels of SO₂, NO_x, PM, and ozone in 2009 is displayed in Appendix Table 2. ExEA's report for 2009 presents the following picture of the Bulgarian environment:

- The level of PM air pollution appears as the main and persistent problem of the air quality in Bulgaria. Moreover, this problem is not localized but affects the entire country.⁸ Domestic heating is a major source of PM, emitting 48% of the total amount emitted. The EU has no specific requirements for ceilings of PM emissions and measures at the European level are currently focused on controlling the precursors⁹ of PM. Yet, nationally-defined acceptable daily and annual thresholds for PM were repeatedly exceeded in all regions in Bulgaria during 2009. The highest concentrations were measured in the cities Vidin, Pernik, and Plovdiv from combustion processes in the industry, burning fuels for household consumption, as well as transport activities and dirty/poorly maintained roads. In Bulgaria, the level of PM is significantly above the European average, affecting 57% of the population. An increasing trend of pollution with PM is observed in the country: in 2007 there were 25 municipalities, where excessive levels were observed, in 2008 the number of these municipalities is 28, and in 2009 - 30.¹⁰
- In 2009, excess of SO₂ emissions was registered in two (out of six) regions (i.e. South-West and South-East) in the country. The main sources were the Thermal Power Plants (TPPs) located in these regions.

⁷ As per data reported by Member States under Directive 2001/81/EC of the European Parliament and the Council of 23 October 2001 on national emission ceilings for certain atmospheric pollutants: "NEC Directive status report 2010", European Environment Agency (EEA), Technical report No 3/2011.

⁸ Bulgaria in the "European Environment - State and Outlook 2010" Report, Executive Environment Agency, 13.01.2011, Sofia.

⁹ PMs can be emitted directly into the atmosphere (primary emissions) or through gases emitted into the atmosphere (secondary emissions), called precursors of fine particulate matter.

¹⁰ Executive Environment Agency, 2009, "National Report on the State and Preservation of the Environment", accepted by the Council of Ministers on 11.05.2011, <http://eea.government.bg/eng>.

Three percent of the population lives in areas where the levels of SO₂ pollution are above the threshold values, while in Europe this percentage is less than 0.3%. The energy sector (most notably electricity and heating) is the largest emitter of SO₂, responsible for nearly 94% of the total SO₂ emissions in the country.¹¹ A National Program for Emissions Reduction¹² launched in 2007 reports an increase of SO₂ emissions between 2000-2003, with a notable contribution from TPP Maritza Iztok due to the increased use of the plant and despite installing new flue-gas desulfurization (FGD) technologies. A look at MEET's report shows a piecemeal application of the directives on SO₂ emissions often backed by financial concerns.¹³ While standing at 657 thousand tons (kt) in 2009, 2010 projections for SO₂ emissions were for 480kt of SO₂ emitted.¹⁴ It is not clear how these emissions reductions are to be attained, considering that, in 2009, desulfurization systems prevented the emission of merely 461.9 tons of SO₂.¹⁵

- The main sources of NOx emissions are road transport and TPPs. During the year, they were responsible for, respectively, 49% and 30% of the total NOx emissions¹⁶ in the country. Excess levels of NOx were registered in the Municipal (Sofia), Plovdiv, and South-East regions (which represents an increase in the number of areas with registered excess, compared to only the Municipal region in the past), with road transport cited as the main source.

Consequently, the share of the population in Bulgaria living at levels of pollution beyond acceptable standards for NOx has increased from 2008 to 2009, reaching 22% (while in Europe it is 5.9%).¹⁷ Historically, NOx emissions registered a 12% increase between 2000-2003 due to an increase in the number of transport vehicles/cars and the related increase in fuel use. Projections for NOx emissions in Bulgaria are for 247kt.¹⁸ Strangely enough, these "projections" are identical to the ceilings prescribed by the EU, which casts a shadow over the reliability of projections.

- Road transport and households are the largest sources of carbon monoxide, emitting, respectively, 57% and 37% of the total national CO emissions. A level of CO emissions in the atmosphere exceeding the norms (10 mg/m³) was registered in the Municipal region. The source of pollution is mainly transport and all other combustion processes.
- Agricultural activity is the main source of NH₃ emissions, responsible for about 75% of the total emissions of NH₃ in the country. Another main source of NH₃ emissions is waste disposal and treatment - 21%. Less than 62kt of NH₃ were emitted in 2009, with 2010 projections for NH₃ emissions in Bulgaria of 108kt.¹⁹ Once again, "projections" for NH₃ emissions are identical to the ceilings prescribed by the EU, which casts a shadow over the reliability of projections.
- NMVOC emissions for 2009 were 135kt, projected to reach 175kt in 2010.²⁰ Yet again, these "projections" are identical to the ceilings prescribed by the EU. NMVOC

¹¹ Executive Environment Agency, 2009, "National Report on the State and Preservation of the Environment."

¹² National Program for Emissions Reduction, 2007.

¹³ A report by the then Ministry of Energy and Energy Resources, 2005, "Energy and Environment: the new realities on [Bulgaria's] way to EU".

¹⁴ EEA, 2011, "NEC Directive status report 2010", Technical report No 3/2011.

¹⁵ National Program for emissions Reduction, 2007.

¹⁶ These are emissions resulting from both human activities and natural emitters of NOx.

¹⁷ Executive Environment Agency, 2009, "National Report on the State and Preservation of the Environment".

¹⁸ EEA, 2011, "NEC Directive status report 2010", Technical report No 3/2011.

¹⁹ EEA, 2011, "NEC Directive status report 2010", Technical report No 3/2011.

²⁰ EEA, 2011, "NEC Directive status report 2010", Technical report No 3/2011.

are emitted mostly from: road transport (responsible for 26-30% of NMVOC emissions), agricultural activities (21-24%), and burning of materials for household use (19-24%).²¹ Moreover, a third of the agricultural emissions result from burning of off-road vegetation. Agricultural activities are also the biggest source of ammonia emissions, followed by waste treatment.²² Until 2003, road transport was a major source of lead emissions, yet, lead emissions from road transport were notably reduced after discontinuing the use of leaded petrol. Lead is currently emitted in notable quantities during combustion processes in the industry (responsible for about 76% of lead emissions into the atmosphere). As a whole, in Bulgaria there is a trend towards decreasing the average concentrations of lead in the air, with the exception of the city of Kardjali. In 2009, levels exceeding annual averages for lead content in the air were registered in the South-West region, where the main source of pollution is the activity of "Kardjali" lead and zinc producing plant.²³ During 2009, levels of benzene were recorded to exceed the annual average norm, which is set for the protection of human health,²⁴ in Burgas. Other pollutants exceeding the norms include cadmium in the Plovdiv and South-West regions (mainly from non-ferrous metallurgy), arsenic in Kardjali, as well as ammonia in Nikopol (attributed to the activities of chemical industry).

At the end of 2008, 5.1% of the whole country's territory was categorized as protected areas. Meanwhile, some 271,100ha of the country's

territory are used for the extraction of mineral resources, 11.4% of them notably and irreversibly damaged. The number of areas with a changed/ altered purpose of land use has increased from 600ha in 2000 to 4,442ha in 2007. In spite of a moratorium on land use changes in the case of forest lands/fund, such changes are ongoing.²⁵

2. Economy

2.1 Resource and Technological Dependence

Bulgaria relies on imports for almost 70% of its gross energy consumption, almost entirely from a single country. In gas, oil, and nuclear energy, the country's dependence on Russia, including technologically, is close to a 100% (i.e. a single gas pipeline, a single Russian-owned refinery, and a single nuclear power plant reliant on Russia for fuel and high-grade waste disposal). The Bulgarian energy sector is characterized by a low local scientific and technological capacity concentrated in traditional energy sources like coal and nuclear energy. In terms of competitiveness, the latter implies that a smaller portion of the value added would originate or remain in the country.²⁶

Both public and private expenses on R&D in the energy sector remain low, as compared to R&D investments in other sectors. Moreover, returns on investments in the introduction of new energy technologies are still far from economically viable.²⁷ Furthermore, investors persistently cite corruption, heavy bureaucracy, non-transparency, poor infrastructure, frequent changes to the legal framework, and lack of qualified personnel as main obstacles to the business in Bulgaria.²⁸

²¹ Total emissions of NMVOC include both human activities and emissions from natural sources.

²² National Program for emissions Reduction (2007)

²³ Executive Environment Agency, 2009, "National Report on the State and Preservation of the Environment".

²⁴ The norm (5µg/m3) is said to be endorsed after January 2010.

²⁵ Bulgaria in the "European Environment - State and Outlook 2010" Report, Executive Environment Agency, 13.01.2011, Sofia.

²⁶ CSD, 2011, "Green Energy Governance in Bulgaria: at a crossroads".

²⁷ The ARC Fund, 2011, "Innovations.bg 2011".

²⁸ Energy Charter Secretariat, 2011, "Bulgaria In-Depth Review of the Investments Climate and Market Structure in the Energy Sector".

2.2 *Reliance on Cheap Labor and Lower Standards & Taxes*

Bulgaria's foreign policy priority seems to be a further integration into the European division of labor.²⁹ Yet, this is not achieved through means boosting Bulgaria's competitiveness and innovations, which are currently at the bottom of their potential.³⁰ The share of labor- and resource-intensive manufacturing is persistently high in Bulgaria.³¹ Accordingly, the share of FDI going into non-resource intensive manufacturing was only modest (10%). Reportedly, the key attraction for Investors were cheap energy prices (notably, electricity), while the key obstacle to investments in higher value-added sectors was a shortage of mid-level-skilled workers.³² Moreover, a robust and sustainable economic growth requires strategies to notably increase labor productivity. There seems to be a vast potential for productivity gains in utilizing the workforce of the low-skilled youth. Importantly, this group has been reported to experience the largest increases in unemployment during the current crisis, while their existing skills mismatch prevents them from being hired anew.³³ Thus, targeted job placement programs and services, as well as training programs³⁴ carry a great potential for reducing unemployment in the short run, while measures aligning education with employers' needs should increase productivity over the long run.³⁵

²⁹ Energy Charter Secretariat, 2011, "Bulgaria In-Depth Review of the Investments Climate and Market Structure in the Energy Sector".

³⁰ The Innovation Union Scoreboard presents Bulgaria as a modest innovator, while less than a third of the Bulgarian firms defined themselves as innovative: CSD, 2011, "Innovation.bg 2011".

³¹ In 2007 IMF reports the share of exports and labor- and resource-intensive manufacturing sectors to be 81% percent, compared to a EU average of 56%.

³² IMF, 2007, Bulgaria: Selected Issues.

³³ IMF, 2011, "Bulgaria—2011 Article IV Concluding Statement", May 20, 2011.

³⁴ Scaling-up the country's use of EU social funds is a viable way for launching such programs and services.

³⁵ IMF, 2011, "Bulgaria—2011 Article IV Concluding Statement", May 20, 2011.

A sizable gray sector in Bulgaria's economy³⁶ may serve as an attraction for starting a business in a more laxly regulated environment. Operating within the gray sector reduces both the price of entrepreneurship and the administrative burden, while informal employment is widely accepted in the country. In 2010, the index of the hidden economic activity of Bulgarian businesses (incl. size of the hidden economy, hidden labor relations, hidden turnover, and redistribution) was on an increase, while the index of hidden economic activity of the population (incl. hidden employment, turnover, and economic activity) actually decreased. The practice of hiring workers with no labor contract has flattened out between 2009 and 2010, while instances of employment under a contract with hidden clauses (envelope wages) have been on the increase since 2008. Furthermore, the index for hidden turnover (incl. underreporting real profit) displayed a growth pattern in 2010, similar to the incidence of cases involving tax evasion, avoidance of customs, fees, and excise duties, as well as VAT fraud that displayed a notable increase in 2010.³⁷

2.3 *Extensive Development of Generating Capacities*

Bulgaria is currently following a path of extensive development of its energy sector. Decisions for constructing big energy infrastructure projects, such as a second nuclear power plant, have been taken without an assessment of their long-term economic, social, and environmental impact. There is no clear framework for taking long-term decisions regarding the energy mix, energy security, and its price, which leaves decision-makers prone to lobbying and corruptive pressure. However,

³⁶ On average, estimations of the share of hidden economy in the Bulgarian GDP is about 25% (estimations vary): CSD, 2011, "The Hidden Economy in Bulgaria and the Global Economic Crisis".

³⁷ CSD, 2011, "The Hidden Economy in Bulgaria and the Global Economic Crisis".

the introduction of EU rules in the gas and electricity sector, as well as the development of a long-term EU strategy for CO₂ reduction and energy efficiency, have provided Bulgaria with a better framework for taking long-term energy decisions in the past three years.

Exports of electricity from Bulgaria to other countries are less than 4% of the gross energy consumption in the country. The latter, and the fact that the country is largely dependent on imports of energy resources, debunks a popular myth that Bulgaria could become an energy hub on the Balkans if only it created enough generation capacity.³⁸ A more logical and obvious step for Bulgaria would be to discontinue the extensive development of generating capacities with government guarantees (which, among others, carries a substantial investor risk for the country), and focus instead on: i) sustainable production of energy to meet its internal demand, ii) upgrading its aged grid, and iii) diversifying its energy mix and using international experience in energy production.

Thus, the country needs a new vision for development of the energy sector, while the idea about becoming an energy hub on the Balkans needs to be revisited in light of declining demand for energy and neighbor countries' intentions on building their own energy generating capacities (e.g., Turkey's and Romania's plans on nuclear, green, and other energy generating capacities), which render the strategy for extensive development of generating capacities in Bulgaria unfounded.

3. Perspectives for Green Growth, Resource Efficiency, and Energy Savings

3.1 Heating and Energy Efficiency in the Housing Sector

Well over half of the population (63% in 2009 and 59.8% in 2010) relies on solid fuels, primarily wood, as a source of energy for residential heating.³⁹ The bulk of the biomass currently in use by Bulgarian households is burned using very inefficient technologies. Wood consumption (mainly for heating) has been on the increase since the 1990s. The reason is simple – central heating facilities are only available in big cities, with Sofia being the only area where the majority of households use central heating. Consequently, two thirds of the gas used for heating is consumed in Sofia. Central heating facilities in other cities use oil rather than gas. The use of wood as biomass has some important implications on sustainability. Using wood is sustainable only in the presence of strong regulations to ensure preservation of the forest fund, which is not the case in Bulgaria. Quite to the contrary, there is a sizable “grey” market for wood in Bulgaria that drives prices down and makes heating from wood cheaper than heating reliant on gas. Estimates show that using about 13 million cubic meters of wood for heating would eliminate approximately 180 square km of forest area and is in stark violation of environmental rules and regulations. Hence, the introduction of more incentives for the use of biomass, as foreseen by the *Law on Energy from Renewable Sources*, should be balanced with an increased control and regulation. Otherwise the incentives could cannibalize the country's forests.

Furthermore, Bulgarian households use a notable share of electricity for their needs. Elec-

³⁸ CSD, 2011, “Green Energy Governance in Bulgaria: at a crossroads”.

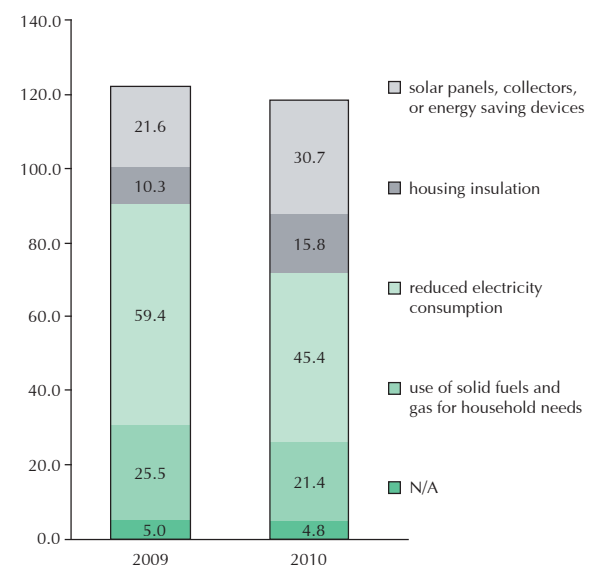
³⁹ According to surveys commissioned by CSD: CSD, 2011, “Green Energy Governance in Bulgaria: at a crossroads”.

tricity's share in household consumption in Bulgaria was 38.9% compared to an average of 22.5% for the EU.⁴⁰ Meanwhile, merely 1.6% of Bulgarian households have access to natural gas, while the average for Europe is 55%. Currently, the use of natural gas in Bulgaria is largely confined to the industry and heating plants. Meanwhile, a vast number of households are using electricity and a significant portion of households' electricity consumption is spent on heating and cooking. It is estimated that the energy efficiency of electricity for these purposes is much less than that of gas, taking into account that efficiency in the whole value added chain of production, transmission, distribution, and use of electricity is around 24-26%. Therefore, Bulgaria should focus on accelerating the development of its gas distribution network. As energy generated from natural gas is traditionally assessed as emitting notably less CO₂ than both oil and coal, there is a great **potential for Bulgaria to further reduce its CO₂ emissions by expanding its gasification**. The present dismal share of natural gas' direct use by households runs counter to most European countries' policies, is a major shortcoming of the Bulgarian energy mix, and is a factor for the low energy efficiency in the country.

In 2009-2010, there was an increase in the number of households attempting to reduce their expenses on energy (45.7% of the households reported doing so in 2010, compared to 41.9% in 2009).⁴¹ Measures most often used were those pertaining to energy savings, as well as to the use of solid fuels and gas, and insulating residential housing. Two tendencies emerged. On one hand, the share of households using electricity saving measures has

decreased from 48.1% in 2009 to 37.1% in 2010. On the other hand, the share of households using energy efficiency measures has increased at the same rate from 25.9% to 38% over the same period. It is important to note that the cumulative effect of energy efficiency behaviors is more likely to produce tangible effects in the longer rather than the shorter run. In 2010, 16.2% of the population reported putting in place additional insulation in their residential houses. The latter has resulted in a 10% savings, on average, in the heating bills of 85% of the above households.⁴²

Figure 4. Measures Adopted by Households to Increase Energy Savings and Efficiency (% of those, who responded).



Note: Answers exceed 100%, as some respondents have given more than one answer.

Source: CSD Energy Survey, 2010.

Still, promoting energy efficiency via market instruments has not produced the desired results in Bulgaria. The price of energy is the major factor determining consumer behavior both in terms of energy savings and investing in energy efficiency. The affordability of ener-

⁴⁰ Energy Charter Secretariat, 2011, "Bulgaria In-Depth Review of the Investments Climate and Market Structure in the Energy Sector", based on a 2009 bulletin on the state of play and development of the energy sector.

⁴¹ According to surveys commissioned by the Center for the Study of Democracy in 2009 and 2010.

⁴² CSD, 2011, "Green Energy Governance in Bulgaria: at a crossroads".

gy-saving market solutions for consumers is a major stumbling block for furthering energy efficiency in Bulgaria. Therefore, at present, most households do not undertake energy efficiency measures not because consumers are wasteful, uninformed, or unwilling, but because they cannot afford the required appliance replacements and technology improvements. There is some potential in improving households' energy saving behavior, as a means of reducing the consumption of energy at no extra cost. But the bulk of the energy efficiency drive will still have to come from government sponsored programs to make a sizable difference.

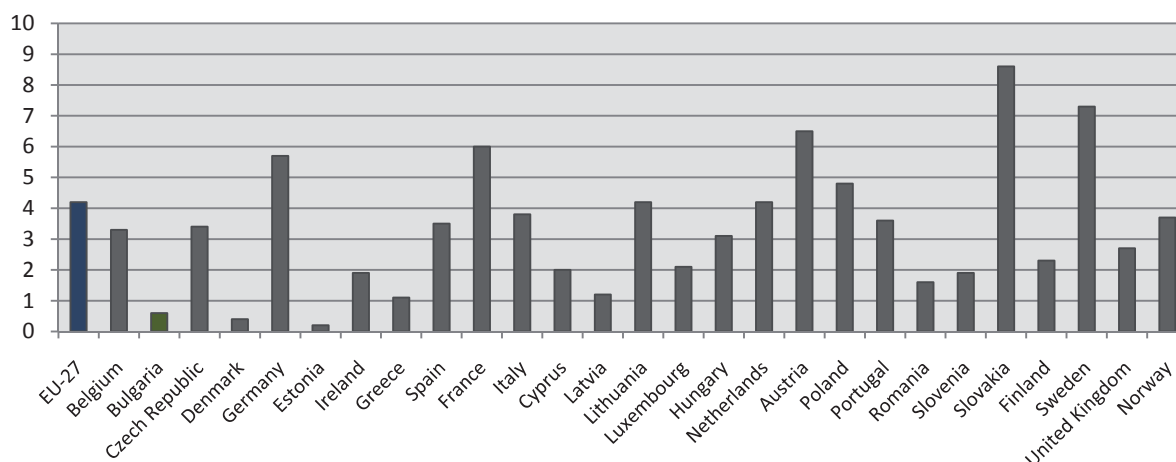
The very high costs of energy efficiency measures and the very high potential public benefits, including in terms of higher energy security, require the Bulgarian government to take a leading role in promoting and financing energy efficiency measures, in particular in the housing sector. This can be achieved through a better use of available resources under EU's operational programs, as well as through loans and subsidies. Currently, only 7.5% of consumers have used a state subsidy or a special bank credit line for insulating their home, while 90.9% have not.⁴³ Thus, there is a vast

room for improvement in increasing financing opportunities for households to pay for their improvements in energy saving and efficiency.

3.2 Encouraging Low-Carbon Means for Transportation and Investing in Public Transport

A high fleet renewal rate in commercial transportation was observed in Bulgaria prior to the crisis, due to the introduction of EU vehicle standards, thus, reducing CO₂ emissions from transport. Yet, a problem that is becoming increasingly visible is the negligible share of biofuels and the use of renewable energy sources in Bulgaria's transport sector. A rise in the standard of living and disposable income in the country over the past decade has led to a dramatic increase in the use of personal vehicles, and the overall annual mileage covered by them. The latter has led to a total increase in the consumption of fuel, while the use of renewable electricity in the transport sector is negligible.⁴⁴ Moreover, through a deliberate last minute change before the adoption of the *Law on Energy from Renewable Sources*, the ruling majority delayed the requirement for transportation fuel producers to add biofuel to their products until 2012, on the grounds that this would keep prices down.

Figure 5. Share of Renewable Energy in Fuel Consumption of Transport (%).



Source: CSD, based on Eurostat data for 2009.

⁴³ According to a CSD-commissioned survey in 2010.

⁴⁴ Beurskens and Hekkenberg, 2011, renewable energy projections as published in the "National Renewable Energy Action Plans of the European Member States Covering all 27 EU Member States", Energy Research Centre of the Netherlands and the European Environment Agency.

A great potential lies in **increasing the use of RES in the transport sector**, while also thinking in the lines of reducing traffic **and stimulating the use of public transport**. The latter requires targeted policies and investments, which are not yet a reality in Bulgaria. For example, a chronic underfunding of rail-road transportation led to recent cuts in available transport for some routes, which appear counter to Bulgaria's apparent commitment to low-carbon economy and green growth.

3.3 Optimizing the Energy Sector and Investing in the Grid

The Bulgarian energy sector is markedly energy-intensive. As shown in Figure 6 below, vast amounts of energy are lost in the processes of transformation, distribution, and consumption of energy. As previously noted, reductions in Bulgaria's energy intensity resulted mainly from a restructuring of the economy (notably, significantly scaling down the industry). Yet, the country is at a point where any additional improvement in its energy efficiency would require the promotion of new and novel production technologies, conversion processes, modes of transportation, etc. Thermal power plants, boilers, and a plethora of other hardware devices will have to be replaced or upgraded, along with production methods and procedures. In energy transportation, smart

grids, more efficient district heating networks, and other solutions will have to be implemented. To accomplish these tasks, extensive investment in energy efficiency will have to be made over the next decade. Yet, a look at the sector's investments in rehabilitation of old plants, construction and installation of new capacities, and improvements in the transportation and distribution network, reveals a rather disturbing picture. For example, at the backdrop of frequent power outages due to failures in the grid, we see that in 2009 the National Electric Company (NEC) has spent almost three times more on building new Hydro Power Plants (HPPs) and rehabilitating old ones, than on improvements to the grid.⁴⁵ These assessments are even worse, if we factor in investments in other large generating capacities, such as NPP Belene.

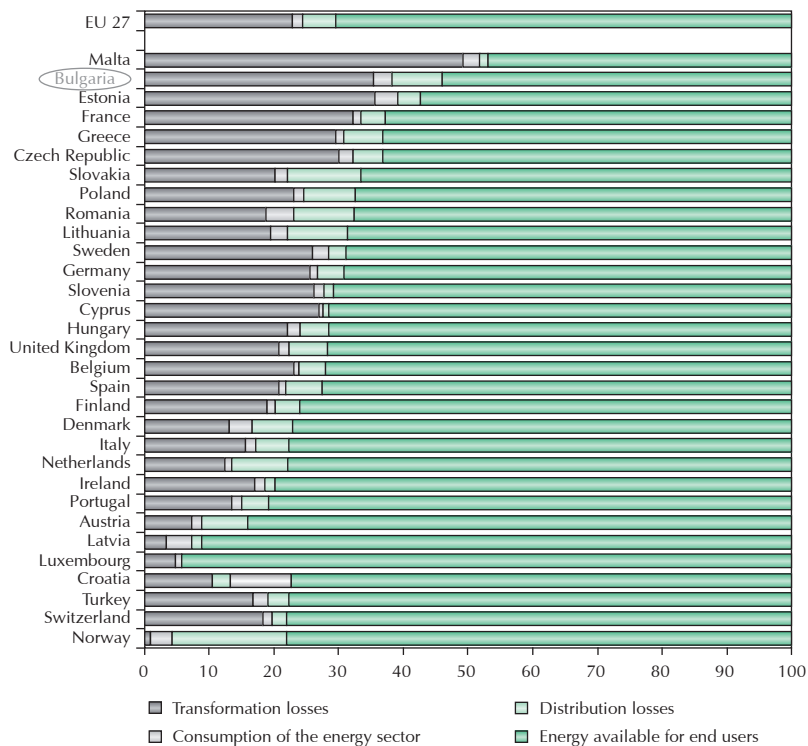
Furthermore, there are notable losses in the electric power energy sector. The sector suffers severe losses from thefts of electric power and cables.⁴⁶ In general, EDCs lose between 20% – 23% of distributed electric power due to technical inefficiencies or thefts. Theft of electric power is carried out by both companies and households (approximately at a ratio of 1:5), while it is believed that small energy intensive companies or production facilities, restaurants, hotels, and coffee shops are amongst the most frequent violators.⁴⁷

⁴⁵ CSD, 2010, "The Energy Sector in Bulgaria – Major Governance Issues".

⁴⁶ The theft of electric power was established as the single costliest commodity theft that takes place in Bulgaria.

⁴⁷ CSD, 2010, "The Energy Sector in Bulgaria – Major Governance Issues".

Figure 6. Energy Losses in the Processes of Transformation, Distribution, and Consumption, 2008 (%).



Source: Eurostat's energy statistics: Supply, transformation, consumption: all products, annual data.

Furthermore, while 23 companies were reported as licensed to carry out heat supply activities through using the method of co-generation,⁴⁸ the latter method is still underutilized in Bulgaria. Similarly, the share of energy produced from RES in the country has remained virtually unchanged throughout the 2000s. Figure 8 in the appendix shows very clearly that RES development in Bulgaria is rather slow-paced. Traditionally, most of the electricity generated from RES originated from HPPs. This has changed only marginally, and in 2010 the bulk of electricity generated from RES still came from large HPPs, while the tendency of building smaller HPPs (with less than 5 MW of installed capacity) was growing. The latter constituted 241 MW of installed capacity in 2010, while photovoltaic installations made up

21.4 MW. Additionally, there are two functioning plants for a combined production of heating and electricity from biogas (from sewage sludge) with a total installed capacity of 3.5 MW.⁴⁹ The latest data from the State Energy and Water Regulatory Commission show that, as of the end of 2010, there are licenses issued for the construction of projects with the following capacity: 2,017 MW for wind turbines, approximately 230 MW for photovoltaics, and 15 MW for power plants using biomass. Meanwhile, the Energy Charter⁵⁰ reports on 112 submitted applications for connection to the grid from wind power plants, and 33 from photovoltaic power plants, while signed contracts amounted to merely 2 for wind energy producers and none for PVs energy producers.

⁴⁸ Energy Charter Secretariat, 2011, "Bulgaria In-Depth Review of the Investments Climate and Market Structure in the Energy Sector".

⁴⁹ Ministry of Economy, Energy and Tourism, 2011, "Report on the achievement of the national indicative targets for electricity generation from RES in 2010" (in Bulgarian).

⁵⁰ Energy Charter Secretariat, 2011, "Bulgaria In-Depth Review of the Investments Climate and Market Structure in the Energy Sector".

In other words, if we separate the production of electricity by source (Appendix Figure 8), we notice that non-hydro renewable sources appeared in the Bulgarian energy mix only in 2007. Still, the bulk of RES electricity production comes from HPPs, while a number of wind and solar energy producers cannot access the grid, as the latter is lacking the capacity to accommodate large amounts of additional energy produced. Thus, it seems that the Bulgarian RES landscape is changing only slowly, with no breakthrough developments in the use of RES technologies. Consequently, there is a large **potential** for encouraging sustainable economic development in Bulgaria through **changing the country's energy mix by boosting the use of RES**, as Bulgaria has not made a proper use of new RES technological developments other than hydro.

3.4 Industry: Efficient Use of Energy and Enforcement of Environmental Standards

After a fall between 1997 and 2002, the energy intensity of the industrial production sector in Bulgaria has been on the increase. Inefficient use of energy, particularly in the power sector, where transmission losses are significant, has been blamed for the increase. Industrial energy intensity in Bulgaria remains with 40% higher than EU average.⁵¹

Compliance with environmental standards and the latter's enforcement appear to be an issue in Bulgaria. For example, a review of different reports by national authorities and international agencies reveals a potential issue with the timing and monitoring of the implementation of environment-saving activities. Such is the issue of installing desulfurization units in plants. Such activities are characterized by lengthy implementation periods and notable delays. The

project on rehabilitating and modernizing Enel Maritza East 3 TPP to bring it on par with European environmental standards, and the construction of two FGDs (flue gas desulfurization systems), took over 5 years to complete (beginning in March 2003 and ending in 2009). Similarly, rehabilitating the Sofia district heating system to increase its efficiency in heat supply, distribution, and consumption and to boost, among other things, its environmental and financial performance took close to five years, though launched as a three-year project. The related costs are also significant. An overview of other such projects⁵² aids similar conclusions – i.e. shows these projects to be taking considerable time. For example, two big projects were started at Martiza East 2 TPP for the construction of FGD modules reducing harmful exhaust emissions and dust. The first project started in 2004 and took almost six years to complete. Two years after its commencement in 2008, the second project is still in its initial stage. Overall, the application of the directives on SO₂ emissions in Bulgaria appears piecemeal, with incompliance often backed by financial concerns. Yet, more alarming is a tendency of non-compliance with regulations. A recent example was TPP "Brikel", which was scheduled for such upgrades, as it did not comply with environmental standards. As the TPP disregarded national regulations, it was to be closed at the end of 2010 due to exceeding its limits on hours of operation without installations to filter its SO₂ emissions. This, however, met with a strong resistance from employees, who were threatened to lose their jobs. As employees started protests against the government (and not their employer), and the nearby town remained without heating, TPP Brikel continued its work, even if at a reduced pace. As of February 2011, the TPP has a temporary system for filtering its emissions, yet, this system

⁵¹ CSD, 2010, "The Energy Sector in Bulgaria – Major Governance Issues".

⁵² As per the Energy Charter Secretariat's 2011 report "Bulgaria In-Depth Review of the Investments Climate and Market Structure in the Energy Sector".

reportedly does not comply with environmental standards.⁵³ Thus, developing a sound system for monitoring such projects' progress and applying targeted sanctions for plants not complying with the rules emerges as a key issue, the application of which having a potential to make a timely difference.

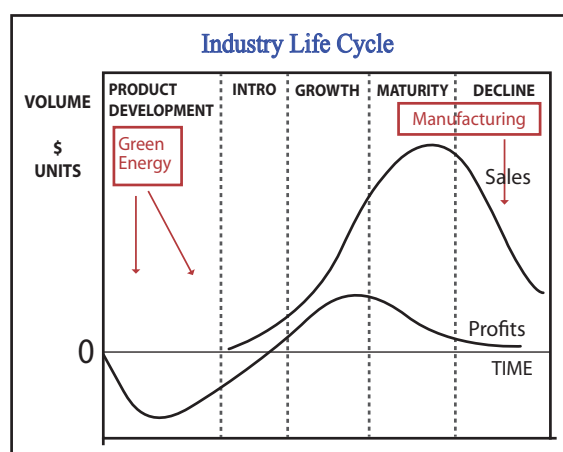
3.5 Green Jobs

The concept of sustainable growth necessarily embraces inclusive economic growth, as outlined and promoted in the latest EU doctrine. Hence, the effect of a low-carbon economic discourse on employment grew in importance.

While creating jobs in the process, there are hints that green energy production may not significantly impact the labor market in the short- and medium-term. While methods for producing energy from wind and other renewable sources have been around for a long time, new technologies for generating energy from RES are still in their "emerging technology" development phase of the industrial life cycle in terms of both market size and maturity.⁵⁴ Unlike established industries (see Figure 7 below), the green energy sector's position in the still "product development stage" makes it unlikely to grow at a tremendous pace to become big enough to significantly impact GDP or employment in the short-run. Moreover, as the sector has not yet reached maturity, its "economic threshold" is still notably high, which renders its subsidy not likely to boost the demand side of the market. Supporting the latter is also the fact that, unlike mature sectors, the green energy sector still lacks the means for a mass delivery. Therefore, if Bulgaria was to pursue an inclusive low-carbon growth conducive to job creation, it appears more logical to focus on energy savings and ef-

iciency in already established sectors that generate notable employment. That is to say that a viable employment strategy for Bulgaria aimed at boosting employment in the short- and medium run should focus on **saving and efficiently using resources and energy in existing industries**, while phasing investments in the latest green technologies to provide employment in the long-run. In this sense, directing government resources toward reducing the intensity and boosting the efficiency of large established sectors (i.e., those in the "Growth" and "Maturity" stages) would be more effective. Meanwhile, sectors like green energy that are in the "Product Development" and "Intro" stages are to be supported, but not burdened with expectations of instant job creation. In this sense, there is a **potential** for Bulgaria in fostering sectors like infrastructure and the service sector in line with the low-carbon sustainable agenda. This can be expected to have an immediate impact on employment, as the jobless rate in construction, for example, is riding high as a result of the crisis. Meanwhile, the Bulgarian government should take steps to address and alleviate some deeply-rooted structural and skill mismatch holdups on the labor market, so as to prepare the Bulgarian workforce for a green future.

Figure 7. Green Energy Technologies in the Industry Life Cycle.



Source: the Daily Markets, 2010.

⁵³ Dnevnik newspaper, 31.08.2011, "Държавата отново пусна 'Брикел'" (in Bulgarian).

⁵⁴ For more detailed information on the Industry Life Cycle model, see Dian L. Chu, in the Daily Markets, 2010.

It should be noted that the **long-term perspective** speaks for green job development,⁵⁵ yet, a **short- to medium-term perspective** seemingly reveal greatest potential in **savings and efficiency in existing industries**. For Bulgaria, a win-win strategy appears to be one that foresees and implements in practice improvements in the use of energy and other resources in existing industries (e.g., manufacturing), while supporting new green technologies' use and development and suitable education. In that sense, the idea of rapid mass employment at the green industry should give way to a more sustainable employment transition, not only because green developments are in their initial market stage, but also because the focus of green energy production should be on efficiency rather than turning it into a social employment agenda (which may prove unproductive). In support of this is the fact that mid-sized and large companies prevail in the generation and distribution of energy from conventional sources in Bulgaria, while micro and small enterprises dominate the RES scene.⁵⁶ Further, the BGWEA reports creating a total of over 350 workplaces in Bulgaria.⁵⁷ While encouraging, these numbers can hardly affect in a significant way the Bulgarian job market that currently has about 348,000 unemployed persons, among which 282,500 are discouraged, 161,700 long-term unemployed (in **2010** they are 46.5% of all unemployed), 27,600 reporting being under-employed (i.e. working part-time but looking for employment), and another 24,500 looking for employment but not immediately available (an indicator often, though subjectively, related to underemployment). Among

the unemployed, those with lower education experienced an unemployment rate of 21.7 in 2010.⁵⁸ Considering the close dependency of enterprises developing green technologies on the availability of highly qualified specialists, a clear need appears from building up a suitably educated human capital. In that sense, those low- or not educated unemployed are not likely to find a permanent job in the green industry (but are poised to rather temporary construction work, for example).

3.6 Green Technologies & Innovation

Bulgaria is largely reliant on foreign import and know-how in terms of green technologies. In the energy sector, the level of utilization of Bulgarian scientific and technological expertise for developing local/national energy solutions is notably low. As a result, a smaller portion of the value-added remains in the country in the form of profits, salaries, or license payments.⁵⁹ Moreover, due to an apparent mismatch between Bulgarian education and its relevance to a low-carbon/green economic development, Bulgaria can participate mainly in activities with low value added, such as early construction stages (e.g., laying concrete). So far, the Bulgarian government has failed to pull technological innovation through the stimulus it provides to RES, as the capacity of the Bulgarian administration to formulate and enforce a more complex stimulus packages is limited. The local commercial (non-government or stimulus-related) market remains very limited, as the purchasing power of households in Bulgaria is five times less than the EU-27 average. Although publicly supported schemes for energy efficiency exist, they are so administratively burdensome, that most of the insulation of buildings done by households is in the gray economy.

⁵⁵ Greenpeace International, 2011, "Energy [R]evolution: A sustainable World Energy Outlook", <http://www.thebioenergysite.com/articles/431/energy-sector-jobs-to-2030-a-global-analysis>.

⁵⁶ The latter represent a business segment with high entrepreneurship and innovation: the ARC Fund, 2011, "Innovation.bg 2011".

⁵⁷ It does not become clear whether these jobs were permanent and high-skilled: Bulgarian Wind Energy Association (BGWEA), 2011, Yearbook.

⁵⁸ Unemployment rate of the population aged 25-64 with re-primary, primary, and lower secondary education, Eurostat.

⁵⁹ The ARC Fund, 2011, "Innovation.bg 2011".

3.7 Economic Obstacles to Green Growth

- **Affordability.** Bulgarian policy makers and the public face a tough dilemma in promoting energy efficiency via market instruments. A major factor determining consumer behavior both in terms of savings in final energy consumption and investing in energy efficiency is the price of energy. While the cheapest among EU countries in absolute terms (Euro per 100 KWh), electricity prices in Bulgaria are already a significant expense out of the average household's income. Moreover, at present, most households do not undertake energy efficiency measures not because consumers are wasteful, uninformed, or unwilling, but because they cannot afford the required appliance replacements and technology improvements. There is some potential in improving households' energy saving behavior, as a means of reducing the consumption of energy at no extra cost. But the bulk of the energy efficiency drive will still have to come from government sponsored programs to make a sizable difference. Affordability of market solutions for consumers is a major stumbling block for furthering energy efficiency in Bulgaria. Much of the country's progress in improving energy efficiency could be wrecked over the next few years if the required fleet and technology replacements and improvements continue to be unaffordable for the majority of the population. While increasing the price of energy may seem like an appropriate tool for pushing consumers to improve energy efficiency (particularly as regards electricity and heat used by residential customers), it is likely that this would not produce the desired outcome, since many consumers are already spending excessively large portions of their incomes on electricity

and heating. Therefore, higher electricity and heating prices would further strain consumer budgets without providing the means to implement upgrades and replace inefficient installations. A switch to more efficient sources (e.g., natural gas) of energy for heating, hot water, and cooking is also difficult to implement, since the residential gas network is not well developed and, where that option is available at all, the required investment for connecting and switching to gas is still beyond the means of most residents. In fact, higher electricity and heating prices may lead to the increased use of wood for heating purposes.

- **Outdated physical infrastructure.** While charging customers for investments in the energy grid on a monthly basis, the past 20 years have seen a continuous underfunding of the grid leading to high depreciation and frequent blackouts. The preferential regime introduced in 2007 to boost the development of projects generating energy from renewables, as per EU regulations, provided for a guaranteed connection to the grid, introduced feed-in tariffs, and offered long-term electricity purchase agreements. Resultantly, these support measures led to a stampede of investment interest, which overburdened the public administration, creating corruption pressures, and quickly overloaded the connection capacity of the national energy grid. The final outcome was a blockage of grid access for RES projects and a public backlash against renewables. Not only is the Bulgarian grid unable to accommodate a significant amount of additional energy produced from RES, but it is also not physically located to reach the bulk of these projects. For example, the bulk of developed wind park projects in Bulgaria are located in the North-East, while the bulk of the transmission capac-

ity (as per grid location) is concentrated at the Center and West.⁶⁰ Thus, the construction of new projects using RES and the expanding urbanization pose challenges to the grid capacity and make the issue of grid investments even more urgent.

- **Administrative capacity.** Development of the RES sector requires a much higher administrative capacity from national regulators and policy setting bodies than is currently available in Bulgaria. The main reason for the failure of regulation to adequately support RES development in Bulgaria has been the lack of administrative capacity to formulate and implement policies. Such is the case with the construction of RES projects with practically no restrictions on contractor, type of technology, or location, including on arable land and environmentally protected areas. This is evidence of administrative incapacity of the highest order, which has given RES a bad name, much like real estate development in the past. Another case in point is the country's experience with the construction of new large generating capacities. During the past decade, experience with managing large energy infrastructure projects in Bulgaria has pointed to the fact that, due to their size and scale, these projects challenge the national economy's absorption capacity and exceed the Bulgarian government and administration's management capacity. Furthermore, in the course of these projects it was revealed that the country lacks administrative mechanisms and capacity to do long-term forecasting (e.g., through foresight). Related to the low efficiency of the energy sector public administration, administrative delays are also frequently observed, notably in the process of connecting RES to the grid,

but also in providing incentives under the various available instruments. Investors and entrepreneurs have also expressed dissatisfaction with the higher connection fees applied to producers of renewable energy. The administrative procedures are still perceived as highly burdensome and resource consuming, especially in the case of wind farms and other smaller RES installations. Administrative deficiencies have been overshadowed by corruption, particularly with respect to public procurement and permit issuing procedures. Thus, it appears that Bulgaria is not yet well equipped with the necessary effective instruments and qualified administration to meet the challenges of developing a low-carbon economy and creating green jobs.

- **A race for limited resources.** Bulgaria's resources for upgrading and renewing the energy sector are limited, given that the country is a small economy (with a GDP per capita of US 6,356⁶¹ in 2010). This is even more so in a time of crisis. Thus, conventional and alternative energy projects compete for a limited funding. The nuclear lobby in the country is very strong, bringing together energy experts, politicians, and a number of private companies that dominate public debates and policies. While nuclear energy is traditionally hidden behind non-transparency and secrecy, the renewable energy sector pioneered the introduction of a green energy line in the electricity bills of customers to increase its transparency. This has, however, focused public attention on the high preferential pricing for RES-E and, similarly, of biodiesel production. Traditional fuel lobbies (coal, nuclear, and oil) have skillfully used this

⁶⁰ Bulgarian Wind Energy Association, 2011.

⁶¹ Gross domestic product per capita, current prices (US dollars). In addition, GDP based on purchasing-power-parity (PPP) as a share of world total was estimated as 0.13%: IMF, WEO data.

additional transparency to convey the message that RES costs and prices are prohibitively high and are the only culprits for rising electricity bills. In particular, this implication has been widely used in an ongoing debate about the price of energy from renewable sources compared to the price of nuclear energy, as Bulgaria prepares to build a second nuclear power plant while also striving to achieve its EU commitment to renewable energy. Meanwhile, while the short term political and economic gains from procuring new generation capacities are obvious, the gains from promoting energy efficiency are neither that obvious, nor easily quantifiable. Thus, no apparent interest or lobby group stand behind energy efficiency measures, which promotion lags behind despite a number of available options for financing such measures.

- **Knowledge and education.** Introducing technologies that produce energy from RES require significant investments and new business skills. Moreover, currently the Bulgarian education system does not appear optimally suited for training appropriately-skilled cadres. A preliminary look at higher education institutions reveals an insufficient number of majors related to green technological development with an equally insufficient number of pupils (or graduates) in the related majors in 2010.

In addition to economic, there are also a number of institutional obstacles to the development of a low-carbon economy and the achievement of a green/sustainable growth, to which we turn next.

4. The Role of Policy and Society

4.1 Existing Measures

Table 1. Bulgarian Instruments for Meeting Obligations on Climate Change.

Type	Instruments	Concrete steps or opportunities
Legal	Laws and ordinances	Multilateral and bilateral international agreements; EU legislation on the environment, pollution, energy efficiency and renewables promotion, etc.
Financial	Incentives and funding opportunities promoting carbon cuts among economic operators and improving energy efficiency	Agriculture Fund, Energy Efficiency Fund, EU Structural Funds, Kyoto Mechanisms (Joint Implementation and Emission Trading), etc.
Prescriptive	Strategies and action plans	The Bulgarian National Strategy for the Environment and Second National Action Plan (2005-2014), Bulgarian National Energy Efficiency Plan
Publicity	Education and public awareness campaigns	

Historically, Bulgaria introduced a separate section on the production of electricity from RES in its 2003 version of the *Law on Energy*.⁶² The *Law on Energy* was followed by a *National Long-Term Programme for Encouraging the Use of Renewable Energy Sources 2005 – 2015*, which, however, never took off in prac-

tice. In 2007, Bulgarian policy-makers adopted a separate *Law on Renewable and Alternative Energy Sources and Biofuels*⁶³ to regulate public relations in the process of generating electricity, heating, and cooling from RES. The law also addressed the use and production of alternative fuels (e.g., biofuels) in transporta-

⁶² Promulgated in State Gazette Nr. 107 of 9 December 2003.

⁶³ Promulgated in State Gazette Nr. 49 of 19 June 2007.

tion, which was required by EU directives but had not been introduced in Bulgaria by then. The law boosted tremendously the incentives⁶⁴ for producing energy from RES, primarily photovoltaic and wind power, without introducing clear mechanisms for access to the grid. In effect, the law created a very liberal preferential market without developing proper regulation or outlining the roles of market players. The result was the explosion of RES projects after 2007, which subsequently forced electricity distribution companies to stop connecting RES-E producers to the grid (contrary to the law's mandate). Thus, as per its accession into the EU, Bulgaria adopted a very comprehensive but badly structured law on promoting renewable energy sources. The resultant swift and chaotic explosion of wind and photovoltaic projects well overshoot the country's infrastructure and prompted the current Bulgarian government to adopt a much more cautious approach to renewable energy development in the new *Law on the Energy from Renewable Sources*. This latest legislative development explicitly states national targets for a 16% share of energy from renewable sources in gross final energy consumption (including a 10% share of energy from RES in the transport sector), and provides a schedule for achieving them. Importantly, the Law also adds biomass to the preferential treatment. It is a step in the right direction in terms of providing more clarity to the RES investment process and dividing responsibilities between producers and grid operators. However, investors have voiced concerns that it shifts much of the burden of RES development away from the grid and towards producers, which, if left unattended, might lead to setbacks in RES promotion.

⁶⁴ It not only guaranteed preferential pricing for RES, but also provided for a maximum of 5% annual downward change in regulated prices, which the State Energy and Water Regulatory Commission could introduce.

In addition to the new *Law on the Energy from Renewable Sources*, EU obligatory targets have been incorporated into the *National Energy Strategy of the Republic of Bulgaria until 2020*, and their achievement has been outlined in detail in the *National Renewable Energy Action Plan*.⁶⁵ The Plan envisions an achievement of national targets for renewables through boosting RES-E production, increasing renewable energy's share in cooling and heating, and bolstering the use of RES in transportation. Furthermore, a successful achievement of the national objectives is deemed feasible only when matched by simultaneous improvements in energy efficiency (notably in final energy consumption, the transmission and distribution of electricity and heat, etc.) and energy intensity.⁶⁶ It is clear from the Plan that the amount of energy foreseen (e.g., for photovoltaics) for 2020 has already been achieved in 2010.⁶⁷ The Plan presents two development scenarios and some forecasts of the technical potential for utilizing renewable energy sources in Bulgaria, based on specific assumptions about the country's economic development by 2020.⁶⁸ The contribution of the various types of renewable sources is not balanced, with hydropower and solid biomass accounting for the biggest share (29% and 34%, respectively), while the potential contribution of wind power is assessed at 7%.

The Energy Charter Secretariat has noted that Bulgaria has made good use of the EU accession process to improve its energy efficiency policy framework.⁶⁹ Yet, while its policy and

⁶⁵ Under the EU's Renewables Directive (2009/28/EC) all Member States have to publish a plan outlining in detail the steps the country will take to reach its 2020 target.

⁶⁶ National Energy Strategy of the Republic of Bulgaria until 2020, p.15-16, www.mee.government.bg/doc_vop/ENERGY.START-240610.doc.

⁶⁷ Report on Reaching the National Indicative Targets for Consumption of Electricity Produced from RES in 2020, Ministry of Economy, Energy and Tourism, March 2011.

⁶⁸ Forecast Document in Accordance with Directive 2009/28/EC, http://ec.europa.eu/energy/renewables/transparency_platform/doc/bulgaria_forecast_english.pdf.

⁶⁹ Bulgaria: In-Depth Energy Efficiency Review, Energy Charter Secretariat, 2008.

administrative framework is assessed as sufficient, Bulgaria's public investment in energy efficiency has remained extremely modest in comparison to the challenges faced by the country. The few existing funding instruments are, in effect, public-private funding mechanisms supported by international institutional investors, which provide assistance in the low tens of millions of Euros. While these have provided a good ground for piloting energy efficiency measures, rolling them out on a national scale would require a much higher financial firepower. Moreover, the challenge for policy makers remains the actual implementation of energy efficiency policies, as well as improving the coherence among various instruments. So far, measures have been focused primarily on final consumption, rather than the processes of energy production, transformation, and distribution. Substantially exceeding EU's 20% target for reduction in gross energy consumption is vital for the sustainability of the Bulgarian economy, as well as for achieving higher energy security. Achieving more ambitious reduction targets largely depends on emphasizing energy efficiency and energy savings in Bulgaria's strategic energy policy documents. Accordingly, energy efficiency is a top ranking priority in the new *National Energy Strategy of the Republic of Bulgaria until 2020*, developed⁷⁰ in 2010, and signaling for a first time a change in attitude towards RES development. The Strategy presented two scenarios for meeting national targets, without specifying the assumptions used or the means for achieving the energy efficiency targets. However, it clearly foresees a more moderate RES growth.⁷¹

4.2 The State

Bulgaria's legislation on climate change and promoting the use of renewable energy sources closely mirrors the developments on EU level. Adopted policies, and the sustainable development agenda, as a whole, stem from a superficial application of the EU's developmental discourse, rather than understanding the real benefits of this agenda for Bulgaria's economic development. For this reason, national policies often seem foreign and fail to translate into action. As the country did not have enough experience in developing new energy sources, this has resulted in frequent changes to legislation,⁷² leaving consumers to pick up the costs, while also scaring off investors.

Similarly, environmental and energy-saving measures in Bulgaria also follow EU trends and requirements. Measures are adopted on a case-by-case basis, rather than being elements of an integrated vision based on strategic analysis. A large potential remains untapped in using EU funding (i.e. OPs) for developing a low-carbon economy.⁷³ For example, of the BGN 83 million provided by OP Regional Development for "...implementation of energy efficiency measures in municipal educational infrastructure in urban agglomerations", the share of contracted funding is merely 6% of the total OPRD. Thus, a better use of available resources under EU operational programs is an obvious potential for great energy efficiency improvements in a short period.

⁷⁰ Developed in accordance with the more recent Directive 2009/28/EC on the Promotion of the Use of Energy from Renewable Sources

⁷¹ Energy efficiency improvements are said to bring 50% savings of primary energy. While it is not immediately obvious how these savings are to be achieved, actions in two areas are anticipated: energy savings in final consumption (incl. households, industry, the transport and the service sectors), and saving energy during the processes of its generation and transformation.

⁷² For the past eight years, Bulgaria has adopted three legal acts on promoting energy from renewable sources, each changing the rules of the game. The pattern has been to adopt very liberal regulations promoting energy from renewable sources on the basis of EU directives, and then start changing it to reduce the stimulus provided.

⁷³ For example, OP Competitiveness currently provides BGN 403 million for the "Introduction of energy saving technologies and renewable energy sources" in the business sector; OP Regional Development provides: (1) BGN 83 million for "Support for implementation of energy efficiency measures in municipal educational infrastructure in urban agglomerations", (2) BGN 117 million for "Access to Sustainable and Efficient Energy Resources", and (3) BGN 27 million to "Support the implementation of energy efficiency measures in municipal educational infrastructure of 178 small municipalities".

Furthermore, as the price of new green technologies remains unaffordable for most households, and as subsidized energy prices take away the stimulus to save energy, the government has a crucial role in stimulating green growth and the use of newer technologies. In addition, as there is currently no central heating outside large cities triggering an unacceptably high use of firewood, notable improvements in the heating system and arrangements would also have to come from the government. Finally, as new regulations (notably on renewables) created a boom and then bust of renewable projects (wind, PVs, and biomass), the tremendous role of the state in crafting the environment for green investments became obvious. Moreover, due to current institutional arrangement, suitable investments in the energy grid (upgrades and notably improving its capacity in order to enable the connection of RES producers) will also necessarily have to come from the state through suitable energy policies.

4.3 The Society

A sustainable economy unavoidably necessitates changes in consumer behavior. A major problem with the promotion of sustainable energy in Bulgaria is the still alien nature of the concept of energy efficiency and savings to the country's consumer culture. An excessive and wasteful use of energy due to currently subsidized prices of electricity, and a history of wasteful consumption during the years of central planning, indicate that energy savings are rather unpopular with the Bulgarian population. In spite of the existence of numerous instruments to stimulate energy efficiency in Bulgaria, these tools are seldom accompanied by targeted and well thought out public awareness campaigns and do not deliver the expected results. Consequently, though gaining popularity, the existence of a mass green culture is not yet a reality in Bulgaria. There are

a number of obstacles to the creation of such culture, starting with relatively low incomes and arriving at the high level of acceptance of the status-quo. At large, Bulgarians are notably supportive of nuclear energy, while also being among the least well informed within the EU with respect to the specifics of nuclear energy. Furthermore, some debates, like nuclear waste storage and disposal, are simply missing from the public debate, being carefully kept aside by strong well-established lobbyists for conventional energy sources. As noted, the latter have skillfully used the introduction of the "green line" in energy bills (intended to bring about additional transparency) to mislead the public into believing that the raising costs of electricity are only or mainly due to new green technologies.

Aside from the public's low knowledge of the nuclear and green energy sectors, insufficient information and knowledge are evident in a number of other cases. For example, adequate public information on the benefits and risks from probing for and extracting of shale gas is missing at a time, when Bulgaria is seemingly interested in pursuing this new energy option. Such a lack of reliable information leads to incoherent energy decisions and inadequate assessments of new energy options. Consequently, the public debate on new and conventional energy sources is dominated by largely populist statements, and a similar lack of a deeper understanding seems apparent in most environmental debates. Providing meaningful factual information (currently missing at large) to the public is, thus, key to a meaningful public participation in the country's energy and environmental future.

A critical factor for developing a sustainable energy sector in Bulgaria is the social price to introducing RES, energy efficiency, and climate change policies. The social burden

of energy bills, especially in the context of an ongoing financial crisis, is a central concern for households. Future price increases are inevitable to cover the costs of new investments in generation and transmission. However, Bulgarian households are not prepared to foot the bill for more expensive electricity.⁷⁴ Only 17% of the households indicate that they are willing to pay extra for clean energy, yet, they would only bear a modest increase (of up to 10%) in their electricity bills. The willingness to pay for “green” energy seems directly linked to the income level of consumers. Low-income households support cheaper, albeit “dirtier”, energy (i.e. well over half of the Bulgarian households use wood for heating, which currently remains the cheapest source of energy). This indicates an overall unwillingness and inability to pay higher electricity prices. Bulgarian consumers are unlikely to support any generation solution that would imply an increase in prices higher than 10%, which means that Bulgarians do not have a preference towards specific solutions in the energy sector. This leaves the entire responsibility for deciding on the energy mix to Bulgarian politicians. In contrast to the population, the willingness of Bulgarian businesses to pay higher prices for electricity produced from RES is higher.⁷⁵ Approximately a third of the businesses report a readiness to incur the extra costs of “greener” energy,⁷⁶ yet there is little sense among both the population and businesses as to what constitutes a manageable price increase.

In general, Bulgarian energy policy-making seems to omit the central role of behavior-

al change from energy-related public debates by ignoring the role and involvement of local authorities and individual consumers. Nevertheless, in order to achieve certain objectives, such as improvements in energy efficiency and savings, the participation of municipalities in transforming the behavior of individual consumers should be given a priority. A notable shift in consumer attitudes and behavior are needed if Bulgaria is to stay on track with its goal of achieving a more sustainable development. At a practical level, one of the critical issues in changing consumer behavior relates to the need to reduce the use of wood as biomass, and the need to reduce deeply-rooted energy-wasteful behaviors at large.

4.4 The International Community

International, and most notably, European standards and regulations are the major drivers for “green” change in Bulgaria. EU’s environmental and developmental discourse has provided the basis for all legislation, strategies, and the policy discourse regarding the environment and renewables in Bulgaria. The country has, in essence, transcribed European regulations and based all its adopted measures on innovative ideas arising on an EU level. As a result, EU developments, and more notably regulations of mandatory character, have actually triggered Bulgaria’s discourse in the absence of a local vision and insight into the actual gains from a low-carbon economy.

As the international, and more notably the European, discourse on energy and environment largely determine national developments, recent changes in the climate change course cause a concern. A decade after the adoption of the Lisbon Strategy and EU’s first Sustainable Development Strategy, the Union’s ambitious objectives are far from reality. The actual implementation of national policies among its Member States remains a

⁷⁴ According to surveys commissioned by the Center for the Study of Democracy in 2009 and 2010.

⁷⁵ The greater readiness of businesses to pay for green energy might be related to a greater ability to pay, a better understanding of the long-term benefits of green energy for businesses, and the better position of businesses to take advantage of existing green energy stimuli.

⁷⁶ According to surveys commissioned by the Center for the Study of Democracy in 2009 and 2010.

challenge, while there are valid concerns over Member States' meeting their 2020 targets. Moreover, latest reports point to all-time-high levels of CO₂ emissions, and large countries remain divided along the lines of committing to a firm "green" developmental agenda. Yet, for smaller players like Bulgaria, it is crucial that larger international players stay on track with the climate change discourse, demonstrating a coherent approach and a firm commitment to countering environmental changes. Moreover, if serious about countering climate change and developing national economies in a sustainable manner, the international community (most notably, large players) needs to act in an orchestrated manner and ensure enforcement. While hard to achieve and, at times, controversial, the latter is a prerequisite to the effective fight against climate change. For example, in the absence of proper international monitoring and enforcement, Bulgaria seems to have taken some short cuts: such is the case with data on the share of RES from final energy consumption that seem to have changed (with the RES share increasing), as deadlines for reaching 2020 targets approach. Meanwhile, no breaking developments are evident, as the country continues to rely mainly on HPPs. Similar is the commonly cited case with dropping CO₂ emissions, yet omitting the fact that this drop does not owe to targeted policy action, but to a decline in production/manufacturing, instead. It is likely that such cases are not confined to Bulgaria only.

5. Conclusions and Recommendations: Most Urgent Actions/Regulations

In view of its international commitments, Bulgaria is yet to come up with the right sustainable energy mix specific to its domestic socio-economic environment. Decisions on the energy mix need to take into consideration the trade-offs between security of supply,

competitiveness, and environmental sustainability. For example, oil and gas are subject to price volatility and political leveraging; coal is relatively cheap but dirty; nuclear energy produces negligible levels of CO₂, yet requires large sunk cost investments, carries a risk that cannot be adequately verified by the public, and does not reduce dependency on imports; renewables are highly technical and likely to drive energy prices up, etc.⁷⁷ Furthermore, Bulgaria needs to catch up with other EU Member States in a number of areas like decreasing its energy intensity, popularizing energy savings and boosting energy efficiency, as well as committing significant investments to developing smart grid solutions that are required for a future "green" growth.

There is a benefit to the delayed timing of introducing RES into the Bulgarian energy system. For example, EU's earlier attempts have been focused on first generation biofuels and technologies that have now been greatly improved. Therefore, the country should take into account the latest developments in the field of RES and determine a realistic scale of investment in the right type of biotechnology. Biofuel production needs to be assessed in terms of its cost-effectiveness and effect on agricultural production and the environment. Wind farm projects ought to be assessed in terms of their flexibility, aiming to select those including primarily adjustable wind aggregates. Such criteria, for example, should be included in the currently ongoing selection process for RES projects that await connection to the grid. Further, earlier policies⁷⁸ contained no planned action on the use of biomass, which has been corrected in the *Law on Energy from Renewable Sources*, but

⁷⁷ Juan Delgado, Hans W. Friederiszick, Lars-Hendrik Röller, *Energy: Choices for Europe*, Bruegel Blueprint Series, 2007, p. 45.

⁷⁸ National Renewable Energy Action Plan submitted to the European Commission in 2010.

the stance towards this source of energy in the national policy remains ambiguous. The potential for using biomass in Bulgaria (including agricultural waste) should be carefully considered, including both potentially positive and negative impacts. Important factors determining whether the use of biomass reduces emissions in the atmosphere, as compared to fossil fuels, are what kind of and how biomass is produced and harvested. Legislation encouraging the substitution of fossil fuels by biomass, irrespective of the source, may prove harmful and end up increasing emissions, thereby accelerating climate change.⁷⁹

The current *National Energy Strategy of the Republic of Bulgaria until 2020* seems to prioritize almost every possible energy source, while it is clear that developing all “prioritized” sources seems unrealistic. Thus, it is urgent that the most suitable and realistically achievable energy sources are selected and prioritized. The latter’s development cannot be discussed, nor achieved, without a concurrent development and modernization of the electrical grid, and by extension, the gas system. Thus, also urgently needed are adequate investments in and upgrades to the national grid system. Any long-term plan ought to prioritize grid development, especially in light of a large scale introduction of RES and improvements in the energy balance structure. Issues relating to the flexibility of electricity generating capacities and the sustainability of the power system need to be prioritized. The current inability to connect all renewable energy producers to the grid is indicative of the grid’s lack of sustainability and inability to maintain security and service quality. While improved, the current *Law on Energy from Renewable Sources* pro-

vides no objective mechanism for connecting RES-E producers to the grid,⁸⁰ while incentives for RES-E producers, such as feed-in tariffs, are unpredictable at best. Fluctuating feed-in tariffs and tendencies to support different sources of renewable energy (e.g., first wind and solar, then biomass) create a volatile environment from investors perspective. As businesses cannot rely on reliable forecasts, sizeable investments are unlikely. Thus, it is critical that the legal framework is re-visited so as to provide clear and transparent criteria and procedures (subject to public scrutiny) for selecting RES-E producers and spreading the costs for an increased use of energy from RES between producers, consumers, and the state (not exclusively burdening either of the parties).

Last but not least, there is one clear overriding priority for Bulgaria’s energy strategy. That is the need to stimulate energy efficiency, especially in the household sector, sufficiently utilizing EU funds. Committing to energy efficiency the same amount of financial resources and only a fraction of the political and social attention, which Bulgaria has spent on developing a second nuclear power plant, would result in saving the energy produced from such a plant. Moreover, following an energy efficiency discourse would bring revenues to the ailing construction sector throughout the country, creating sustainable job opportunities in Bulgarian SMEs. In contrast, constructing a new nuclear power plant would involve primarily larger construction companies selected by a foreign contractor in charge of the project. Finally, unlike introducing RES-E producing technologies that require significant investments and new business skills, energy savings can be achieved utilizing the existing capacity at a low or no extra cost.

⁷⁹ Report from the EEA Scientific Committee on Greenhouse Gas Accounting in Relation to Bioenergy: www.eea.europa.eu/about-us/governance/scientific-committee/sc-opinions/opinions-on-scientific-issues/sc-opinion-on-greenhouse-gas.

⁸⁰ According to BGWEA, the law would not allow new capacities to be connected to the grid before mid 2012 at the earliest, and, in its current version, the law provides no actual procedure for connecting to the grid.

Appendix

Figure 8. Bulgaria: Net Generation and Losses of Electricity (billion KWh).

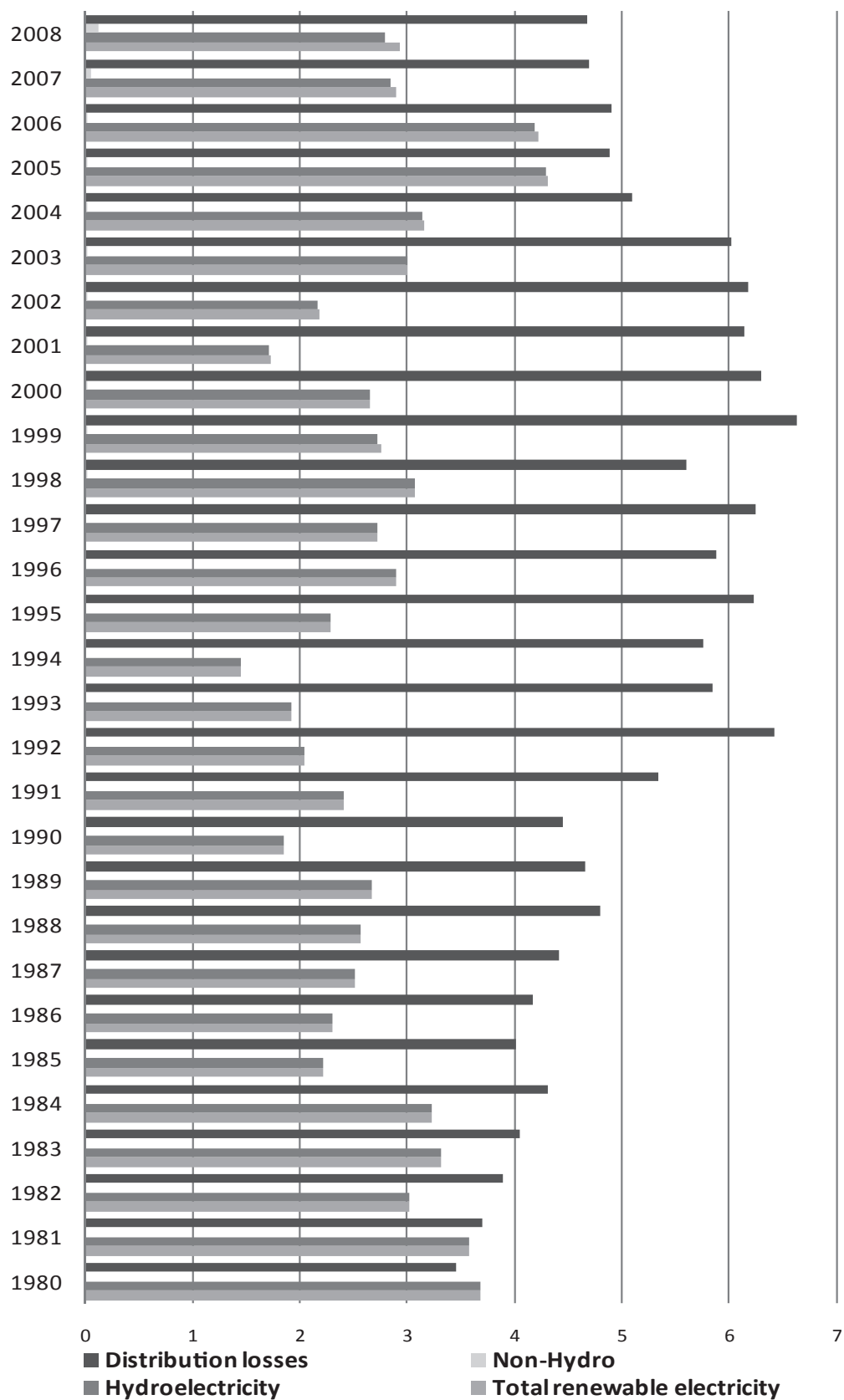


Table 2. Share of the Population Subjected to Excess Levels of SO₂, NO₂, PM, and Ozone by Region.

Region	SO ₂	NO ₂	PM	Ozone
Metropolitan	0	100	100	0
Plovdiv	0	100	100	0
Varna	0	0	100	0
North/Donnaw	0	0	40	0
South-West	9	0	27	0
South-East	5	0	52	14
Country Total	3	22	57	4

Source: Executive Environment Agency, 2009, "National Report on the State and Preservation of the Environment".

Table 3. SO₂ Emissions.

Sector Aggregation	2008	2009
Energy use & supply (excl. transport)	668.84	630.03
of which, electricity & heat production	663.22	617.21
Industrial processes	21.30	19.58
of which, other chemical industry	15.99	17.12
of which, pulp and paper	4.39	1.44
of which, lead production	0.44	0.60
Road transport: Passenger cars	0.15	0.21
Agriculture	n.a.	n.a.
Waste	n.a.	n.a.
TOTAL	735.22	657.93

Note: n.a. is not available; Sector aggregations only include activities for which there is data.

Source: Calculations based on EEA's Technical report No 3/2011.

Table 4. NOx Emissions.

Sector Aggregation	2008	2009
Energy use & supply (excl. transport)	112.33	61.52
of which, Electricity & heat production	56.82	49.42
Industrial processes	25.96	16.10
of which, road paving with asphalt	0.17	0.12
of which, nitric acid production	25.20	15.55
of which, iron and steel production	0.23	0.18
of which, pulp and paper	0.21	0.09
Road transport: Passenger cars	48.85	81.87
Agriculture: Field burning of agricultural wastes	3.42	3.42
Waste	n.a.	n.a.
TOTAL	192.28	164.46

Note: Sector aggregations only include activities for which there is data; while in 2008 there were nearly 38 Gg from "Other, Mobile (including military, land based and recreational boats)", information for this category is missing for 2009, possibly skewing the data by reducing NOx emissions.

Source: Calculations based on EEA's Technical report No 3/2011.

Table 5. NMVOC Emissions.

Sector Aggregation	2008	2009
Energy use & supply (excl. transport)	48.16	35.00
of which, Electricity & heat production	0.07	0.06
Industrial processes	6.06	3.98
of which, ammonia production	2.04	1.10
of which, other chemical industry	1.23	0.51
of which, iron and steel production	0.19	0.08
of which, pulp and paper	0.14	0.02
of which, food and drink	2.39	2.22
Road transport: Passenger cars	34.21	63.26
Agriculture	26.68	26.68
of which, synthetic N-fertilizers	19.85	19.85
of which, field burning of agricultural wastes	6.83	6.83
Waste	0.36	0.33
of which, solid waste disposal on land	0.09	0.14
of which, industrial waste incineration	0.27	0.19
TOTAL	122.56	135.21

Note: Sector aggregations only include activities for which there is data; while in 2008 there were data for "Other, Mobile (including military, land based and recreational boats)", information for this category is missing for 2009, possibly skewing the data by reducing NMVC emissions.

Source: Calculations based on EEA's Technical report No 3/2011.

Table 6. NH₃ Emissions.

Sector Aggregation	2008	2009
Energy use & supply (excl. transport)	n.a.	n.a.
Industrial processes	1.57	1.08
of which, other chemical industry	1.54	1.06
Road transport: Passenger cars	0.69	0.72
Agriculture	48.90	48.90
of which, cattle dairy	14.02	14.02
of which, cattle non-dairy	5.95	5.95
of which, sheep	4.88	4.88
of which, horses	2.78	2.78
of which, swine	5.51	5.51
of which, laying hens	3.23	3.23
of which, other poultry	5.41	5.41
of which, synthetic N-fertilizers	6.10	6.10
of which, field burning of agricultural wastes	1.02	1.02
Waste	7.01	10.95
of which, solid waste disposal on land	6.82	10.95
TOTAL	58.18	61.76

Note: n.a. is not available; Sector aggregations only include activities for which there is data.

Source: Calculations based on EEA's Technical report No 3/2011.

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