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Study

Resource Efficiency Gains and Green Growth Perspectives in Bulgaria

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- Bulgaria's current pattern of energy use (including both households and industry) is unsustainable, its energy intensity is striking, compared to other European countries, and thus the country's overriding priority is stimulating energy efficiency. Air pollution is a persistent problem throughout the country.

- Renewable energy sources' development in Bulgaria is fairly slow-paced, while vast amounts of energy are lost (e.g. during distribution processes). The energy grid is in need of substantial upgrade and sizeable investments, as it is currently unable to accommodate either an expanding urbanisation, or a significant amount of additional energy produced from renewables.

- 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 suitably educated human capital.

- Bulgarian energy policy-making seems to omit the role of behavioural change. In order to achieve improvements in energy efficiency and savings, the participation of municipalities in transforming individual consumers' behaviour should be a priority. A sustainable economy unavoidably requires changes in consumer behaviour and internalising the concept of energy efficiency and savings.

Content

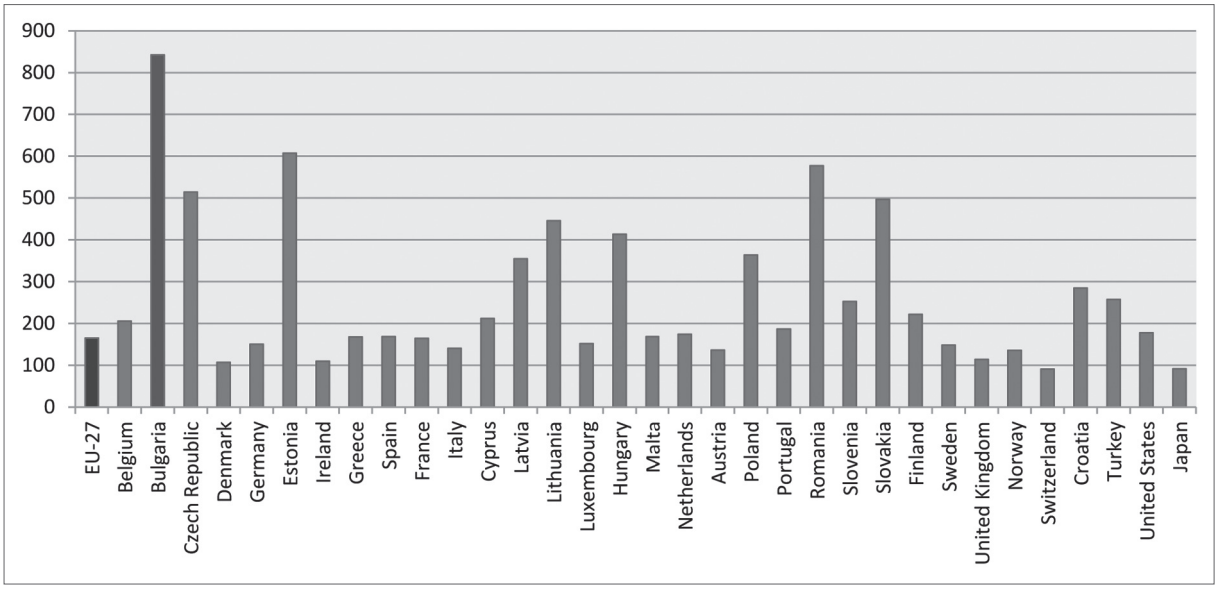
1. Environment

Bulgaria's approach to climate change in the past decade varies 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 (that are 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 centralised energy system highly dependent on imported resources and predominantly fossil fuel- and nuclear-dependent methods of electricity production.

Bulgaria is both more CO_2 intensive per capita than China and India, and more CO_2 intensive per dollar of GDP than the United States.[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.

In terms of the amount of CO_2 emitted through the consumption of energy, the country ranks 66th out of 216 countries.[3] Disaggregating the different sources of consumption, coal appears to be the largest emitter of CO_2 in the country, followed by petroleum (Figure 2). Thus, there is a vast potential in expanding gasification in the country as a means to pursue a low-carbon economic development. An increased use of gas, especially for heating and cooking purposes, would reduce Bulgaria's CO_2 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 1: Energy Intensity of the Economy (gross domestic consumption of energy/GDP), kgoe per EUR 1,000.



Source: CSD, based on Eurostat data for 2009.

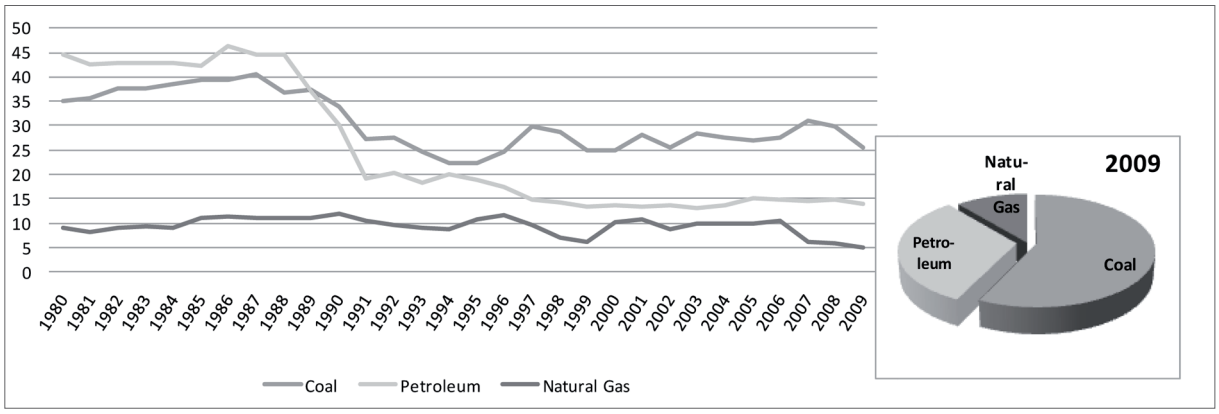
1. Center for the Study of Democracy (CSD), 2011, »Green Energy Governance in Bulgaria: at a crossroads«.

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

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 high for consumers, while future prices are projected to increase in relation to introducing duties on gas.

Figure 2: Bulgaria: CO_2 Emissions by Source of Consumption (million metric tonnes)

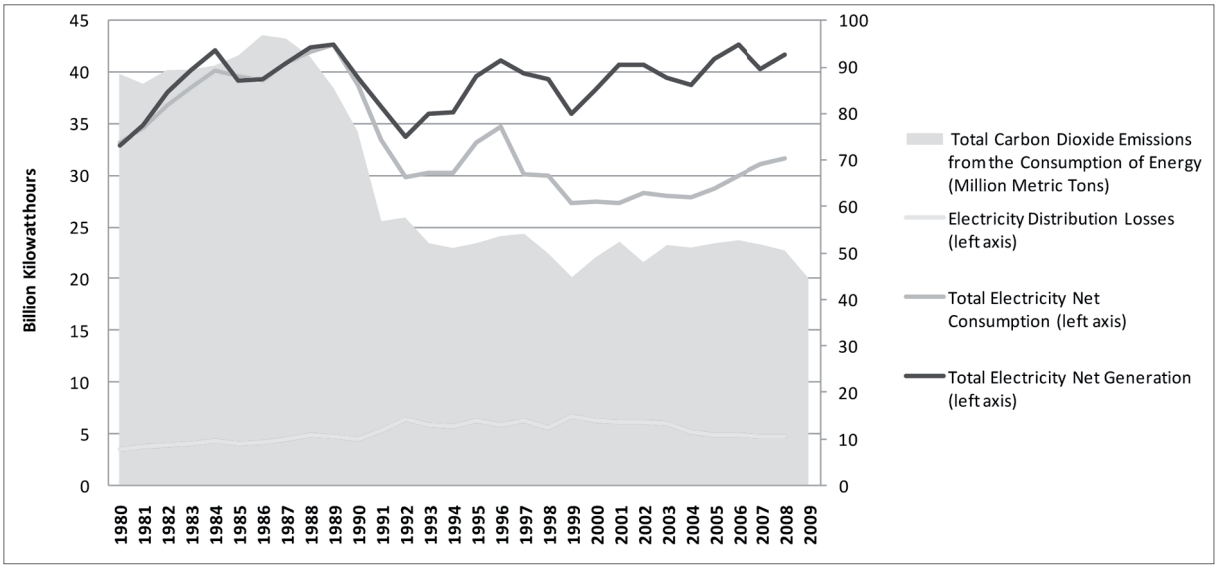


Source: EIA, International Energy Statistics.

Both the energy intensity and the amount of CO_2 emitted have been on the decrease since the late and the early 1990s, respectively. The observed decrease is primarily a result of a restructuring of energy demand in the country owing to the closure and privatisation of inefficient and energy intensive industries (notably metallurgy and the production of chemicals). As metallurgy's share in the industrial portfolio of Bulgaria decreased, so has heavy industry's share in final energy consumption. An additional reason for a »windfall« decrease in energy intensity and CO_2 emissions is the high fleet renewal rate in commercial transportation pushed by the introduction of EU vehicle standards to Bulgaria.

As the fall in CO_2 emissions corresponded to a drop in industrial activity rather than being a result of specific targeted policies, such a fall does not seem conducive to sustainable economic growth. The latter requires a sustained energy policy that stimulates economic growth and emissions reductions 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 optimisation for a variety of reasons, yet this

Figure 3: Future Reductions of CO_2 Emissions (right axis) Will Have to Come from Energy Efficiency



Source: EIA, International Energy Statistics.

policy choice appears to be influenced by larger 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 capacity 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.

Furthermore, a key component of every sustainable »green« economic development strategy is a sustainable environment. The latter embraces not only CO_2 emissions, but also emissions of a number of substances harmful to human health. For example, processes burning coal and oil release carbon dioxide, sulphur 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, sulphur dioxide and trace amounts of toxic pollutants, such as 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: sulphur oxides (SOx), nitrogen oxides (NOx), non-methane volatile organic compounds (NMVOC), ammonia (NH_3), 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 emissions of so-called acidifying substances, SO_2, NO_x and NH_3. 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 subjected to excessive levels of SO_2, NOx, PM and ozone in 2009 is displayed in Appendix Table 2. ExEA's 2009 report presents the following picture of the Bulgarian environment:

- The level of PM air pollution appears to be the main and persistent problem with air quality in Bulgaria. Moreover, this problem is not localised but affects the entire country.[8] Domestic heating is a major source of PM, emitting 48 per cent 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 precursors[9] of PM. However, 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 of Vidin, Pernik and Plovdiv from combustion processes in 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 per cent of the population. An increasing trend of pollution with PM is observed in the country: in 2007 there were 25 municipalities in which excessive levels were observed; in 2008 the number of these municipalities was 28 and in 2009, 30.[10]

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

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

7. According to 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, available at: http://eea.government.bg/eng.

■ In 2009, excess of SO_2 emissions was registered in two (out of six) regions (that is, South-West and South-East) in the country. The main sources were the TPPs located in these regions. Three per cent of the population lives in areas where the levels of SO_2 pollution are above the threshold values, while in Europe this percentage is less than 0.3 per cent. The energy sector (most notably electricity and heating) is the largest emitter of SO_2, responsible for nearly 94 per cent of total SO_2 emissions.[11] A National Programme for Emissions Reduction[12] launched in 2007 reports an increase of SO_2 emissions between 2000 and 2003, with a notable contribution from TPP Maritza Iztok due to the increased use of the plant and despite installing new flue-gas desulphurisation (FGD) technologies. A look at MEET's report shows a piecemeal application of the directives on SO_2 emissions, often backed by financial concerns.[13] While standing at 657 thousand tonnes (kt) in 2009, 2010 projections for SO_2 emissions were for 480kt of SO_2 emitted.[14] It is not clear how these emissions reductions are to be attained, considering that, in 2009, desulphurisation systems prevented the emission of merely 461.9 tonnes of SO_2.[15]

■ The main sources of NOx emissions are road transport and TPPs. During the year, they were responsible for, respectively, 49 per cent and 30 per cent of total NOx emissions.[16] Excess levels of NOx were registered in the Municipality of Sofia, Plovdiv and south-east regions (which represents an increase in the number of areas with registered excess, compared to only the Municipality 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 increased from 2008 to 2009, reaching 22 per cent (in Europe it is 5.9 per cent).[17] Historically, NOx emissions registered a 12 per cent increase between 2000 and 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 247kt.[18] Strangely enough, these »projections« are identical to the ceilings prescribed by the EU, which casts a shadow over their reliability.

■ Road transport and households are the largest sources of carbon monoxide, emitting, respectively, 57 per cent and 37 per cent of the total national CO emissions. A level of CO emissions in the atmosphere exceeding the norms (10 mg/m^3) was registered in the Municipality of Sofia. The source of pollution is mainly transport and other combustion processes.

■ Agricultural activity is the main source of NH_3 emissions, responsible for about 75 per cent of the total emissions of NH_3 in the country. Another main source of NH_3 emissions is waste disposal and treatment, at 21 per cent. Less than 62kt of NH_3 were emitted in 2009, with 2010 projections for NH_3 emissions in Bulgaria of 108kt.[19] Once again, »projections« for NH_3 emissions are identical to the ceilings prescribed by the EU, again calling into question their reliability.

■ NMVOC emissions for 2009 were 135kt, projected to reach 175kt in 2010,[20] again, identical to the ceilings prescribed by the EU. NMVOC are emitted mostly by: road transport (responsible for 26–30 per cent of NMVOC emissions), agricultural activities (21–24 per cent) and the burning of materials for household use (19–24 per cent).[21] Moreover, one-third of agricultural emissions result from the 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, but lead emissions from road transport were reduced notably after discontinuing the use of leaded petrol. Lead is currently emitted in notable quantities during combustion processes in industry (responsible for about 76 per cent of lead emissions into the atmosphere). As a whole, in Bulgaria there is a trend towards decreasing the aver-

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

12. National Programme 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 the EU.

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

15. National Programme 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.

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

22. National Programme for Emissions Reduction (2007)

age 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 the Kardjali lead and zinc producing plant.[23] During 2009, levels of benzene were recorded that exceeded 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 the chemical industry).

At the end of 2008, 5.1 per cent of the whole country's territory was categorised as protected. Meanwhile, some 271,100 hectares are used for the extraction of mineral resources, 11.4 per cent of them markedly and irreversibly damaged. The number of areas with a changed purpose of land use increased from 600 hectares in 2000 to 4,442 hectares in 2007. In spite of a moratorium on land use changes in the case of forest lands, such changes are ongoing.[25]

2. Economy

2.1 Resource and Technological Dependence

Bulgaria relies on imports for almost 70 per cent 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 100 per cent (in other words, 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 characterised by a low local scientific and technological capacity concentrated in traditional energy sources, such as coal and nuclear energy. In terms of competitiveness, the latter implies that a smaller portion of 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 the main obstacles to business in Bulgaria.[28]

2.2 Reliance on Cheap Labour and Lower Standards & Taxes

Bulgaria's foreign policy priority seems to be further integration into the European division of labour.[29] But this is not achieved by boosting Bulgaria's competitiveness and innovation, which are currently at the bottom of their potential.[30] The share of labour- and resource-intensive manufacturing remains persistently high in Bulgaria.[31] Accordingly, the share of FDI going into non-resource intensive manufacturing was fairly modest (10 per cent). Reportedly, the key attraction for investors was cheap energy (notably, electricity), while the key obstacle to investments in higher value-added sectors was a shortage of mid-level skilled workers.[32] Moreover, robust and sustainable economic growth requires strategies to increase labour productivity significantly. There seems to be a vast potential for productivity gains in utilising the workforce of low-skilled young people. 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 programmes and services, as well as training programmes[34] carry

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 January 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.

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 one-third of Bulgarian firms defined themselves as innovative: CSD, 2011, Innovation.bg 2011.

31. In 2007, the IMF reported the share of exports and labour- and resource-intensive manufacturing sectors to be 81 per cent per cent, compared to an EU average of 56 per cent.

32. IMF, 2007, Bulgaria: Selected Issues.

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

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

great potential for reducing unemployment in the short run, while measures aligning education with employers' needs should increase productivity over the long run.[35]

A sizable gray sector in Bulgaria's economy[36] 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 2010, the index of the hidden economic activity of Bulgarian businesses (including the size of the hidden economy, hidden employment, hidden turnover and redistribution) was on the increase, while the index of hidden economic activity of the population (including hidden employment, turnover and economic activity) actually decreased. The practice of hiring workers with no labour contract 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 (including 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, which 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 to construct 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, the introduction of EU rules in the gas and electricity sector, as well as the development of a long-term EU strategy for CO_2 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 per cent of 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 in 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 other things, 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 neighbour countries' intentions with regard to building their own energy generating capacities (for example, 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 per cent in 2009 and 59.8 per cent 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

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

36. On average, estimates of the share of the hidden economy in Bulgarian GDP are about 25 per cent (estimates 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.

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

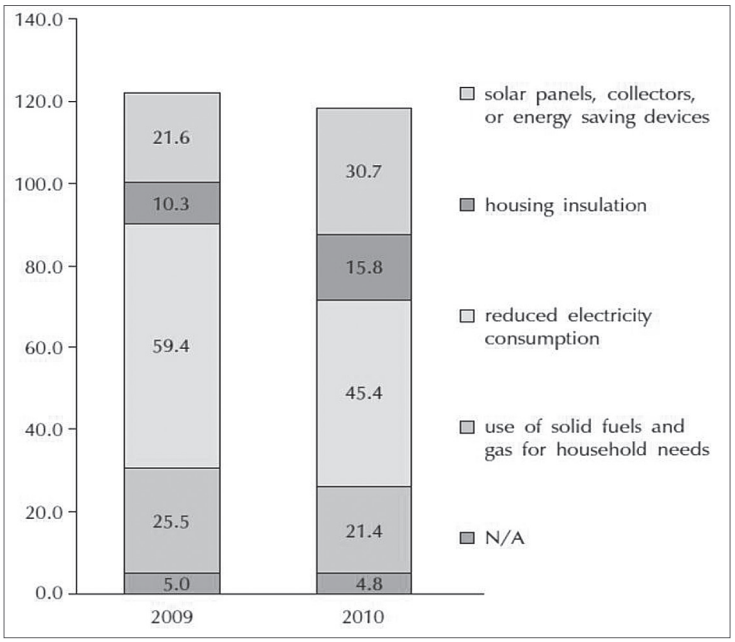
39. According to surveys commissioned by CSD: CSD, 2011, Green Energy Governance in Bulgaria: at a crossroads.

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 for sustainability. Using wood is sustainable only in the presence of strong regulations to ensure preservation of the forest stock, 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 increased control and regulation. Otherwise, the incentives could cannibalise the country's forests.

Furthermore, Bulgarian households use a notable share of electricity for their needs. Electricity's share in household consumption in Bulgaria was 38.9 per cent compared to an average of 22.5 per cent for the EU.[40] Meanwhile, a mere 1.6 per cent of Bulgarian households have access to natural gas, while the average for Europe is 55 per cent. Currently, the use of natural gas in Bulgaria is largely confined to 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 per cent. 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 CO_2 than both oil and coal, there is a great potential for Bulgaria to further reduce its CO_2 emissions by expanding its gasification. The present dismal share of natural gas's direct use by households runs counter to most European countries' policies, a major shortcoming of the Bulgarian energy mix and a factor in the country's low energy efficiency.

In 2009–2010, there was an increase in the number of households attempting to reduce their spending on energy (45.7 per cent of households reported doing so in 2010, compared to 41.9 per cent 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 decreased from 48.1 per cent in 2009 to 37.1 per cent in 2010. On the other hand, the share of households using energy efficiency measures increased at the same rate from 25.9 per cent to 38 per cent over the same period. It is important to note that the cumulative effect of energy efficiency behaviours is more likely to produce tangible effects in the longer than the shorter run. In 2010, 16.2 per cent of the population reported putting in place additional insulation in their residential houses. The latter has resulted in a 10 per cent saving, on average, in the heating bills of 85 per cent 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 gave more than one answer. Source: CSD Energy Survey, 2010.

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.

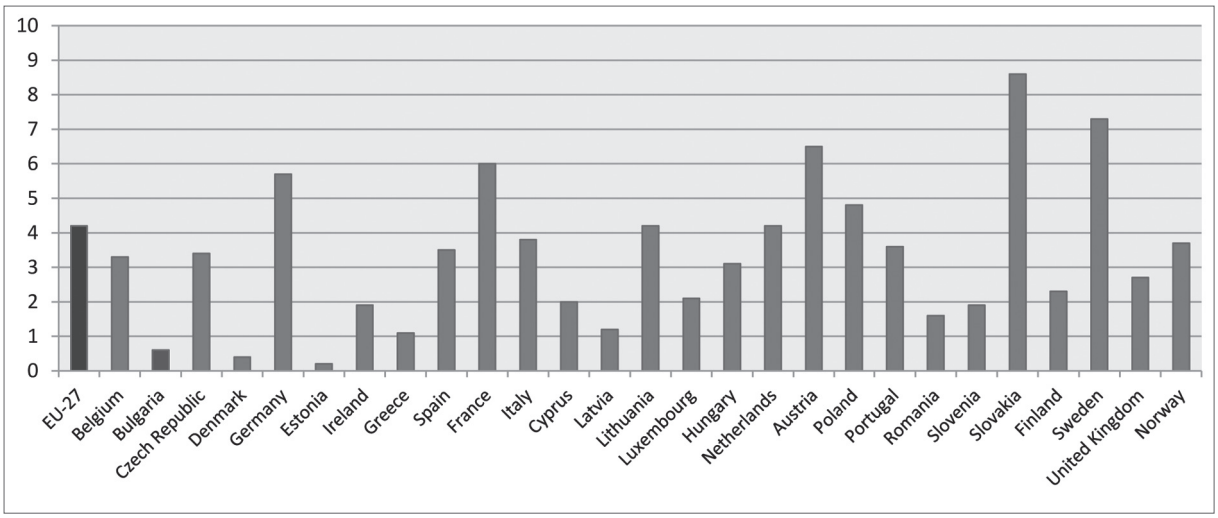
Nevertheless, promoting energy efficiency via market instruments has not produced the desired results in Bulgaria. The price of energy is the major factor determining consumer behaviour both in terms of energy savings and investing in energy efficiency. The affordability of energy-saving market solutions 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 behaviour, 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 programmes 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 the EU's operational programmes, as well as through loans and subsidies. Currently, only 7.5 per cent of consumers have used a state subsidy or a special bank credit line for insulating their home, while 90.9 per cent have not.[43] Thus, there is 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 CO_2 emissions from transport. But 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 fuel consumption, 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 by 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.

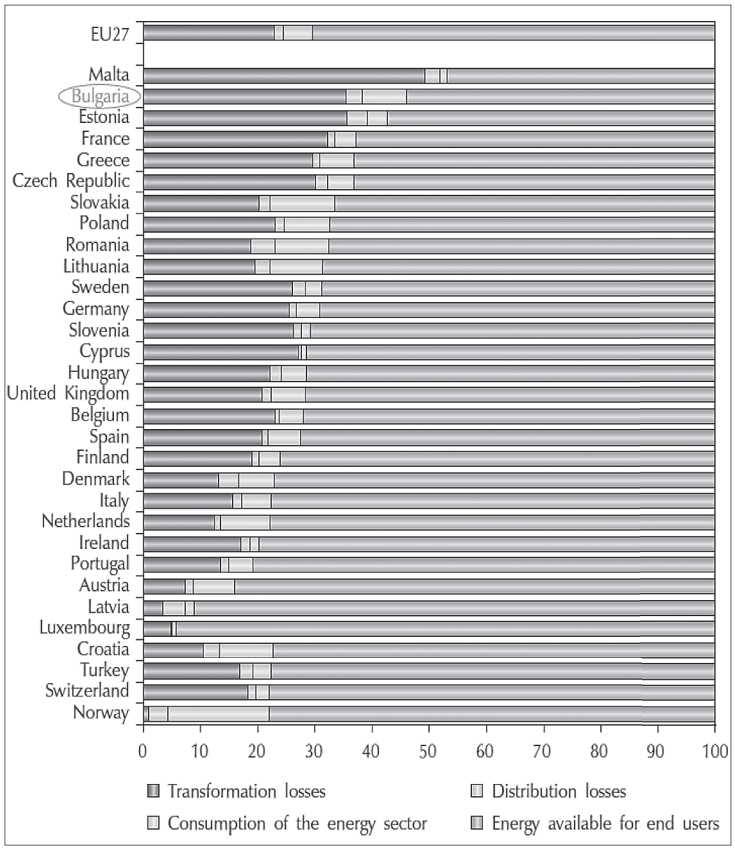
There is great potential in increasing the use of RES in the transport sector, while also thinking along the lines of reducing traffic and stimulating the use of public transport. The latter requires targeted policies and investments, which are not yet a reality in Bulgaria. For example, a chronic underfunding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

3.3 Optimising the Energy Sector and Investing in the Grid

The Bulgarian energy sector is markedly energy-intensive. As shown in Figure 6, 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 industry). But 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 and so on. 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. However, a look at the sector's investments in the 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, against the backdrop of frequent power outages due to failures in the grid, we see that in 2009 the National Electric Company (NEC) spent almost three times more on building new 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 and 23 per cent 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 among the most frequent violators.[47]

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

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.

the method of co-generation,[48] the latter method is still underutilised 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 to build 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 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 Charter[50] 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 only two for wind energy producers and none for PVs energy producers. 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 lacks 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.

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.

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 40 per cent higher than the EU average.[51]

Compliance with environmental standards and the latter's enforcement appear to be an issue in Bulgaria. For example, a review of various 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 desulphurisation units in plants. Such activities are characterised by lengthy implementation periods and notable delays. The project on rehabilitating and modernising Enel Maritza East 3 TPP to bring it on par with European environmental standards, and the construction of two FGDs (flue gas desulphurisation systems), took over five 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, although launched as a three-year project. The related costs are also significant. An overview of other such projects[52] supports similar conclusions – that is, 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 SO_2 emissions in Bulgaria appears piecemeal, with non-compliance often backed by financial concerns. Even more alarming is a tendency towards 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,

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.

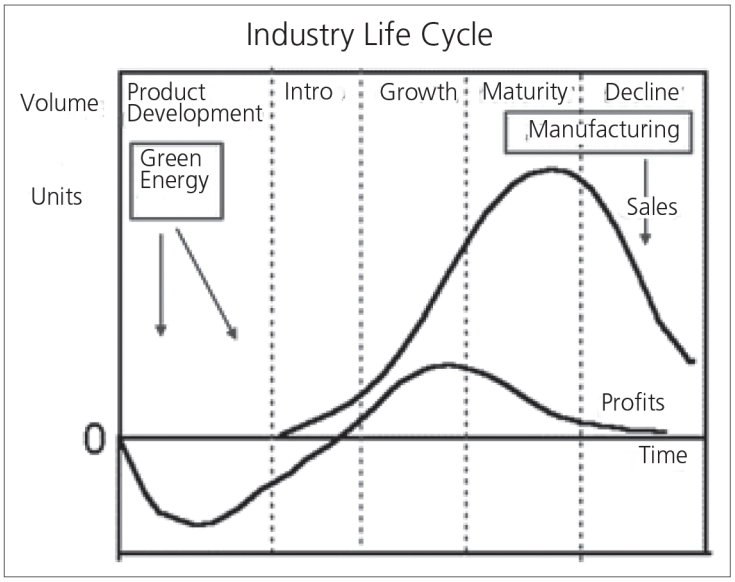
it was to be closed at the end of 2010 due to exceeding its limits on hours of operation without installations to filter its SO_2 emissions. This, however, met with strong resistance from employees, who were threatened with job losses. As employees started protests against the government (and not their 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, but this system 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 has 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 labour 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), the green energy sector's position in the »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 term. Moreover, as the sector has not yet reached maturity, its »economic threshold« is still notably high, which renders its subsidy unlikely 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 mass delivery. Therefore, if Bulgaria is to pursue inclusive low-carbon growth conducive to job creation, it appears more logical to focus on energy savings and efficiency 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 (in other words, those in the Growth and Maturity stages) would be more effective. Meanwhile, sectors such as 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 potential for Bulgaria in fostering sectors such as infrastructure and the service sector in line with the low-carbon sustainability 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 labour market, so as to prepare the Bulgarian workforce for a green future.

Figure 7: Green Energy Technologies in the Industry Life Cycle



Source: 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 Daily Markets, 2010.

It should be noted that the long-term perspective speaks for green job development,[55] but a short- to medium-term perspective seemingly reveals the 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 (for example, manufacturing), while supporting new green technologies' use and development and suitable education. In that sense, the idea of rapid mass employment in 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] Furthermore, 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, which currently has about 348,000 unemployed, among whom 282,500 are discouraged, 161,700 long-term unemployed (in 2010 they were 46.5 per cent of all unemployed), 27,600 report being underemployed (that is, working part-time but looking for employment) and another 24,500 looking for employment but not immediately available (an indicator often, if subjectively, related to underemployment). Among the unemployed, those with lower education experienced an unemployment rate of 21.7 per cent in 2010.[58] Considering the close dependency of enterprises developing green technologies on the availability of highly qualified specialists, there appears to be a clear need to build up suitably educated human capital. In that sense, low or uneducated unemployed are not likely to find a permanent job in the green industry (but rather in temporary construction work, for example).

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

56. The latter represents a business segment with high entrepreneurship and innovation: CSD, 2011, Innovation.bg 2011.

57. It is not 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 pre-primary, primary and lower secondary education, Eurostat.

3.6 Green Technologies and Innovation

Bulgaria is largely reliant on foreign imports and know-how in terms of green technologies. In the energy sector, the level of utilisation 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 low-carbon/green economic development, Bulgaria can participate mainly in activities with low value added, such as early construction stages (for example, 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 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 below the EU27 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.

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 behaviour in terms of both 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 behaviour 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 programmes to make

59. The ARC Fund, 2011, Innovations.bg 2011.

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 (for example, 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 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. As a result, 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 capacity (as per grid location) is concentrated in the centre and West.[60] Thus, the construction of new projects using RES and the expanding urbanisation pose challenges to 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 (for example, 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 via 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.

60. Bulgarian Wind Energy Association, 2011.

■ 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 6,356[61] in 2010). This is even more so in a time of crisis. Thus, conventional and alternative energy projects compete for 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 skilfully used this 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, while promotion lags behind despite a number of available options for financing such measures.

Knowledge and education. Introducing technologies that produce energy from RES requires 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 green/sustainable growth, to which we turn next.

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 per cent: IMF, WEO data.

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 practice. 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 (for example, biofuels) in transportation, which was required by EU directives but had not been introduced in Bulgaria by then. The law boosted tremendously the incentives[64] 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

62. Promulgated in State Gazette No. 107 of 9 December 2003.

63. Promulgated in State Gazette No. 49 from 19 June 2007.

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

subsequently forced electricity distribution companies to stop connecting RES-E producers to the grid (contrary to the law's mandate). Thus, in accordance with its accession to 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 overshot 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 Energy from Renewable Sources. This latest legislative development explicitly states national targets for a 16 per cent share of energy from renewable sources in gross final energy consumption (including a 10 per cent 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.

In addition to the new Law on 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, 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 and so on) and energy intensity.[66] It is clear from the Plan that the amount of energy foreseen (for example, 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 utilising 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 per cent and 34 per cent, respectively), while the potential contribution of wind power is assessed at 7 per cent.

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] But while its policy and 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 much greater financial firepower. Moreover, the challenge for policy makers remains the actual implementation of energy efficiency policies, as well as improving 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 the EU's 20 per cent 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 emphasising 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,* developed[70] in 2010, and signalling for the first time a

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, pp. 15–16, available at: 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, available at: http://ec.europa.eu/energy/renewables/transparency_platform/doc/bulgaria_forecast_english.pdf.

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

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

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 developments at the 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 from an understanding of the real benefits of this agenda for Bulgaria's economic development. For this reason, national policies often seem alien 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 resource remains untapped with regard to EU funding (OPs) for developing a low-carbon economy.[73] For example, of the BGN 83 million provided by OP Regional Development for the »implementation of energy efficiency measures in municipal educational infrastructure in urban agglomerations«, the share of contracted funding is merely 6 per cent of the total OPRD. Thus, better use of available resources under EU operational programmes has obvious potential for great energy efficiency improvements in a short period.

Furthermore, as the price of new green technologies remains unaffordable for most households, and as subsidised 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 arrangements, 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 Society

A sustainable economy inevitably requires changes in consumer behaviour. A major problem with the promotion of sustainable energy in Bulgaria is that the concept of energy efficiency is still alien to the country's consumer culture. An excessive and wasteful use of energy due to currently subsidised electricity prices, and a history of wasteful consumption during the years of central planning, indicate that energy savings are rather unpopular with the Bulgarian population. Despite 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, although gaining in popularity, there is as yet no mass green culture in Bulgaria. There are a number of obstacles to the creation of such a culture, ranging from relatively low incomes to the high level of acceptance of the status quo. Generally, 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,

71. Energy efficiency improvements are said to bring 50 per cent 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 (including households, industry, the transport and service sectors) and saving energy during the process of its generation and transformation.

72. Over 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 to start changing it to reduce the incentives.

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 the municipal educational infrastructure of 178 small municipalities«.

such as nuclear waste storage and disposal, are simply missing from the public debate, being carefully excluded by strong, well-established lobbyists for conventional energy sources. As already noted, the latter have skilfully used the introduction of the »green line« in energy bills (intended to bring about additional transparency) to mislead the public into believing that the rising costs of electricity are only or mainly due to new green technologies.

Aside from the public's lack of 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 of prospecting for and extracting 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 lacking, generally speaking) to the public is thus key to a meaningful public participation in the country's energy and environmental future.

A critical factor in developing a sustainable energy sector in Bulgaria is the social price of 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 per cent of households indicate that they are willing to pay extra for clean energy, although they would only see only a modest increase (of up to 10 per cent) 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 (well over half of 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 energy generation solution that would imply an increase in prices higher than 10 per cent, which means that Bulgarians do not have a preference for specific energy solutions. This leaves the entire responsibility for deciding on the energy mix to Bulgarian politicians. In contrast to the population, Bulgarian businesses are more willing to pay higher prices for electricity produced from RES .[75] Approximately one-third of businesses report a readiness to incur the extra costs of greener energy,[76] although 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 behavioural 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 behaviour of individual consumers should be prioritised. A notable shift in consumer attitudes and behaviour are needed if Bulgaria is to stay on track with its goal of achieving more sustainable development. At a practical level, one of the critical issues in changing consumer behaviour concerns the need to reduce the use of wood as biomass, and to reduce deeply-rooted energy-wasting behaviour.

4.4 The International Community

International, and most notably European, standards and regulations are the major drivers of green change in Bulgaria. The EU's environmental and developmental discourse has provided the basis for all legislation, strategies and 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 at the EU level. As a result, EU developments, and more notably regulations of mandatory character, have actually trig-

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 incentives.

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

gered 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 discourse are cause for concern. A decade after the adoption of the Lisbon Strategy and the 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 challenge, while there are valid concerns about whether Member States will meet their 2020 targets. Moreover, the latest reports point to all-time-high levels of CO_2 emissions, and large countries remain divided on committing to a steadfast green developmental agenda. For smaller players like Bulgaria, however, 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 change. 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 for 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 in final energy consumption, which seem to have changed (with the RES share increasing), as deadlines for achieving 2020 targets approach. Meanwhile, no breaking developments are evident, as the country continues to rely mainly on HPPs. The commonly cited case of falling CO_2 emissions is similar, omitting the fact that this fall is not owing to targeted policy action, but to a decline in production/manufacturing. It is likely that such cases are not confined to Bulgaria.

5. Conclusions and Recommendations: Most Urgent Actions and 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 CO_2, 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 upwards.[77] Furthermore, Bulgaria needs to catch up with other EU Member States in a number of areas, such as decreasing its energy intensity, popularising energy savings and boosting energy efficiency, as well as committing significant investments to developing smart grid solutions that are required for future green growth.

There is a benefit to the delayed timing of introducing RES into the Bulgarian energy system. For example, the EU's earlier attempts were 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 that include 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. Furthermore, earlier policies[78] contained no planned action on the use of biomass, which has been corrected in the *Law on Energy from Renewable Sources*, but the government's attitude towards this source of energy remains ambiguous. The potential for using biomass in Bulgaria (including agricultural waste) should be carefully considered, including both potentially positive and negative

77. Juan Delgado, Hans W. Friederiszick and 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.

impacts. Important factors determining whether the use of biomass reduces emissions in the atmosphere, as compared to fossil fuels, are what kind of biomass is produced and harvested and how. 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 prioritise almost every possible energy source, although it is clear that developing all prioritised sources is unrealistic. Thus, it is urgent that the most suitable and realistically achievable energy sources are selected and prioritised. The latter's development cannot be discussed or achieved without concurrent development and modernisation of the electricity 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 prioritise grid development, especially in light of the large-scale introduction of RES and improvements in the energy balance. Issues related to the flexibility of electricity generating capacities and the sustainability of the power system need to be prioritised. 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 provides 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 – for example, first wind and solar, then biomass – create a volatile environment from an investor's 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 of 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 and overriding priority for Bulgaria's energy strategy. That is the need to stimulate energy efficiency, especially in the household sector, sufficiently utilising EU funds. Committing to energy efficiency the same amount of financial resources and only a fraction of the political and social attention that Bulgaria has spent on developing a second nuclear power plant would result in saving the energy produced from such a plant. Moreover, pursuing 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 primarily involve larger construction companies selected by the 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 by utilising existing capacity at 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)

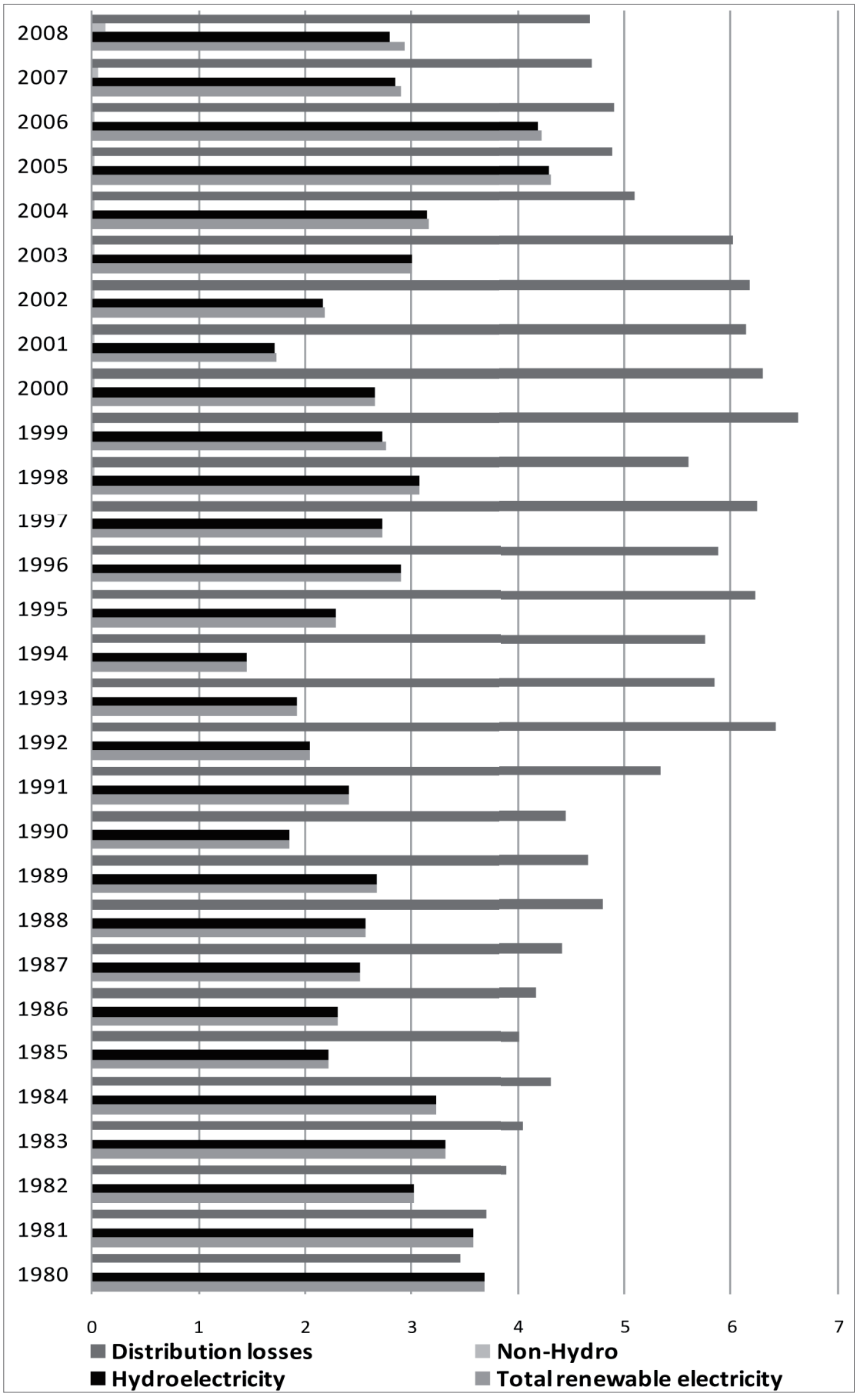


Table 2: Share of the Population Subjected to Excess Levels of SO_2, NO_2, PM, and Ozone by Region

Region	SO2	NO2	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: SO_2 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: Sector aggregations only include activities for which there are 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 are data; while in 2008 there were nearly 38 Gg from »Other, Mobile (including military, land based and recreational boats)«, information on 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-fertilisers	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 are data; while in 2008 there were data for »Other, Mobile (including military, land based and recreational boats)«, information on 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: NH_3 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-fertilisers	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: Sector aggregations only include activities for which there are data.
Source: Calculations based on EEA's Technical Report No. 3/2011.

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