Applying European Emissions Trading and Renewable Energy Support mechanisms in the Greek electricity sector (ETRES)

Priority Considerations Concerning the Integration of the Greek Electricity Sector in the Emissions Trading Scheme

(Report under Task 2)

January 2005

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Introduction

This report presents the revised Priority Considerations for Task 2 of the project "Applying European emissions trading and renewable energy support mechanisms in the Greek electricity sector (ETRES)".

A brief overview of the European Emissions Trading Scheme is provided in Section 2 with reference to the recently published Linking Directive and its implications on the scheme.

Sections 3 and 4 present the process of the Scheme's implementation in Greece and the country's obligations under the Kyoto Protocol.

Section 5 provides an overview of the Greek electricity sector, its market structure and its distinctive characteristics

Finally, the priority considerations are presented in Section 6.

NOTE

This document was prepared before the publication of the Greek NAP on 21 December 2004.

RAE realises the major importance of the allowance allocation plan in the emissions trading scheme. ***In this context, it was considered necessary to expand the original report to include a brief presentation of the NAP and some preliminary comments on its potential implications in the form of an appendix.***

A brief Overview of the European Emissions Trading Scheme

Directive 2003/87/EC, dated 13th October 2003, establishes an Emission Allowance Trading Scheme (ETS) within the Community.

The Scheme is a major instrument at a European level in order to reduce greenhouse gas (GHG) emissions and combat the threat of climate change. It is expected to help the EU meet its commitments under the Kyoto Protocol in the most cost effective manner.

The Scheme commences on 1 January 2005 and its first initial phase runs to the end of 2007. The second phase will run from 2008 to 2012 and coincides with the first Kyoto Commitment Period. Further 5-year periods are expected subsequently.

In its first phase the Scheme covers carbon dioxide (CO_2) emissions from large installations in the following activities:

- Energy Activities (with thermal input exceeding 20MW)
- Production and Processing of Ferrous Metals
- Mining Industry (cement, glass, ceramic products)
- Production of pulp and paper

More than 12,000 installations producing about 40% of all CO_2 emissions in the EU-25 will be covered.

The Scheme works on a "cap-and-trade" basis. Member States must produce a National Allocation Plan (NAP), to be approved by the Commission. The NAP sets an emission cap for all installations covered by the Scheme and allocates emission allowances to each installation for the period in question. Each allowance corresponds to 1 ton of CO_2 emitted.

From April 2006 and each year subsequently, the operator of each installation is required to surrender a number of allowances equal to the installation's emissions the preceding year. Installations whose emissions exceed their allowances will have to buy allowances from installations that hold a surplus due to e.g. reduced production or investment in cleaner technology.

Directive 2004/101, dated 27 October 2004, amends Directive 2003/87 by linking the EU Scheme with the Kyoto flexibility mechanisms: Installations covered by the Scheme will be

allowed to convert credits generated by projects under the CDM and JI mechanisms to emission allowances, in order to fulfill their obligation under the Scheme. The conversion takes place through the issue and immediate surrender of one allowance by the Member State in exchange for one JI or CDM-generated credit held by the installation's operator.

The Directive also provides for the avoidance of "double counting" of emissions reductions and does not allow use of credits from nuclear energy or land use projects.

Implementation of the Scheme in Greece

The Directive is expected to be implemented into national law by the end of 2004.

As of 15 December 2004, the draft Greek NAP was submitted to the Ministry of Environment by the responsible working group.

This report was drafted before the NAP became public ally available (on the 21th of December), and no information on the Greek State's emission reduction plans in the preliminary period 2005-2007 towards its Kyoto commitments (2008-2012) nor any quantifiable indication on:

a. the amount of the respective national emissions reductions to the sectors covered by the scheme

b. the amount of emission allowances allocated to the electricity sector

c. the treatment of existing plants by technology and the size of the reserve set aside for new entrants

was available.

In this context, the priority considerations for the Greek electricity sector regarding its integration to the emissions trading scheme addressed in the following sections are only be of a general and qualitative nature. Following the publication of the NAP on 21 December 2004, RAE proceeded with its review. A brief presentation of the NAP and some initial comments are provided in the appendix.

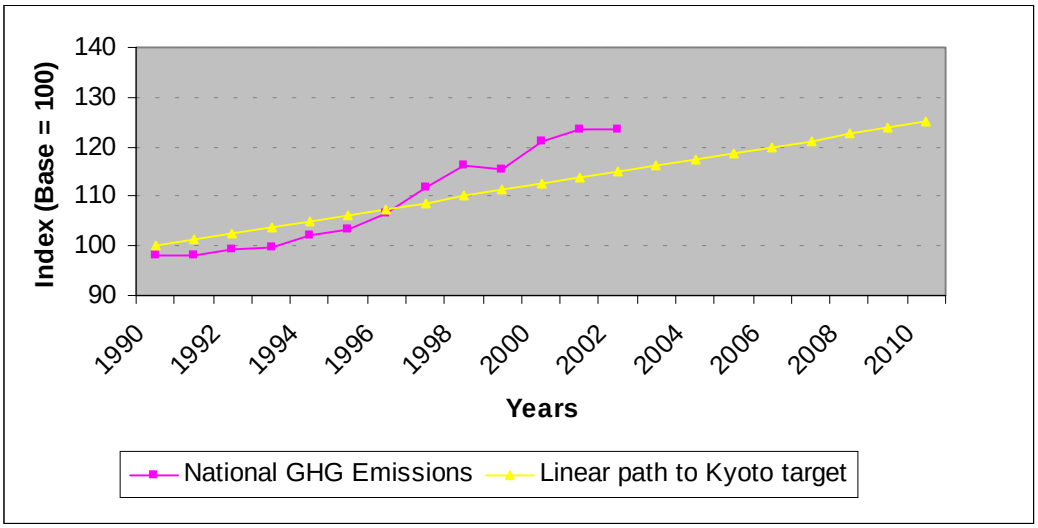
Greece and its Obligations under the Kyoto Protocol

Under its commitments under the Kyoto Protocol, the EU must reduce its greenhouse gas emissions by 8% below 1990 levels by 2008-2012.

A so-called "burden sharing agreement" (Council Decision 2002/358/CE) allows different reduction targets for the Member States. The national target for Greece is to limit the increase in its greenhouse gas emissions in the period 2008 to 2012 to 25% over 1990 levels.

The latest Emissions Inventory (NOA, 2004) prepared for the Ministry of Environment, reveals that in 2002 Greece's greenhouse gas emissions were already 22.6% above base levels (without including LULUCF emissions) clearly indicating that Greece will be well above its Kyoto target path unless robust actions towards GHG emission reductions are initiated.

Figure 1: Greek GHG Emissions Compared with Kyoto Target (Source: EEA, 2004)

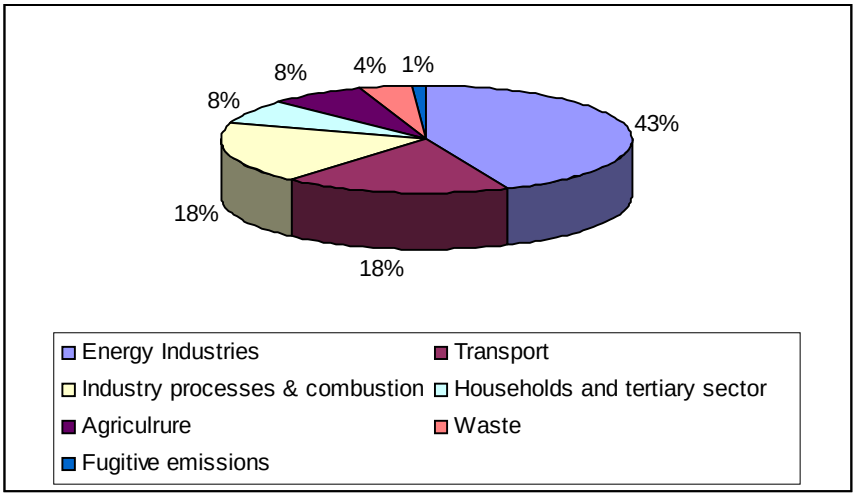


The Ministry of Environment in its Third National Communication to the UNFCC (MoE,2003) projects that under the "existing measures and policies" scenario, in 2010 the national GHG emissions will be 147.2 $MtCO_2eq$ or 35.8% above base levels.

Emissions of CO_2 in Greece account for 80% of total GHG emissions.

The Energy Industries sector (electricity generation and refineries) is the largest contributor accounting for 43.7% of total GHG emissions with electricity generation accounting for 93% of the sector's emissions. Transport is the second largest sector with a GHG emissions share of 17.7%. Figure 2 provides a per sector overview of the Greek GHG emissions.

Figure 2: Greek GHG emissions by sector, 2001. (Source: EEA2003)



The Greek Electricity Sector

The Greek electricity sector is the primary CO_2 emitter, representing in 2001 49.8% of total CO_2 emissions from fuel combustion[1], well above the EU-15 average of 31.4 %.

This section provides an overview of the sector.

1.1. Fuel mix in electricity generation

Lignite is the major domestic energy source in Greece.

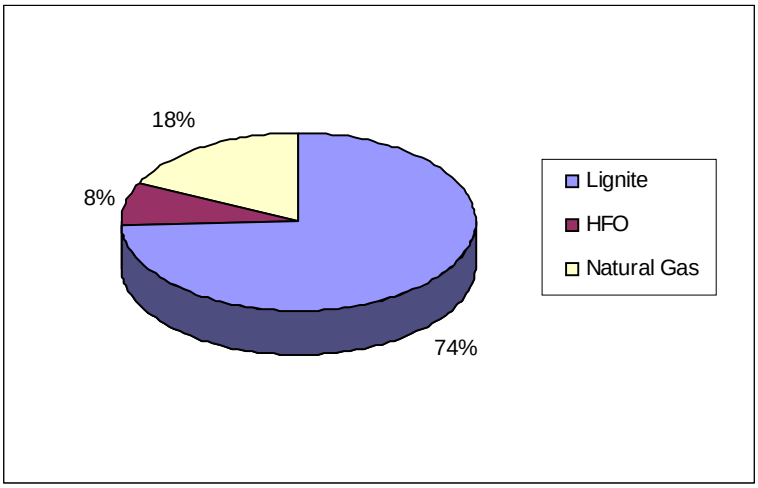
In particular, total capacity of lignite-fired power plants in the mainland grid was 5.288 MW in 2003 or 47% of the total of 11.224 MW. Total capacity of natural gas-fired plants is 1693MW (or 15.1%) and of oil-fired plants (in the mainland) is 858MW (or 7.6%).

Electricity production from lignite was 32.133 GWh in 2003 or 74% of net thermal electricity production.

Figure 4 illustrates the dominant role of lignite in thermal electricity generation in Greece.

[1] (IEA, 2004)

Figure 3: Electricity production from thermal plants by fuel type



1.2. Non-interconnected islands

Greece has a large number of islands not interconnected with the mainland Grid. The number of autonomous systems is 32 while installations in cold-reserve exist in 8 other islands connected to other systems or the mainland grid. Total installed capacity of oil-fired plants is 1573 MW while another 234MW are expected to come on line by 2007.

92.7% of the installed capacity in the non-interconnected islands is oil-fired, accounting for 98.3% of production.

Installations in 17 non-interconnected islands are expected to be covered by the scheme, while another 2 will be added in 2006 when additional capacity will be built, bringing each installation's total above the $20MW_{th}$ threshold.

1.3. Renewable Energy Sources

Electricity production in Greece from renewable energy sources (RES) including large hydro plants was 6.39 TWh in 2003 (11.85% of total production) up from 1.77 TWh in 1990 (5.1% of total production).

In terms of installed capacity (excluding large hydro plants) the vast majority (88.1%) of RES plants in Greece are wind-powered.

Greece has taken steps to promote electricity production from RES mainly by guaranteeing priority of access to the transmission grid and through a feed-in tariff system. Moreover, under EU's Community Support Framework, investment in RES projects is subsidized by up to 40% of investment cost.

With the opening up of the Greek electricity market in 2001, there was an outstanding investor interest for RES installations. From February 2001 to September 2004, the Ministry of Development has issued Generation Licenses for RES installations totaling 4.7GW.

However implementation of RES projects has been slow the past 3 years mainly due to lack of transmission system capacity, complicated and bureaucratic licensing procedures, local oppositions as well as legal issues.

1.4. Market Structure

The Liberalisation of the Greek Electricity Sector begun in 1999 with the implementation of Law 2773/99.

The Law established the independent Regulatory Authority for Energy (RAE) which overviews and monitors the energy markets and provides opinion to the Minister of Development for regulations (Grid Code, Power Exchange Code), for transmission access, for captive consumer tariffs and for Generation and Supply Licenses. However, the Ministry of Development has the primary regulatory responsibility.

The independent Hellenic Transmission System Operator (HTSO) was also established to operate and administer the mainland's High Voltage transmission lines and to guarantee non-discriminatory access to the System for any eligible party.

However, the incumbent utility PPC has a market share of 97% in the generation sub-sector (the rest being in their majority autoproducers) and 100% in the supply sub-sector. According to Greek Law, from July 2004 all customers connected to the mainland grid except households, with a share of 75% of final electricity consumption, are eligible customers and full market opening is envisioned for July 2007. Approval of tariffs for eligible customers by the Ministry of development will be mandatory as long as PPC has a market share of over 70% in the supply sub-sector.

1.5. New entrants

With the exception of Renewable energy sources and small scale CHP that have a special treatment, the electricity generation sector in Greece has not developed as was initially envisaged.

Although Generation Licenses totalling 4,000 MW for new large-scale CCGT plants have been issued to Independent Producers since 2001, only 790MW are expected to start operation

by 2006. In particular, two natural gas fired CCGT power plants are currently under construction in the vicinity of Thessaloniki and Athens respectively. The former is owned and operated by a private consortium and is expected to be commissioned late 2005 - beginning of 2006. The latter is owned by the incumbent PPC and is expected to be commissioned within the first half of 2006. A couple other private consortiums, holding generation licenses for new CCGTs of the order of 400 MW, could in principle be commissioned before the end of 2007.

The main reasons for the lack of investor interest for new generating capacity in Greece have to do with increased business risk and the associated unwillingness of the financial markets to fund these projects due to uncertainties over the evolution and the competitiveness of the Greek electricity market.

1.6. Interconnections

The Greek Transmission System is interconnected with Italy with a 500 MW DC link and with its northern neighbours (Albania, FYROM, and Bulgaria) with interconnectors with total available capacity of 600 MW. Another 400MW interconnector between Greece and FYROM is currently under construction and is expected to be operational by 2007. Its expected purpose is to strengthen the FYROM System and provide additional capacity. In the longer term, an additional interconnector linking the Greek to the Turkish System has also been planned but it is not expected to be completed before the end of the decade.

The total interconnector capacity of the Greek System will therefore amount to about 12% of its installed generation capacity indicating that the Greek electricity market faces limited international competition.

In 2003 net imports of electricity were 2,100 GWh or 3.7% of total electricity consumption while exports (including transits) reached 1,124 GWh. The breakdown of imports/exports by origin/destination as shown in Table 8 clearly indicates a pattern of imports from the northern interconnectors, mainly from Bulgaria where the electricity price is lower than in Greece due to generation overcapacity and the utilisation of nuclear plants The bulk of electricity exports are towards Italy, where the price of electricity is higher and generation capacity is limited. Exports via the Italian interconnector take place mainly from October to June, which is during the period where the Greek system does not experience its peak load.

Table 1: Electricity imports & exports in 2003. Source HTSO

	Electricity flows in 2003 (MWh)	
	Italy interconnector	Northern interconnections
Imports	26,400	3,308,210
Exports	1,124,014	63,945

1.7. Expected increase in costs

With the establishment of the Emissions Trading Scheme, the competitiveness of carbon-intensive generation which produces more CO_2 emissions per unit of output will decrease relative to more carbon-efficient generation. The value of CO_2 as an opportunity cost (the revenue from selling the allowance) will be included in the cost structure of generation in the same way as fuel costs are. This should be reflected in the bids submitted by each installation in the Daily Electricity Market for the System Operator to determine the plant dispatch order. The System Marginal Price should reflect the carbon cost of the price-setting plant.

The Lignite-fired plants in Greece have a carbon intensity factor of about 1.10 tCO2/MWh while Oil-fired conventional steam plants 0.72 tCO2/MWh (Source: RAE calculations). Assuming a natural gas-fired CCGT plant with a carbon intensity factor of 0.37 tCO2/MWh, the following table shows the impact of different carbon prices to the plants' marginal production costs:

Table 2: Indicative impact of allowance price to marginal generation cost

Allowance price (€/tCO_2)	Cost impact (€/MWh) by technology		
	Lignite-fired	Oil-fired	CCGT
5	5.5	3.6	1.85
10	11.0	7.2	3.70
15	16.5	10.8	5.55

Summary of Priority Considerations

As a result of the above discussion of the characteristics of the Greek Electricity Sector, the following priority considerations for its integration to the emissions trading scheme can be made:

1.8. National Allocation Plan

Obviously, a quantifiable indication on the effort required by the electricity sector towards the Greek Kyoto target is crucial. Publication of the Greek NAP, in the very near future, is expected to shed light on this important issue. Unfortunately however, the remaining time before the scheme becomes operational is rather limited to allow for an extensive public consultation on this matter.

The Greek State should evaluate the cost-effectiveness of policies and measures required to achieve the Kyoto target, especially for the sectors not covered by the EU ETS such as the transport sector.

Quantified knowledge on the emissions reduction required from the electricity sector would allow modelling work to determine more accurately the sector's least-cost options and requirements.

1.9. Monitoring and reporting of emissions

All installations participating in the Scheme must take all necessary measures to comply with the Commission's guidelines for the monitoring and reporting of GHG emissions as stated in the Commission's Decision C(2004) 130 final, of 29 January 2004.

1.10. Fuel switching

If Greece is to meet its emissions reductions targets, it is deemed necessary that the lignite share in electricity production is reduced and/or investments are made on more "clean coal" technologies with improved combustion or emission efficiencies (such as supercritical plants or plants base in integrated gasification cycles).

New capacity construction should be facilitated, namely CCGT currently the most carbon-efficient generation technology and preferred by investors for its relatively small investment cost.

However, a balance between national security of energy supply and GHG emissions mitigation is crucial, given the rapidly growing share of imported natural gas.

1.11. New entry – generation competition

In order for additional capacity to be built by new market players, the process of market liberalisation must be accelerated:

The Greek State must provide market certainty by clarifying its vision for the overall market design and structure. The possibility of abuse of market power by the incumbent must be prevented.

1.12. Efficient operation of the daily electricity market

The carbon constraint introduced by the Scheme alters the marginal production costs of the power plants and therefore the dispatch order may change accordingly. For the efficient operation of the daily electricity market the relevant Codes and Regulations prepared by RAE and the Ministry of Development must be finalized and implemented.

Currently all power plants participating in the ETS (with the exception of a 150MW peak saving, natural gas fired, OCGT plant owned and operated by private entities) are owned by PPC. In order for the installations' bids to realistically reflect their marginal costs, PPC should proceed to the unbundling of its vertically integrated activities.

1.13. Cost pass-through – supply competition

The cost of CO_2 emissions as reflected in the allowance price will increase the total generation cost. Since the NAP hasn't been produced and approved by the Commission, there is no definite indication of the scale of this increased cost but it is likely to be no less than 30 million euros annually, if the power sector's emissions share is to remain stable.

The incumbent would like to see this increased cost passed through to the consumer but it is not likely that the Ministry of Development who approves the tariffs even for eligible customers will agree to a full cost pass through. To minimise the impact on the consumers it is essential that competition in the supply sub-sector is encouraged and accelerated.

1.14. Promotion of Renewable energy sources

A number of issues including:

- the necessary expansions of the grid,
- streamlining the authorisation procedures,
- development of relevant land use plan and
- informing the general public

must be dealt with.

Tariff differentiation by energy source should be considered in order to promote the less competitive technologies, e.g. photovoltaic systems, that are currently stalled.

The financial support currently in place (investment subsidy and guaranteed feed-in tariff) should be continued and provisions be made for any RES project that may not receive investment subsidy from the Community Support Frameworks funds.

The system for the issuance of Guarantees of Origin must be established, as required by Article 5 of the Directive 2001/77.

1.15. Non-interconnected islands

The small size of the autonomous systems, with the likely exception of Crete, makes penetration of natural gas economically infeasible. Moreover, as demand is driven mainly by the tourism industry, peak load during summer months can exceed the winter peak many times over. Electricity demand is generally strongly inelastic and exhibits a high annual rate of increase. Electricity consumption in all the non-interconnected islands increased by 6.1% from 2001 to 2002 compared to 3.0% for mainland Greece.

Almost all islands have a high potential for renewable energy but system stability issues limit the RES contribution to 15%. Therefore, the potential for emissions reductions in the islands' electricity generation, with the exception of Crete, is very limited and this is expected be reflected in the NAP.

A strategic study on natural gas as fuel for power production in Crete, commissioned by RAE in early 2004, has been recently concluded. The study indicates that natural gas in the form of LNG is competitive to gas oil and that the construction and operation of an LNG importation terminal is economically feasible. Bearing in mind that installation of new capacity of the order of 400-800 MW within the decade 2010-2020 is mandatory and that decisions for a phased shutdown of one of the two ageing power plants have been taken, a

potential for a dramatic reduction on CO2 emissions during the second Scheme period from 2008-2012 is identified. However no CO2 reductions are anticipated in 2005-2007 as anticipated to be reflected in the NAP.

However, a potential in GHG emission reductions on the non-interconnected islands exists through the use of Hybrid Systems and additional efforts must be put towards their promotion. Hybrid Systems can increase RES penetration and result to a smoother system load curve reducing the need for peak plants.

In the longer term, the possibility of interconnecting autonomous systems should be studied, taking into consideration the new dimension of emissions cost, if the high wind potential and especially the geothermic potential of Milos is to be exploited.

1.16. Interconnections

Emissions trading is likely to lead to an increased utilisation of the northern interconnections since the three neighbouring countries are not affected by the scheme and their electricity generation industry will have a competitive advantage relative to the Greek. In particular, in the case that domestic production cost plus the allowance price is greater than the import price plus transmission costs, it would be more profitable for the Greek system to import electricity rather than produce it, subject to interconnectors' available capacity.

1.17. Kyoto flexibility mechanisms

With the linking of the EU Scheme to the flexibility mechanisms of the Kyoto Protocol, operators of installations covered by the Scheme may find profitable to comply with their obligations by investing in such emissions-reducing projects in neighbouring countries instead of reducing emissions domestically or purchasing allowances.

Joint Implementation projects can be carried out in Annex I countries and Clean Development Mechanism projects in non- Annex I countries. Such projects, in order to be registers under the Kyoto mechanisms, must demonstrate beyond any doubt that they reduce emissions below those that would have occurred in the absence of the project activity. They have to be approved by relevant Authorities operating under the COP/UNFCC. On 18 November 2004, a project reducing methane emissions from a landfill in Brazil was the first project to be registered under the CDM. Other eligible projects might involve, for example, a rural electrification project using renewable energy or the installation of more energy efficient boilers etc.

The status of Balkan countries with regard to the Kyoto Protocol is summarised in the following Table:

Table 3: Status of Balkan countries with regard to the Kyoto Protocol and its mechanisms

	Annex I	Emission Target	Ratified KP	Project Mechanism
Albania	N	N	*expected in 2005*	CDM
Bosnia Herzegovina	N	N	N	CDM
Bulgaria	Y	-8%	Y	JI
Croatia	Y	-5%	N	JI
FYROM	N	N	N	CDM
Romania	Y	-8%	Y	JI
Serbia & Montenegro	N	N	Y	CDM
Turkey	Y	N	N	Unclear

Conclusions

This report presents the revised Priority Considerations for Task 2 of the project "Applying European emissions trading and renewable energy support mechanisms in the Greek electricity sector (ETRES)".

The European Emissions Allowances Trading Scheme will be in place shortly and is the major EU-wide policy in order to reduce GHG (CO_2 initially) emissions in a cost-effective way. The carbon constraint imposed by the Scheme on the EU industrial sectors may have significant implications to these sectors and EU the economy.

Given its share in the national CO_2 emissions, the Greek electricity sector will have a principal role in the EU ETS at a national level. In order for the scheme to be implemented successfully and with a cost-effective manner, the Greek Authorities should:

- Evaluate the cost-effectiveness of long term policies and measures required to achieve the Kyoto target, especially for the sectors not covered by the EU ETS such as the transport sector.
- Strike a balance between national energy security and GHG emissions mitigation, given the rapidly growing share of natural gas.
- Continue the liberalisation process of the electricity market and prevent abuse of the incumbent's dominant market position.
- Facilitate the increased penetration of renewable energy sources.
- Facilitate the investment in projects under the Kyoto flexibility mechanisms in neighbouring countries.

RAE intends to update the present document if necessary, once the definite Greek NAP has been approved by the Commission.

References

1. National Observatory of Athens, Emissions Inventory, 2004. Available at http://www.climate.noa.gr/Reports/Sub_2004 NIR_ENG.pdf

2. Ministry of Environment, 3rd National Communication to the UNFCC, 2003. Available at http://www.unfccc.int/resource/docs/natc/grenc3.pdf

3. International Energy Agency, Emissions Trading and its possible impacts on investment decisions in the power sector, 2004. Available at http://www.iea.org/dbtw-wpd/textbase/papers/2003/cop9invdec.pdf

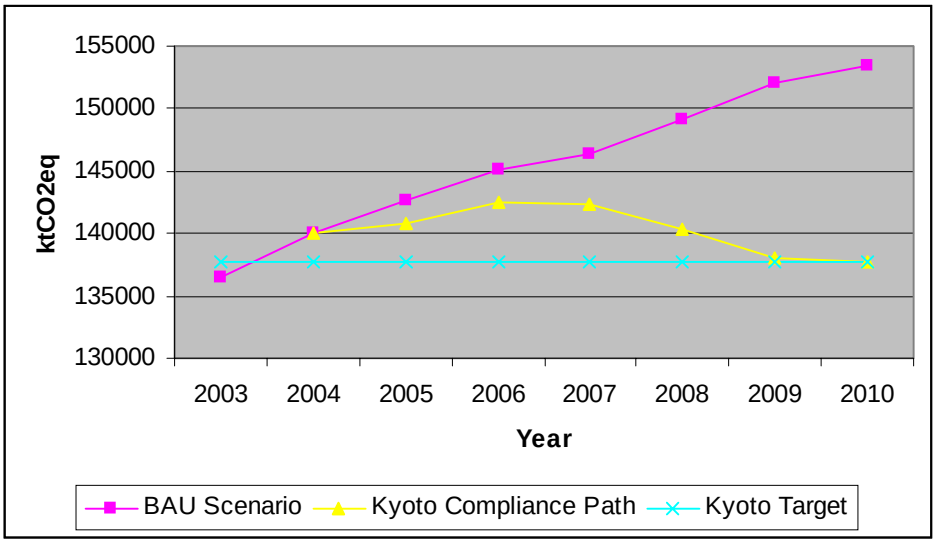
Appendix

Introduction

The Draft Greek NAP was published for Public Consultation on 21 December 2004 and was submitted to the Commission on 30 December 2004. Directive 2003/87/EC was incorporated into Greek regulation on 27 December 2004 through a joint decision of the Ministries of Development and Environment published in the Greek Official Journal (ΦΕΚ Β΄ 1931).

The purpose of this document is to present the Greek NAP in brief and to provide initial comments on the proposed allowance allocation scheme and its implications.

Figure I: Greek GHG emissions: BAU Scenario, Compliance Path and national target (Draft Greek NAP)



1. The Draft Greek NAP – General Presentation

1.1 The proposed Kyoto compliance path

In accordance to Appendix III of the ETS Directive and the guidelines issued by the Commission regarding the development of a National Allocation Plan (COM2003(830)), each member state had to define in their respective NAP a "Kyoto compliance path".

The proposed compliance path for the Greek GHG emissions is shown schematically in Figure I and was determined in the NAP by taking into account

- the national target of +25% of the base year GHG emissions,
- the updated Business-as-Usual (BAU) projections,
- the actions laid out in the 2nd National Plan for Emissions Reductions and
- the latest developments towards reduction of GHG emissions

1.2 Allowance allocation

The **total amount of allowances** to be issued was calculated by taking into account the Kyoto compliance path and the emissions share from all installations covered by the scheme, using the "forecasting approach". As Greece has taken no actions towards the utilisation of the Kyoto flexibility mechanisms, no additional increases in the total amount of allowances were incorporated.

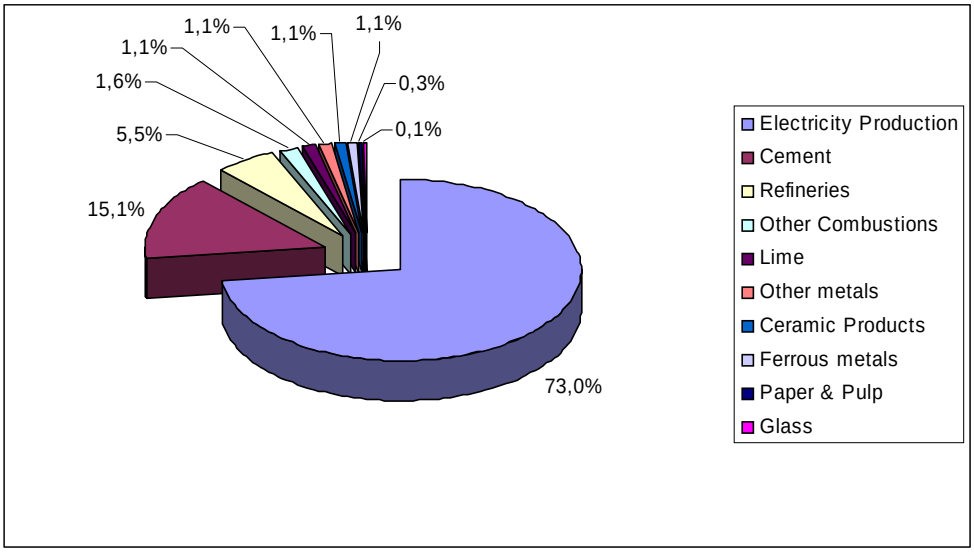
The proposed NAP covers 141 existing installations and foresees the distribution of 213,.870,.958 allowances (i.e. 71,290,319 allowances per annum). Additional 9.395.094 allowances are set aside for new entrants. The emissions covered by the scheme correspond to **52.5%** of the forecasted national GHG emissions in the period 2005-2007. All allowances will be **allocated free of charge**.

The **base period** for the calculations was 2000-2003, excluding for each installation the year with the lowest emissions.

The total amount of allowances to be issued for the period 2005-2007 is 2.1% lower than the projected emissions of the installations under the BAU scenario for that period.

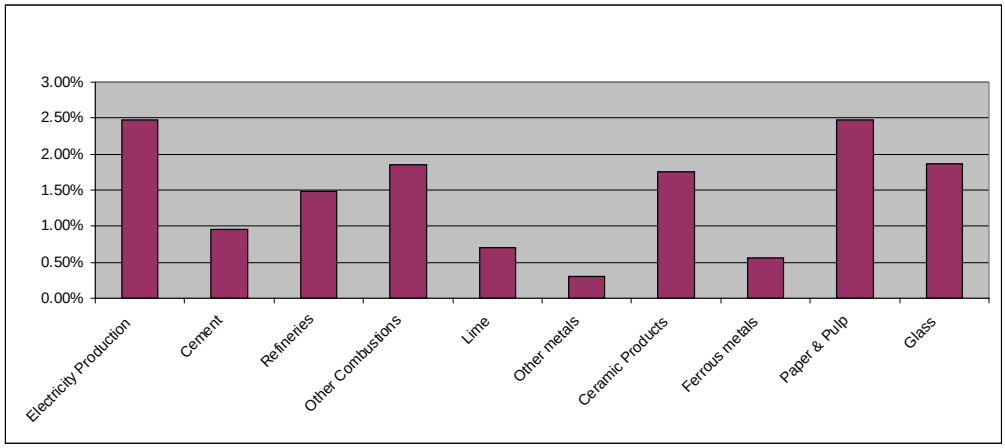
The sectoral breakdown of the allowances is shown in Figure II

Figure II: Sectoral Share of Allowances



The required emissions reductions for each sector as compared to the BAU scenario are shown in Figure III.

Figure III: Required emissions reductions as compared to BAU, by sector



Banking of allowances is allowed only within the three year period from 2005 to 2007. Unused allowances held after April 2008 will be cancelled.

Early action is rewarded indirectly. During the estimation of the number of allowances at installation level, for the purposes of the NAP, the year with the lowest emissions was excluded. In this context, if an installation had implemented actions towards GHG emission reductions was granted more allowances that necessary. The superfluous allowances can be sold in the market allowing for the operator to recover part of the early actions investment cost.

Co-generation is being promoted by allowing for a compliance factor of 1 for existing and new installations. Note that installations with unity compliance factor can proceed with their operation according to the BAU scenario for the period 2005-2007,

1.3 New Entrants

According to the draft NAP, a 4.2% of the total allowances (9.395.094 tCO_2) is reserved for new entrants.

The NAP distinguishes between known and unknown new entrants. Known new entrants are the installations that have already acquired a number of permits and are likely to begin operation during the 2005-2007 period.

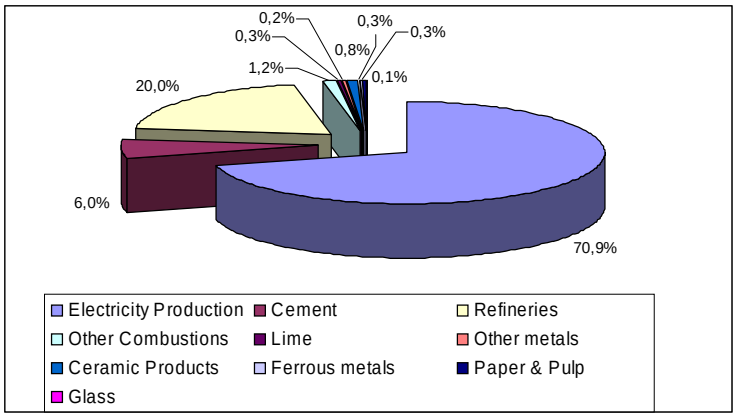
Reserved allowances, not allocated before the end of 2007, will be auctioned for use in the first period.

The **known new entrants reserve** accounts for 4.1% of the total allowances and allows for the following installations:

- Thirteen oil-fired, PPC owned, power plants at the non-interconnected islands
- A new, PPC owned, 400MW CCGT plant located in the prefecture of Attika (Lavrio).
- A number of PPC leased open circle gas turbines of total capacity of 107 MW installed in Lavrio to meet peak demand.
- Two CCGTs built, owned and operated by investors other than PPC (Hellenic Petroleum and Greek Aluminium) of total capacity of 724 MW.
- Two CCGT plants with a total capacity of less than 900MW resulting from a public tender issued by the System Operator.
- Five co-generation plants
- Two refinery capacity expansions to meet the requirements of directive 2003/17/EC and other legislation regarding fuel oil specifications.
- A ferrous metals installation.

Unknown new entrants are expected only in the lime, ceramic products, pulp and paper and other combustion sectors. The amount of allowances in reserve, a total of 400 $ktCO_2$, corresponds to 15% of these sectors' 2003 emissions,

Figure IV: Sectoral share of the new entrants reserve



1.4 Allowance allocation in the electricity sector

The Scheme covers thirty existing power generating installations, seventeen of them are located on the non-interconnected islands. The total annual number of allowances

allocated to the power sector is 156,199,372 tCO_2 accounting for about 99.5% of the 2003 CO_2 emission levels.

Total allowances for known new entrants (including co-generation) are 809,312 tCO_2 for 2005, 2,359,244 tCO_2 for 2006 and 3,04,544 tCO_2 for 2007.

The sector's compliance factor with regard to the BAU scenario is 97.5%.

2. Initial comments on the Draft Greek NAP

Although the time available for a thorough review of the draft allocation plan was limited, some initial comments can be offered.

- The NAP sets a path for an at least 2.1% reduction on the GHG emissions from the BAU scenario. Emission reductions are anticipated to be achieved after 2006, mainly due to improved energy efficiency and increased natural gas penetration in the electricity and domestic sectors.
- Long-term strategy (e.g. in the next compliance period from 2008 to 2012) and the implications of emission reduction on the Greek economy are not explicitly addressed. Some general indications for the treatment of sectors and technologies are provided.
- The historical emissions are solely based on the reports submitted by the installations' operators and have not been verified.

In reference to the proposed allowance allocation for the electricity sector a number of more specific comments can be made:

- As anticipated, the electricity sector is expected to carry one of the heaviest burdens of emission reduction efforts in comparison to the BAU scenario. According to the NAP, the required emissions reductions from the electricity sector will be of the order of 2.47%. Note that similar reductions are also anticipated to be made by the pulp and paper sector.
- Emissions reductions are expected to be met through the introduction of new natural gas-fired CCGT plants in mainland Greece.
- The NAP identifies and reserves allowances for some 1600MW of independently owned capacity to be installed by 2007. In this context, the on going liberalisation process of the power generation sector is being promoted and accelerated.

- The NAP does not provide additional incentives towards the gradual replacement of ageing installations with carbon efficient ones e.g. by stating that the least carbon-efficient technologies will be in an increasingly disadvantageous position in the future by being allocated less allowances per unit of output in comparison to the newer plants. In analogy to the German NAP, additional incentives could have also been provided through foreseeing to reward the operators who switch to more efficient technologies by allowing them to transfer, to the new installation, the closed plant's now superfluous allowances.