

*CONVENTION ON LONG-RANGE TRANSBOUNDARY AIR POLLUTION  
(LRTAP)*

*Country mission to Greece following EB decisions 2009/6 on compliance with  
the 1988 NO<sub>x</sub> protocol*

***Report of the Expert Review Team***

CONTENTS

1. EXPERT REVIEW TEAM .....	1
2. PLACE AND DATE OF THE MISSION .....	1
3. SUBJECT AND AIM OF THE MISSION .....	1
4. PROGRAMME OF THE MISSION .....	2
5. REPORT OF THE MISSION .....	3
5.1. Introduction .....	3
5.2. Presented information, discussions and analysis .....	3
5.2.1. Clarification of the EB decisions .....	3
5.2.2. Administration: organisation and responsibilities .....	3
5.2.3. Policies and measures .....	4
5.3. Conclusions .....	8
6. RECOMMENDATIONS .....	9

DATE:

**1. EXPERT REVIEW TEAM**

Following members of the Implementation Committee (IC) conducted the in-depth review of Greece's situation on compliance with the 1988 NO<sub>x</sub> protocol:

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**2. PLACE AND DATE OF THE MISSION**

The meeting of the Expert Review Team (ERT) with the representatives of the responsible Greek authorities was held on the 3<sup>rd</sup> and 4<sup>th</sup> of November 2010 in Athens, Greece, in the Ministry of Environment, Energy and Climate Change (Auditorium, 119 Mesogeion Ave, 10192 Athens, Greece).

**3. SUBJECT AND AIM OF THE MISSION**

This mission is a follow-up to Executive Body (EB) decision 2009/6 on compliance by Greece with the 1988 NO<sub>x</sub> protocol.

Due to Greece's long-lasting non-compliance with the basic obligations of the NO<sub>x</sub> protocol and due to the fact that Greece had not provided the IC with sufficient and adequate information related to the

obligations to meeting of the requirements of previous EB decisions on this non-compliance case, stronger measures were urged by a decision adopted at the EB meeting in December 2009. In paragraph 8 of EB decision 2009/6 Greece was requested to invite the IC in accordance with paragraph 6(b) of EB decision 2006/2 to conduct an in-depth review of Greece's compliance on the basis of EB decisions 2002/6, 2003/5, 2004/7, 2005/4, 2006/5, 2007/3 and 2008/3 with respect to the NO<sub>x</sub> protocol.

In accordance with paragraph 6(b) of Decision 2006/2 setting up the structure, the functions and procedures for review of the Implementation Committee, the aim of the visit was to gather information on existing and planned policies and measures in relevant sectors in Greece in order to ensure compliance with its obligations under the NO<sub>x</sub> protocol. A Terms of Reference (ToR) document from the Implementation Committee was the basis for the ERT.

The long-lasting non-compliance of Greece with the basic obligations of the 1988 NO<sub>x</sub> protocol concerns the exceeding by Greece of its national annual emission targets for NO<sub>x</sub>:

- According to Article 2 of the NO<sub>x</sub> protocol Greece has to reduce its annual NO<sub>x</sub> emissions below the annual emission of the base year 1987, at the latest by the year 1994.
- Consistent with the official submitted emission data by Greece (March 2010) the 285 kt national emission target for NO<sub>x</sub> for Greece is therefore applicable.

By the time of the ERT visit Greece has been already in non-compliance for 10 years (1998-2008) with its NO<sub>x</sub> emission target. The submitted 2010 emission data for the year 2008 show national totals for NO<sub>x</sub> of 357 kt, or 25% above the protocols target. According to data uploaded by Greece onto the CDR in 2011 (i.e. after the ERT mission) emissions for the entire territory for the year 2009 were 375 kt and projected emissions for 2010 are expected to be 370 kt, which is app. 30 % higher than the base year emission target of 285 kt, as estimated at the time of the mission<sup>1</sup>. According to these data, it is obvious that Greece would not attain its ceiling neither in 2009 nor in 2010.

#### **4. PROGRAMME OF THE MISSION**

The mission was envisaged as a two day visit. During the process of preparation for the visit the expert review team, with a help from IC, has set up a detailed programme of the mission. A list of specific questions was also elaborated and annexed to the programme. The programme and the list of questions were put forward to the competent Greek authorities who agreed on their content.

The aim of the detailed programme was to cover all relevant topics in sufficient detail, to enhance the discussions and to gain sufficient insight into Greece's current situation. The general outline of the adopted programme, like the analogous program for the mission in Spain previous year, was as follows:

- Clarification of EB decisions
- General presentations and discussions on
  - Administration: organisation and responsibilities
  - Policies and measures
  - Emissions and projections
- Sectoral presentations and discussions on NO<sub>x</sub> measures and effects

The ERT reminded of keywords in the ToR for the fact finding mission, and suggested the hosting team to summarize their comments on them: *measures, timetable, projected effects, revision of inventory and further reductions and obstacles.*

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<sup>1</sup> According to its March 2011 report, Greece has revised its base year emission from 285 kt to 341 kt, reducing the exceedance in 2009 to app. 10%.

## **5. REPORT OF THE MISSION**

### **5.1. Introduction**

This report presents the main findings of the mission of the expert review team to Greece.

The meeting was attended by approximately 25-30 persons, including high level policy makers, experts and consultants in the field of air quality, pollution control and climate change. Policy makers, consultants and experts were from different units of the Ministry of Environment, Energy and Climate Change, from the National Technical University of Athens, National Committee 20-20-20, and from some industries as well (e.g. Hellenic Petroleum SA).

The team was welcomed by Prof. Andreas Andreopoulos, General Secretary of the Ministry of Environment, Energy and Climate Change and Prof. Konstantinos Mathioudakis, General Secretary at the same Ministry. The two days meeting was chaired by Prof. Ioannis Ziomas, National Technical University of Athens. The Greek team was well prepared and made presentations on issues relevant to both the reasons causing the problem of exceeding NO<sub>x</sub> ceiling and the opportunities to address them. All elements of the mission programme were covered by the presentations and the follow-up discussions, together with additional information. The meeting was held in an open and positive atmosphere.

### **5.2. Presented information, discussions and analysis**

#### **5.2.1. Clarification of the EB decisions**

At the start of the meeting the review team briefly explained that the aim of the mission was information gathering as well as having stimulation discussions that could provide an accurate insight of Greece current situation.

The goal of the visit was to get detailed information on the specific circumstances which may be considered as reasons for long-lasting non-compliance and also on the current and future measures and their effects on the national levels of NO<sub>x</sub> emissions as well.

#### **5.2.2. Administration: organisation and responsibilities**

Environmental policy in Greece is the competence of the national government. To the Ministry of Environment, Energy and Climate Change (MEECC) falls the main responsibility for development, implementation and enforcement of the environmental policy. Its mandate is set down in law 1650/86. The Hellenic Environmental Inspectorate is responsible for the enforcement of the legislation, and in particular for inspections and control of the application of the environmental requirements. Regional and local authorities also take part in enforcement. Unlike some other member states of EU, Greece has no executive Environment Agency. The country's obligations for performing and reporting inventories of hazardous substances and greenhouse gases are carried out by the National Technical University of Athens. The Center for Renewable Energy performs emission forecasts. But the control regarding the obligations related to the national air pollution emission targets is of the competence of MEECC.

In its Report to the EB in December 2009 Greece attributed the exceeding of the national NO<sub>x</sub> ceiling to the increased production of the energy sector and mainly due to the extended use of the internal combustion engines for production of electricity on the remote Aegean islands. According to the report, 2012 was pointed as year for reaching compliance. During this information gathering mission

the above mentioned specific reason for exceeding the national NO<sub>x</sub> ceiling was confirmed. However, 2012 was not mentioned during the mission as the year to achieve compliance.

### 5.2.3. Policies and measures

Greece has fully transposed environmental legislation of the European Union, including the directives related to air quality: LCP directive, VOC directive, fuel quality directive, waste incineration directive, etc. This means that in practice all requirements related to e.g., emission limitations, to the application of Best Available Technologies (BAT), are identical or more stringent compared to the requirements of the Protocols to the Convention.

Greece signed but did not ratify so far the last three protocols to the Convention.

Greek side made presentations during the ERT visit dedicated to the national environment permitting and inspections system, to the institutional, legal and procedural arrangements of Greek National GHG Emission System, and to measures in some sectors, related to reduction of NO<sub>x</sub> emissions. It should be noted that some of the presentations, although made with sufficient expertise and with good will, with a genuine desire to make the expert team acquainted with the main aspects of Greek environmental policy, were not always addressing the basic reason for the ERT visit i.e., exceeding the national ceiling for nitrogen oxides, as well as ways to address it.

The emphasis was placed on the part of Greece during the two days ERT visit, similar to the presentation of the country to the EB in 2009, on the measures relating to the implementation of the **GHG Action Plan** (amalgamation of and another name for National Renewable Energy Action Plan, Green Package or 20-20-20). This action plan includes measures which at the same time also have the potential to significantly reduce NO<sub>x</sub> emissions, in particular the measures related to energy saving, substitution to cleaner fuels and reduction of fuel combustion. Considering this GHG Action Plan and in addition the national plans that Greece has developed in compliance with the reporting obligations of the European NEC Directive (2001/81/EC) and LCP Directive (2001/80/EC), Greece has up to now not developed or has no intention **to develop and implement any additional plan at national level** related to the NO<sub>x</sub> reduction obligation under the NO<sub>x</sub> Protocol.

Greek experts presented measures, taken and planned, which have to contribute to overall reduction of the NO<sub>x</sub> emissions. These measures are determined by the Greek side as general institutional measures and measures to reduce energy consumption.

1. As general institutional measures have been listed:
  - establishment of a new Ministry for the Environment, Energy and Climate Change (MEECC) – in order to bring under a single administrative structure the respective bodies involved in the licensing i.e., of power plants, taking into account energy, environment and fiscal considerations including the long term requirements to address climate change;
  - acknowledgment of the priority given to achieving the targets set by Directive 2009/28/EC (promoting renewable energy) and by international commitments of the country for protection of the environment;
  - dissemination campaign for 20-20-20;
  - streamlining of licensing regulations and the rationalization of the terms and conditions of land management;
  - renewable energy sources (RES) technologies in electricity production, heat supply and transport;
  - energy efficiency measures;
  - plans for technology investments in energy savings projects.
2. Actions in different sectors in addition to the general institutional measures, with starting and ending dates, were presented as measures to reduce energy consumption. It has to be noted that some of these measures should already have been implemented (they were with expired term of application) but there was no presented data by Greece on their impact on NO<sub>x</sub> emissions reduction:

- 2.1. a. The largest number of measures presented as policy measures were for the energy sector. Amongst them might be pointed:
  - decommissioning or modernization of LCPs. A large number of plants were identified as subject to decommissioning in the period between 2011 and 2015. As of modernization of some other plants, only a general time period between 2011 and 2020 was indicated;
  - using renewable energy sources;
  - construction of hydropower plants;
  - production of electricity from biomass and from natural gas combined cycle plants, and to a smaller extent gas turbines;
  - reinforcement of the interconnection capacity with neighbouring countries etc.
- 2.1.b. As a technical measure was presented the further development of distribution grid based on the smart grids principles, because of specificities of energy consumption on isolated islands during the tourist season.
- 2.2. As a general policy measures in the transport sector were suggested, but not proposed or implemented:
  - reforming the transportation system, infrastructure change, and urban mobility plans;
  - CO<sub>2</sub>-related car taxation and labelling;
  - incentives for the replacement of old heavy vehicles;
  - incentives for using hybrid cars and biofuels, etc.
- 2.3. As a general policy measures in the building sector were presented:
  - promotion of the use of natural gas in commercial and residential sector;
  - energy system certification for public sector buildings;
  - building energy renovation, etc.

Regulatory measures were pointed out for building sector, generally aimed at improving energy efficiency and energy saving in the public sector.

There was special presentation aiming to elucidate the ERT of the country's policy in this sector. According to the data presented a great majority of the buildings are not thermally insulated. This leads to excessive use of energy not only in winter time – for heating, but also in summertime – for cooling.

Application of the GHG action plan adopted in 2008 has to lead to the following energy savings from e.g. residential sector – 1 679 GWh in 2010 and 5533 GWh in 2016.

A new legislation on energy performance of buildings has been adopted. It targets “the reduction of the consumption for the conventional energy for heating, cooling, air conditioning, lighting and hot water”.

3. Greece made presentation on NO<sub>x</sub> emissions trends, projections, the impact of the policies and measures on emissions, and also on relationship between emission levels and country's economic development.
  - 3.1. According to the information presented, for the period 1990 to 2008 emission levels by oil refining, industry and domestic shipping are almost unchanged. Slight decrease, though with deviations through the years, was observed in agriculture and road transport. The only sector which showed a significant increase in emissions of NO<sub>x</sub>, is energy production, the sector with the largest contribution in overall emissions of this pollutant. In 2008 (the last reported year by the time of the ERT visit) from power production originate 37% of NO<sub>x</sub> emissions, from transport 29%, from agriculture and shipping 10% each.
  - 3.2. Two scenarios were presented from the GHG action plan and its results in terms of projections for emissions of nitrogen oxides by 2020:
    - Business as Usual (BaU);
    - Compliance Scenario (CS).

3.2.1. The following measures are taken into account in BaU scenario:

- decommissioning of old inefficient thermal power units and commissioning of new ones;
- natural gas in Crete island power production;
- RES penetration;
- SCR and gradual replacement of internal combustion engines (on the islands);
- interconnection of Cyclades islands to the mainland electricity grid;
- NG use in industry, residential and tertiary sector;
- Electrification of railways.

3.2.2. Measures included in CS are as follows:

- BaU measures mentioned above;
- higher rate of RES for 20-20-20-targets;
- interconnection of Milos and North Aegean islands to the mainland electricity grid;
- other measures in GHG Action Plan.

At the time of the visit of the ERT Greece considered that applying measures included in BaU scenario would allow a gradual reduction of NO<sub>x</sub> emissions after 2011 and achieving compliance with the NO<sub>x</sub> Protocol **only by 2019**, while applying measures included in CS would allow a gradual reduction of NO<sub>x</sub> emissions after 2010 and achieving compliance with the NO<sub>x</sub> Protocol **only by 2016**. According to the revised projections and base year emissions (submitted in 2011, after the ERT mission), Greece will reach compliance with the NO<sub>x</sub> Protocol by **2015** – according to its BaU scenario, and by **2013** – according to its Compliance scenario.

Greece experts' presentation indicates that if applying BaU scenario the changes in levels of total NO<sub>x</sub> emissions in practice will follow closely the changes in the levels of emissions from the energy sector, with relatively little influence of the emissions changes from transport sector. This corresponds to the above mentioned that the country at that time does not execute and does not plan to implement actions at the national level, others that the measures included in the GHG Action Plan. The influence of the energy sector is even bigger if applying CS. Implementation of BaU scenario should lead in 2020 to reduction of the contribution of the energy sector in overall NO<sub>x</sub> emissions from 37% to 20%, while applying CS this reduction will be from 37% to 15%.

Greece expects that only applying measures related to gradual decommissioning of old inefficient thermal power plant units and commissioning of new ones will result to the following reduction of NO<sub>x</sub> emissions, compared to a baseline as-usual level projected for 2010:

Table 1: Emission reductions of NO<sub>x</sub> emissions applying measures related to gradual decommissioning of old inefficient thermal power plant units and commissioning of new ones:

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>NO<sub>x</sub> emission reduction</b>	0.5	2.1	3.0	5.4	7.1	7.1	7.1	8.7	23.5	23.5

The measures are mainly related to implementing the requirements of **Directive 2010/75/EU on industrial emissions (integrated pollution prevention and control)**.

Different levels of emission reduction are expected from different levels of implementation of RES. Implementation of only the BaU scenario will lead to less relative reduction compared to CS, and also in a time lag. Some measures are already in place expected to give a some reduction.

Table 2: Emission reductions of NO<sub>x</sub> emissions expected from different levels of implementation of RES:

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>BaU [kt]</b>	11	12	13	14	16	17	13	15	16	15	16
<b>Compliance Scenario [kt]</b>	11	13	15	16	18	21	17	19	21	20	23

The two phases of connection of electricity grids of some of the islands with that of the mainland are expected to lead to the emissions reduction respectively by 7.3 and 10.2 kt per year.

Greek authorities also expect that changing the fuel base in Crete related to electricity production (a gradual transition to natural gas) will reduce overall emissions of NO<sub>x</sub> (the baseline here is assumed to be 2010).

Table 3: Emission reductions of NO<sub>x</sub> emissions expected from planned changing the fuel base in Crete:

Year	2015	2016	2017	2018	2019	2020
<b>NO<sub>x</sub>, kt avoided</b>	5.2	10.6	10.6	10.6	10.6	23.1

It is expected also that implication of some other measures such as:

- Selective Catalytic Reduction (SCR) at selected sites and gradual replacement of internal combustion engines (on islands);
- NG use in industry, residential and tertiary sector;
- electrification of railways will also have effect of reducing the total NO<sub>x</sub> emissions, although it will be relatively small.

The table below presented by the Greek experts summarises **the expected effect** from application of some basic measures which would have effect upon overall NO<sub>x</sub> emissions, summarising the tables above. Some of the measures come only in the Compliance scenario. As it might be noticed the expected effect is expressed only for years 2015 and 2020 (assumed compared to projected 2010 situation):

Table 4: Emission reductions of NO<sub>x</sub> emissions expected from application of some basic RES-, energy efficiency and GHG-related measures with effects upon overall NO<sub>x</sub> reduction:

Policies	2015	2020
RES	17 - 21	16 – 23
Decommissioning of old thermal power units	7.1	23.5
Interconnection of islands – phase A	7.3	7.3
Interconnection of islands – phase B		10.2
Use of Natural Gas (in Crete)	5.2	23.1
Use of New Internal Combustion Engines (in islands)	8.4	8.4
Penetration of NG in Industry Residential etc. Tertiary	3.2	4
Electrification of Railways	0.9	1.4
National Energy Efficiency Action Plan	5.7	7
<b>Total impact of policies</b>	<b>55 – 59</b>	<b>101 - 108</b>

Greece expects to begin to **emerge from the heavy economic crisis in 2011**. An almost linear growth in gross domestic product is expected between 2015 and 2020 and it corresponds to similar though not a linear decline in total emissions of NO<sub>x</sub>. The Ratio of NO<sub>x</sub> emissions to GDP is expected to be almost one and the same for both scenarios – BaU and CS.

### 5.3 Conclusions

Primary aim with the ERT was to gather further information on Greece situation. In this aspect the two-days meeting would be regarded as successful. It added more information and enhanced ERT's understanding. It is our belief that our Greek colleagues have also acquired a better understanding of the CLRTAP and our endeavours.

On the five keywords it may be concluded:

**Measures** presented by Greece are listed in the table in section 5.2.3. Main effect on NO<sub>x</sub> reduction is predicted to come from switching to natural gas in power production and improved housing. Greek authorities are working according the compliance scenario which is established by the GHG Action Plan. The possible compliance program may give reductions of emissions that will not be encountered in a business as usual development.

**Timetable** follows from the GHG Action Plan. Effects on NO<sub>x</sub> will kick in mainly after 2015. Greece does not have annual updates of the timing or emission progression.

**Projected effects** on total NO<sub>x</sub> emissions are as follows:

- BaU. Having in mind the measures included in BaU scenario (p.3.2.1 and Table 4 above) it might be concluded that implementation of this scenario is expecting to result in 49.1 ktons reduction of NO<sub>x</sub> emissions in 2015 and in 83.7 ktons reduction in 2020.
- CS. The application of the additional measures is expected to lead in 58.8 reduction in 2015 and in 107.9 ktons reduction in 2020.

At the time of the visit it was expected that Greece would reach compliance by 2019 if only BaU scenario measures would be applied. And that compliance would be reached by 2016 if CS scenario measures would be applied. According to the revised projections and base year emissions submitted



in 2011, Greece is now expected to reach compliance with the NO<sub>x</sub> Protocol target by 2015 according to its ‘Business as Usual’ scenario, and by 2013 according to its “Compliance scenario”.

Revision of inventory will be a continuous option. The base year emissions may be revised, as well as transport and power sector. (See the post-ERT revisions to CDR-data.) Revision of plans and policy measures are primarily linked to the GHG Action Plan.

Further reduction and possible obstacles are not actively addressed. Greece is currently not considering additional measures to speed up its compliance with the NO<sub>x</sub> Protocol target, any sooner than 2013 (BAU) or 2015 (CS), although the technical availability of additional measures to further reduce NO<sub>x</sub> emissions could be recognised. Greece is not planning any new measures or policy revisions within at least the next two years. Based on the gathered information, the ERT believes that the current GHG Action Plan and national emission reduction plans drawn up for the European NEC and LCP directives do not contain sufficient measures to achieve compliance with the NO<sub>x</sub> Protocol target in the shortest possible time-frame.

## 6. RECOMMENDATIONS

- 1) The findings and conclusions of the ERT’s report should be reflected in further Implementation Committee’s reports to EB.
  - 2) It should be stressed that Greece has to speed up the pace for complying with its obligations. A further delay for many years is not acceptable, especially if not taking all possible measures to achieve compliance.
  - 3) Greece is invited to further improve its emission inventory and reporting routines.
  - 4) Greece is encouraged to make further efforts for planning and implementing effective policy measures directed towards controlling NO<sub>x</sub> emissions, in particular from mobile sources which contribute to roughly half of Greece NO<sub>x</sub> emissions.
  - 5) As the most significant reductions in energy sector are expected after 2015 and having in mind the long lasting and continuing non-compliance, additional measures to speed up compliance should be considered for LCPs or at least the use of any derogations should be kept to minimum.
  - 6) The Implementation Committee may consider further assistance to Greece, for example from expert teams.
  - 7) Experience from this second ERT conforms to the recommendations from the first ERT to Spain. Findings from this ERT may be used to inform Parties in long-lasting non-compliance. Further ERT exercise may well be justified.
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