

XI ENERGY POLICY DEVELOPMENTS IN THE EU AND IN GREECE, GREENHOUSE GAS EMISSION PERFORMANCE, AND RENEWABLE ENERGY SOURCES

I CLIMATE CHANGE, ENERGY POLICY OPTIONS AND THE CURRENT CONJUNCTURE

The Bank of Greece has repeatedly stressed that changing the current energy production and consumption pattern is an essential aspect of reforms aimed to relaunch economic growth in Greece. The Greek economy is very energy-consuming, and its oil dependence remains high, despite the use of renewable energy sources (hydropower and wind power) and lignite. Moreover, available estimates indicate that Greece, as a Mediterranean country, will be more strongly affected by the impact of climate change. Also, in order to comply with the EU energy and climate change policies, Greece is required to adjust its production processes, by introducing less energy-consuming technologies, and improve life in the cities. The latter involves overhauling public transport to phase out energy-consuming vehicles, as well as promoting new technologies and alternative energy sources for the insulation and heating of homes and other buildings. Significant steps are being taken in this direction, which is of paramount importance for Greece, not only because of climate change and life quality considerations, but also given its potential to lead to major investments, stronger competition in the energy sector and the creation of new businesses and jobs, and can help reduce the country's energy dependence and the associated current account deficit.

The **recent disaster in Japan**, where the severe earthquake and the tsunami were followed by a large-scale nuclear accident, showed how technological progress can compound the fallout of natural disasters. Nuclear dependence coupled with safety measures that, in hindsight, are judged insufficient, amplified – just how much remains to be seen – the initial impact of the earthquake and the subsequent tsunami. These considerations, as well as the need to start addressing climate change before it is too late imply that new policy choices will be required on a global scale in such areas as construction, town-planning and zoning, transportation, as well as energy production and consumption.

At the EU level, it is worth noting that the **European Council of 24-25 March** stressed the need to fully draw the lessons from the events in Japan and to provide all necessary information to the public. Recalling that the energy mix is the competency of Member States, the European Council called for work to be taken forward as a matter of priority on the following aspects:

- the safety of all EU nuclear plants should be reviewed, on the basis of a comprehensive and transparent risk and safety assessment (“stress tests”). The European Nuclear Safety Regulators Group (ENSREG) and the European Commission are invited to develop as soon as possible the scope and modalities of these tests in a coordinated framework in the light of lessons learned from the accident in Japan and with the full involvement of Member States. Assessments will be conducted by independent national authorities and through peer reviews. Their outcome and any necessary subsequent measures that will be taken should be shared with the European Commission and with the ENSREG and should be made public; The European Council will assess initial findings by the end of 2011, on the basis of a report from the Commission;
- the priority of ensuring the safety of nuclear plants *obviously cannot stop at EU borders. The EU will request that similar stress tests be conducted in the neighbouring countries and worldwide, regarding both existing and planned plants;*
- the highest standards for nuclear safety should be implemented and continuously improved in the EU and promoted internationally;
- the Commission will review the existing legal and regulatory framework for the safety of nuclear installations and will propose by the end of 2011 any improvements considered necessary. Member States should ensure the full implementation of the Directive on the safety of nuclear installations. The proposed Directive on the management of spent nuclear fuel

and radioactive waste will have to be adopted as soon as possible. *The Commission is invited to reflect on how to promote nuclear safety in neighbouring countries;*

- consequences for the world and for the EU need to be closely monitored, paying particular attention to the volatility of energy and commodity prices, in particular in the context of the G20.

2 GREENHOUSE GAS EMISSIONS UPDATE – GREECE'S PERFORMANCE AGAINST THE KYOTO TARGET

According to the latest available data, in 2008 total greenhouse gas emissions in the EU-27, excluding the sector “land uses, land use change and forestry” and emissions from international aviation and maritime transport, amounted to 4,940 million tonnes of carbon dioxide (CO₂) equivalents, i.e. 11% less than in 1990. In the EU-15 (the older EU Member States), 2008 gas emissions amounted to 3,970 million tonnes (down by 6% from 1990 levels), accounting for 80% of total emissions in the EU-27 (compared with a share of 76% in 1990). Among the older Member States, Germany and the United Kingdom were jointly responsible for the largest part of the total EU greenhouse gas emissions in 2008 (32% of total EU-27 emissions and 40% of total EU-15 emissions), making, however, considerable progress relative to 1990, as their emissions decreased by 22% and 19% respectively. The smallest gas emission contributors were Luxembourg (0.2%), Sweden, Denmark and Finland (1%), which all had similar shares in total EU-15 emissions.

As regards Greece, although its contribution in total EU emissions is very small, its level of greenhouse gas emissions in 2008 increased by 23% relative to 1990, highlighting the need to promote green economy and renewable energy sources (see Table XI.1).

The data of Table XI.1 also indicate that countries which, due to their size, are among the

largest contributors of total greenhouse gas (GHG) emissions tend to perform better in terms of GHG emissions per capita or per unit of gross domestic product (GDP).¹ Conversely, Luxembourg and Ireland, although having very small shares in total emissions, rank among the higher scorers in terms of emissions per capita (25 and 15 tonnes of CO₂ equivalent/person, respectively). Looking at the evolution of this index over time, almost all of the older Member States (with the exception of Greece, Portugal and Spain) have shown an improvement. Greenhouse gas emissions per unit of GDP, on the other hand, dropped in all EU-15 Member States in 2008, relative to 1990, with Sweden being the best performer (0.02 kg of CO₂ equivalent/ unit of GDP) and **Greece the worst (0.69 kg of CO₂ equivalent/ unit of GDP). However, Greece, along with Ireland and the United Kingdom, is one of the countries with the largest improvement in terms of this index.**

Regarding the breakdown by each of the six main gases in the EU-27 in 2008, carbon dioxide (CO₂) had the far largest share (83%), followed by methane (CH₄) and nitrous oxide (N₂O) with shares of 8% and 7%, respectively. Looking at changes in individual gas emissions, CO₂ emissions fell by 7%, while CH₄ and N₂O emissions fell by 31% and 30%, respectively, between 1990 and 2008.

In Greece, CO₂ emissions in 2008 stood at 110 million tonnes, corresponding to 2.7% of CO₂ emissions in EU-27 and 87% of total GHG emissions in Greece and representing an increase of 32% compared with 1990.

As far as the sources of GHG emissions are concerned (see Table XI.2), energy was the largest contributor with a share of 79% in the EU-27 for 2008 (3,907 million tonnes of CO₂ equivalent). The second largest source of GHG emissions was agriculture, with a share of 10% (472 million tonnes of CO₂ equivalent), followed by industrial processes and waste, with

¹ This may be due to differences in the energy efficiency of power production and other plants, the energy savings of households and enterprises, energy market deregulation, etc.

Table XI.1 Greenhouse gas emissions¹ in EU-15 and EU-27 Member States

	Greenhouse gas emissions (in million tonnes of CO ₂ equivalents)			Shares in EU-15 total (%)			Greenhouse gas emissions per capita (in tonnes of CO ₂ equivalents)			Greenhouse gas emissions per unit of GDP (in kg of CO ₂ equivalents)		
	1990	2000	2008	1990	2000	2008	1990	2000	2008	1990	2000	2008
Austria	78	80	87	1.8	1.9	2.2	10.2	10.0	10.4	0.48	0.39	0.35
Belgium	143	145	133	3.4	3.5	3.4	14.4	14.2	12.5	0.71	0.57	0.46
Denmark	69	68	64	1.6	1.7	1.6	13.4	12.8	11.7	0.07	0.05	0.04
Finland	70	69	70	1.7	1.7	1.8	14.2	13.3	13.2	0.65	0.52	0.42
France	563	557	527	13.3	13.5	13.3	10.0	9.2	8.2	0.48	0.39	0.32
Germany	1,232	1,025	958	29.0	24.9	24.1	15.6	12.5	11.7	0.70	0.50	0.42
Greece	103	125	127	2.4	3.0	3.2	10.2	11.5	11.3	0.96	0.92	0.69
Ireland	55	68	67	1.3	1.7	1.7	15.6	18.0	15.3	1.04	0.65	0.46
Italy	517	550	541	12.2	13.4	13.6	9.1	9.7	9.1	0.51	0.46	0.43
Luxembourg	13	10	12	0.3	0.2	0.3	34.3	23.0	24.8	0.97	0.45	0.40
Netherlands	212	215	207	5.0	5.2	5.2	14.2	13.6	12.6	0.69	0.51	0.42
Portugal	59	81	78	1.4	2.0	2.0	5.9	7.9	7.4	0.63	0.64	0.57
Spain	285	381	406	6.7	9.3	10.2	7.3	9.5	9.0	0.60	0.60	0.50
Sweden	72	69	64	1.7	1.7	1.6	8.5	7.8	7.0	0.04	0.03	0.02
United Kingdom	772	673	628	18.2	16.4	15.8	13.5	11.4	10.3	1.02	0.69	0.54
EU-15	4,245	4,114	3,970	100.0	100.0	100.0	14.4	13.4	12.3	0.59	0.47	0.39
EU-27	5,567	5,062	4,940				11.8	10.5	9.9	0.74	0.55	0.46

Source: European Environment Agency, *Annual European Union greenhouse gas inventory 1990-2008 and inventory report 2010*, 27 May 2010.

¹ Excluding international aviation and maritime transport as well as the "land use, land-use change and forestry" sector.

Table XI.2 Greenhouse gas emissions by source: EU-27, EU-15 and Greece

(in million tonnes of CO₂ equivalents)

	1990	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
EU-27															
Energy	4,267	4,024	4,136	4,030	4,018	3,957	3,962	4,046	4,013	4,096	4,088	4,062	4,050	3,978	3,907
Industrial processes	484	463	458	467	439	401	413	400	397	405	416	420	421	434	410
Solvents and other product use	17	14	14	14	14	14	14	13	13	13	13	13	13	13	12
Agriculture	592	513	515	515	513	509	501	492	487	481	481	475	472	472	472
Waste	207	201	198	190	185	179	173	165	161	155	150	146	145	142	139
<i>Total</i> ¹	5,567	5,215	5,321	5,217	5,169	5,060	5,062	5,117	5,072	5,149	5,148	5,117	5,100	5,039	4,940
EU-15															
Energy	3,254	3,176	3,261	3,194	3,238	3,212	3,226	3,297	3,281	3,338	3,335	3,316	3,291	3,223	3,168
Industrial processes	375	374	371	379	359	327	331	322	320	323	329	327	322	330	313
Solvents and other product use	14	12	12	12	12	12	12	11	11	11	11	11	11	10	10
Agriculture	431	410	415	415	415	414	410	401	395	390	389	383	378	379	378
Waste	171	165	161	153	148	141	136	129	123	116	111	108	106	104	102
<i>Total</i> ¹	4,245	4,137	4,220	4,154	4,171	4,106	4,114	4,159	4,131	4,178	4,174	4,145	4,108	4,046	3,970
Greece															
Energy	78	81	83	88	93	92	97	100	99	103	104	107	105	108	104
Industrial processes	10	12	13	13	14	14	13	13	13	13	13	13	11	11	11
Solvents and other product use	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Agriculture	11	10	10	10	10	10	10	10	10	10	10	9	9	10	9
Waste	4	4	4	4	4	4	4	3	3	3	3	3	3	3	3
<i>Total</i> ¹	103	108	111	116	121	121	125	126	126	130	130	133	129	132	127

Sources: European Environment Agency, Annual European Community greenhouse gas inventory 1990-2008 and inventory report 2010, 27 May 2010; Ministry of Environment, Energy and Climate change, Annual inventory submission under the convention and the Kyoto Protocol for greenhouse and other gases for the years 1990-2008, April 2010.

¹ Excluding "land use, land use change and forestry" sector.

shares of 8% and 3% (410 and 139 million tonnes of CO₂ equivalent, respectively).

In Greece, gas emissions from the energy sector reached 104 million tonnes of CO₂ equivalent in 2008, up by 34% from 1990, while in the EU-27 the corresponding emissions dropped by 8% over the same period.

Finally, with regard to the evolution of GHG emissions **against the Kyoto Protocol targets**, it is worth noting that most of the EU-15 Member States are still short of the country-specific targets under the Protocol (see Table XI.3). Spain and Austria are the countries farthest off-track, although they have made progress compared with 2007. By contrast, Sweden, the United Kingdom and France have already overshot their Kyoto targets.

It should be recalled that the target set under the Kyoto Protocol for Greece is to contain the increase in its greenhouse gas emissions to 25% relative to the base year 1990, by 2008-2012. In 2008, Greece's GHG emissions were 18.6% higher relative to the base year, i.e. within the target. It should also be noted that a considerable improvement was recorded in comparison with 2007, when the increase against the base year had been 23.2%.

3 THE DEVELOPMENT OF RENEWABLE ENERGY SOURCES IN GREECE

The considerable increase in Greece's GHG emissions from 1990 to date, both in aggregate terms and per capita, as shown by the above data, points out to an urgent need for environmentally friendly methods of generating electricity. Renewable energy sources (RES) are considered to play a decisive role in this respect, with their total capacity coming to 1,736 MW at end-2010, from 1,446 MW in 2009. Photovoltaic (PV) systems increased their penetration and their capacity, growing from 53 MW in 2009 to 198 MW in 2010; adding wind power capacity of 131 MW, this makes a total of 1,298 MW.

Furthermore, the capacity of small hydroelectric power plants increased to 196.3 MW in 2010, from 182.6 MW in 2009. According to the Greek Ministry of Environment, Energy and Climate Change (YPEKA) and based on data from the licencing procedures, the capacity of wind and PV power plants is expected to increase by 300 MW and 200 MW, respectively, in 2009.²

The selection, however, of the specific RES energy mix should at all times take account not only of technological parameters, but also of administrative and economic considerations. For instance, the experience with PV subsidisation programmes has revealed a number of administrative and economic distortions, the removal of which is not administratively or fiscally neutral. Regarding these distortions, the following points can be made:

- *First*, the administrative or technical services (system stability) were not, at least initially, adequately prepared to accommodate the large interest of households and professionals (businessmen and farmers as investors) in PV. It should be noted that the bulk of investment plans submitted under the previous legislation on investment incentives and are still under examination refers to PV systems. Furthermore, it is worth mentioning that more than 30,000 applications which were submitted to the Public Power Corporation (DEH) concerned solely PV systems that are exempted from an energy production license.

- *Second*, from an economic perspective, factors to be considered are the following: (a) the opportunity cost implied by the use of high-productivity farmland for the installation of PV systems by farmers; (b) the market distortions entailed, as the application of a special RES tax leads to a wide subsidy gap between PV and windfarms; and (c) a common misconception among farmers that PV systems can be a substitute for sound agricultural business activity.

² RES Investor Report for 2010. Ministry of Environment, Energy and Climate Change (YPEKA).

Table XI.3 Greenhouse gas emissions¹ and the Kyoto Protocol targets

	1990	Kyoto Protocol (base year) ²	2008	Change 2008 over 2007	Change 2008 over 1990	Change 2008 over base year	Kyoto targets 2008-2012
	(in million tonnes of CO ₂ equivalents)			(percentage changes)			
Austria	78.2	79.0	86.6	-0.4	10.8	9.6	-13.0
Belgium	143.4	145.7	133.3	2.3	-7.1	-8.6	-7.5
Denmark	68.9	69.3	63.8	-4.5	-7.4	-7.9	-21.0
Finland	70.4	71.0	70.1	-10.2	-0.3	-1.2	0.0
France	563.2	563.9	527.0	-0.6	-6.4	-6.5	0.0
Germany	1,231.8	1,232.4	958.1	0.1	-22.2	-22.3	-21.0
Greece	103.3	107.0	126.9	-3.8	22.8	18.6	25.0
Ireland	54.8	55.6	67.4	-0.3	23.0	21.3	13.0
Italy	517.0	516.9	541.5	-2.0	4.7	4.8	-6.5
Luxembourg	13.1	13.2	12.5	-2.3	-4.8	-5.1	-28.0
Netherlands	212.0	213.0	206.9	0.0	-2.4	-2.9	-6.0
Portugal	59.3	60.1	78.4	-1.9	32.2	30.3	27.0
Spain	285.1	289.8	405.7	-7.5	42.3	40.0	15.0
Sweden	72.4	72.2	64.0	-3.3	-11.7	-11.3	4.0
United Kingdom	771.7	776.3	628.2	-1.8	-18.6	-19.1	-12.5
EU-15	4,244.7	4,265.5	3,970.5	-1.9	-6.5	-6.9	-8.0

Source: European Environment Agency, *Annual European Community greenhouse gas inventory 1990-2008 and inventory report 2010*, 27 May 2010.

1 Total emissions excluding the "land use, land use change and forestry" sector.

2 For the gases CO₂, CH₄ and N₂O, all the Member States chose 1990 as their base year. For the gases HFC, PFC and SF₆, 12 Member States chose 1995 as their base year, while Austria, France and Italy chose 1990.

Furthermore, the unquestionable environmental and growth benefits³ of investing in RES should be part of the *broader medium- to long-term planning of the economy*, in order to ensure that the resulting demand will not lead to lower than expected job creation and that the following are duly taken into account:

- (i) the long-term benefits in terms of GHG emission reduction, as well as oil import substitution (implying an improvement in the current account); and
- (ii) the one-off deterioration in the current account associated with the non-existence or insufficiency of domestic production of photovoltaic panels and wind generators.

Nevertheless, the electricity market is affected both by RES subsidisation and the purchase of

extra emission permits (from 2013 onwards). This impact should be mitigated through reforms to further streamline the energy market and make it more competitive (energy market reforms are discussed in the following section of this chapter).

4 REFORMS IN THE GREEK ENERGY MARKET – IMPLEMENTATION OF THE THIRD EU ENERGY PACKAGE

An important step towards ensuring effective competition in the domestic electricity and gas markets was taken by the draft law harmonising Greek legislation with the provisions of

³ According to YPEKA, the total level of investment in RES for the 2010-2020 period is estimated to amount to €16.4 billion, plus an additional €4-5 billion for connection and network projects.

Directives 2009/72/EC and 2009/73/EC of the European Parliament and of the Council (Third Internal Energy Market Package”),⁴ which was unveiled by the Minister of Environment, Energy and Climate Change at a Cabinet meeting on 9 March 2011.

The provisions of the draft law focus on the following:

- enhancing the independence and scope of the Regulatory Authority for Energy;
- reforming the electricity and natural gas markets, with a view to strengthening competition; and
- increasing consumer protection and safeguarding the rights of consumers.

In this context, the **Regulatory Authority for Energy (RAE)** assumes broader responsibilities and an expanded role, including the power to adopt *all administrative acts and measures* regarding the regulation of energy markets and the implementation of the current legal framework, excluding those relating to the formulation of the overall national policy in the energy sector, which will remain with the Ministry of Environment, Energy and Climate Change (YPEKA).⁵

In the field of the **deregulation of electricity and natural gas markets**, the draft law provides for the separation of the generation function from the transmission and distribution functions in the respective markets.⁶

In the **electricity market**, the draft law envisages the establishment of three new companies:

– *A company which will be a wholly owned subsidiary of DEH* (the Public Power Corporation), according to the Independent Transmission Operator (ITO) model, under the name of “ADESMHE S.A.”,⁷ which will take up *the transmission activities of DEH* (as well as its fixed assets) and the transmission activities currently carried out by DESMHE. The

new company will be entrusted with the ownership, maintenance, management, exploitation and development of the Transmission System.⁸ Furthermore, the draft law envisages a *Supervisory Body* of ADESMHE, responsible for decisions having a significant bearing on the value of fixed assets, as well as the appointment of a *Compliance Officer*, also involved in ADESMHE’s daily operations.

The draft law also enables the transfer of minority interests in ADESMHE S.A. to third parties (other than stakeholders in the production and supply of electricity or natural gas), with a view to strengthening the company’s capital base and securing the resources required for the projects envisaged in the company’s ten-year development plan.

– *A company responsible for the operation of the electricity market*, under the name of “LAGHE S.A.”, which will be the successor of the present DESMHE. The Greek State will initially have a 100% holding in the new com-

⁴ As well as with Regulations (EC) 713/2009, 714/2009 and 715/2009 of 13 July 2009.

⁵ Specifically, the RAE is entrusted with *decision-making powers* (which have up to now been solely advisory) regarding (a) the security of energy supply, (b) the licensing procedure, i.e. *all electricity generation and supply licences*, as well as the *licences for the exercise of natural gas activities*, will be granted by the RAE, which until now had been granting only RES licences, (c) the development and monitoring of a network and infrastructure development project, (d) the tariffs for non-competitive business (operation of networks and infrastructures), (e) the supervision and certification of independent electricity and natural gas operators (*granting certification is a new task of the RAE*) and (f) consumer protection.

⁶ According to the EU directives, Member States may choose among three alternative options with regard to the separation of the electricity and natural gas generation procedure from the transmission procedure. These are: (a) the “*full ownership unbundling*” model, under which the same person or persons are not entitled to exercise control over a generation or supply undertaking and, at the same time, exercise direct or indirect control over a transmission system operator, (b) the “*independent system operator – ISO*”, according to which undertakings are entitled to maintain the supply and transmission activities whilst ensuring “*effective separation of interests*”, and (c) the “*independent transmission operator – ITO*”, on the basis of which a vertically integrated undertaking shall maintain its network of activities whilst ensuring “*effective separation of interests*” by establishing rules concerning individual activities, equipment, staff, identity and compliance control.

⁷ Under the Independent System Operator (ISO), ADESMHE must have been certified by the RAE as an Electricity System Operator by March 2012.

⁸ The new subsidiary will take over the entire staff of the Transmission branch of DEH S.A., as well as the staff of DESMHE S.A. responsible for the maintenance, management, exploitation and development of the Transmission System.

pany,⁹ with a possibility to transfer part of its stake to third parties.

– A company which will be a totally owned subsidiary of DEH under the name of “ADDHE S.A.”, responsible for the operation, maintenance and development of the *distribution network*, including the network of non-interconnected islands. The ownership of the fixed assets of the distribution network will however remain with DEH, which will be required to finance the network’s development according to the applicable network development plans.

In the **natural gas market**, the draft law provides for the unbundling of DEPA from DESFA, once again opting for the Independent Transmission Operator (ITO) model.

In this context, DESFA S.A. will take up the operation, maintenance and development of the National Natural Gas System (ESFA), after having been authorised by RAE. Furthermore, the draft law envisages the creation of a Supervisory Body, responsible for making decisions with a significant bearing on the value of the company’s fixed assets. Three out of its seven members must not have entered into any kind of business relations with DEPA in the last three years. Furthermore, the draft law provides for the appointment of a Compliance Officer, also involved in DESFA’s daily operations. In addition the draft law transposes into national law Article 9 of Directive

2009/73/EC regarding the ownership unbundling of undertakings performing any of the functions of natural gas production or supply from new (i.e. after 3 September 2009) transmission system operators.

Finally, the draft law addresses key issues regarding consumer protection in electricity and natural gas supply, with a view to ensure:

– maximum benefits to consumers from energy market deregulation, access to affordable and high-quality energy products and services;

– the effective protection of consumer rights; this involves, among other things, protection against market abuse on the part of suppliers, the introduction of smart meters, enabling consumers’ active participation in the energy market and uninterrupted electricity supply even in the event of supplier failure. Furthermore, all suppliers are subject to public service obligations (social tariffs for household customers), and the concept of energy poverty is introduced, while a Universal Service Provider is designated (acting as a default or last resort supplier) and vulnerable consumers are defined (who can benefit from favourable payment options or the prohibition of disconnection in critical times).

⁹ The 100% participation of the Greek State will result from the transfer of 49% of DESMHE shares, which are currently owned by DEH.