

WEC Energy and Climate Change Study Group



Climate Change Policies and Measures Portuguese National Assessment

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WEC Study Group on Energy and Climate Change

Climate Change Policies and Measures

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1. Background

Portugal signed the United Nations Framework Convention on Climate Change on 13th June 1992, during the United Nations Conference on Environment and Development, which was held in Rio de Janeiro. In 1997, during the Conference of the Parties to the Climate Change Convention, Portugal participated in the negotiations, which would lead to the Kyoto Protocol. Portugal signed the Kyoto Protocol on April 1998 and its Greenhouse Gases (GHG) Emission commitment was set in 2002, when the European Union as a whole compromised to reduce their GHG emissions by 8 % until 2012.

In 1998, the Portuguese Government established a Climate Change Commission (CAC), in order to promote and facilitate the climate change policy across the Government bodies with relevant competences, as well as to ensure that these issues are considered in the full range of sectoral policies. Other responsibilities of this structure, which is co-ordinated by the Ministry of the Environment, include the discussion of technical options and adequate policies for climate change, being also responsible for supporting the Portuguese Government in establishing its Climate Change Strategy, which was approved in 2001. The CAC was also appointed, in 2006, as Designated National Authority for the Kyoto Protocol flexibility mechanisms.

Accordingly to the organizational structure of the Ministry of the Environment, climate change affairs fall under the Secretariat of State for the Environment. The agency with leading competences on climate change policy is the Institute for the Environment, whose responsibilities include promotion, co-ordination and support to the various issues related to climate change. This agency is also the competent authority in the context of the European Union Emissions Trading Scheme.

2. Greenhouse Gas Emissions

In May 2002, in the context of the Burden Sharing Agreement, Portugal committed to limit, by 2008-2012, its GHG emissions growth to 27 %, when compared to 1990 emission levels.

In 2004 Portugal total GHG emissions estimates accounted for 84,5 MtCO₂. This reflects an increase of approximately 41% when compared to 1990 emissions, which represents an increase of about 3% per year.

Comparing the growth observed between 1990 and 2004 with the linear trend for the period 1990-2010, estimated with Portugal's Kyoto target, GHG emissions were by 2004, 22% above the Kyoto target, as shown in Figure 1. With 78% of the total emissions in 2004, CO₂ is the most abundantly emitted GHG (Figure 2).

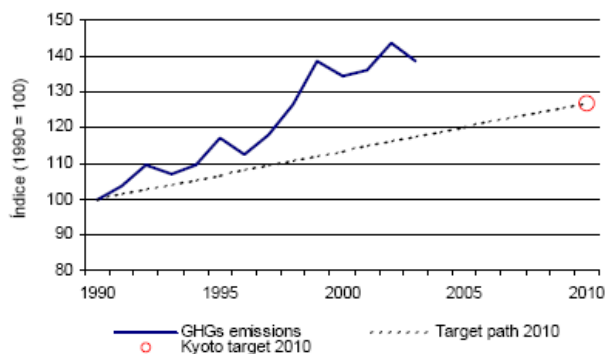


Figure 1 - Greenhouse gases emissions (1990-2004)

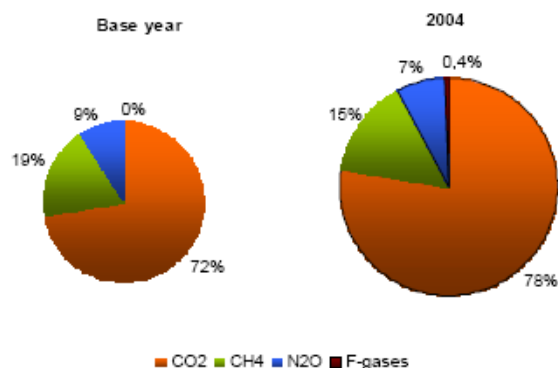


Figure 2 - GHG emissions by gas (base year and 2004)

(Source: IA, 2006)

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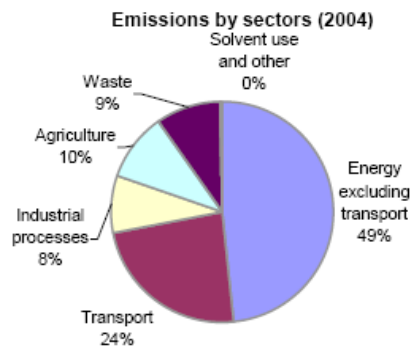


Figure 3 - GHG emissions by sectors in 2004

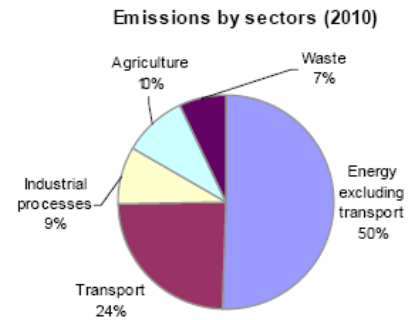


Figure 4 - Projected GHG emissions by sectors in 2010

(Source: EEA, 2006)

The energy sector, including transportation, represents 73% of the total emissions in 2004, having increased 51% when compared to 1990. Within this sector, the public electricity and heat production and the transportation sub-sectors are the most relevant, representing 25% and 24%, respectively, of the total emissions in 2004, which demonstrates the dependency on fossil fuels of the country for power generation and transportation.

It should also be noticed that GHG emissions from the electricity sector have significant fluctuations, related with the high variability of hydroelectric generation, strongly dependent of the verified hydrologic conditions. This means that whenever the hydro capability factor (HCF) is high (thus representing an increase in the hydroelectric production), the GHG emissions are lower (representing a lower contribution of thermal power generation). Figure 5 illustrates the relationship between the HCF and the GHG emissions from power and heat production in the period from 1990 to 2004.

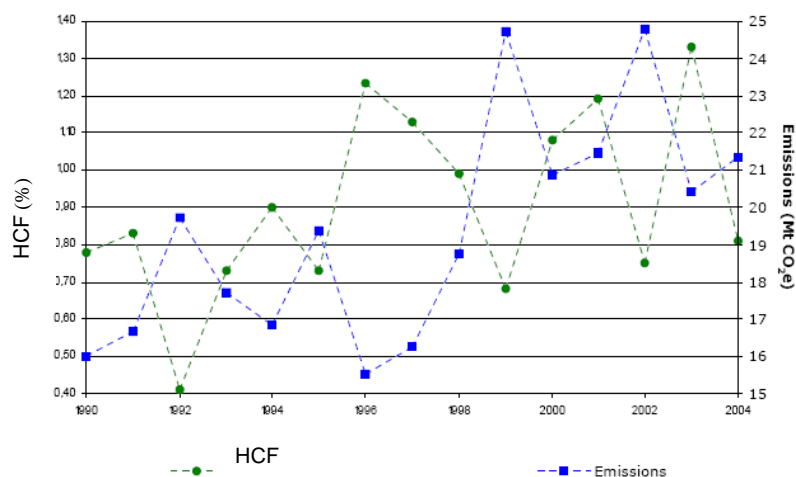


Figure 5 - Hydraulic capability factor and GHG emissions from power and heat production (Source: IA, 2006)

Figure 6 illustrates the GHG emissions projections by 2010, compared with the Kyoto target.

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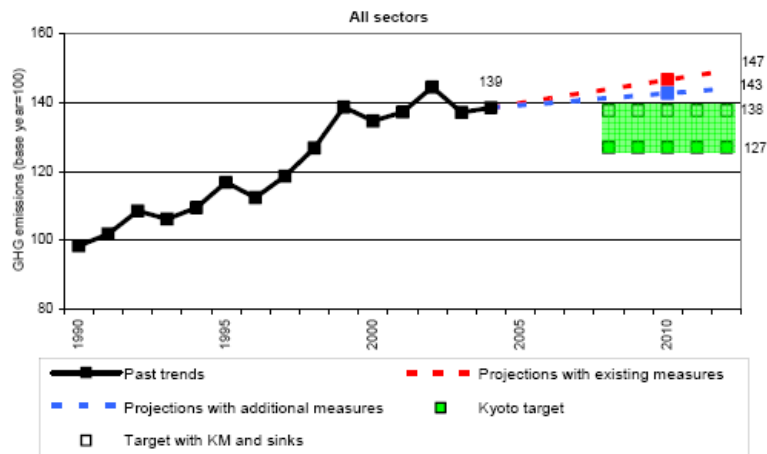


Figure 6 - GHG emission projections (Source: EEA, 2006)

3. Policies and Measures regarding Energy and Climate Change

In 2000 during the Portuguese Presidency of the European Union, the Lisbon Strategy was approved. This initiative was brought back in 2005, being focused in the employment and economic growth. To give an answer to this Strategy, the Portuguese Government approved its National Action Programme for Economic Growth and Employment (PNACE 2005-2008), which comprises 125 measures in order to achieve four strategic objectives, one of which is the reinforcement of the social, territorial and environmental cohesion. This programme constitutes a framework for other programmes and strategies related to environment and energy, especially:

- the National Strategy for Sustainable Development;
- the Technological Plan;
- the National Energy Strategy;
- the Portuguese National Climate Change Programme (NCCP); and
- the National Allocation Plans (NAP).

3.1 Tackling Climate Change

The main strategic instrument for compliance with the GHG commitment under the Kyoto Protocol is the Portuguese National Climate Change Programme (NCCP). This programme proposes policies and measures which were divided by sectors. This programme, nowadays on its third revision published in 2006, took into account new projections not only for GHG emissions, but also other new economic indicators.

Table 1 summarises the proposed policies and measures for the energy sector and their respective GHG reduction potential.

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Table 1 - Policies and measures proposed in the Portuguese National Climate Change Programme for the energy sector

(Source: PGB, 2006)

Policies and Measures	Objective	Emission Reduction potential (kt CO ₂ e) by 2010
MRe1 "E4, E-FER" Programme	Reduction of GHG emissions from electricity production through the increase in generation from RES	3600
MRe2 Energy efficiency improvement in the electricity generation sector	Introduction of higher efficiency combined cycle natural gas units (60% instead of 55%)	800
MRe2 Energy Efficiency in Buildings	Increase energy efficiency in buildings by about 40%	400
MRe3 Solar Hot Water for Portugal Programme (AQSpP)	Promotion of domestic water heating by solar energy	400
MAe1 Energy efficiency improvement in the electricity generation sector	Reduction of grid losses in transmission and distribution grid to a rate of 8,6%	146
MAe2 Energy efficiency improvement in the energy supply systems, considering electricity generation from co-generation	Electricity generated from co-generation systems: goal of 2000 MW of installed capacity by 2010	200
MAe3 Improvement in energy efficiency from the electricity demand-side	Reduction of 1020 GWh in electricity consumption	795
MAe4 Promotion of electricity produced from renewable energy sources	Increase installed capacity of units of electricity generation from RES to yield up to 5100 MW of wind power	370
MAe5 Introduction of natural gas in the Autonomous Region of Madeira	Fuel switch from fuel to natural gas in the Autonomous Region of Madeira	5
MAR1 Realignment of the tax burden on diesel fuel for heating (residential sub-sector)	Tax harmonisation between diesel for heating and for road transport by 2014	14
MAs1 Realignment of the tax burden on diesel fuel for heating (services sub-sector)	Tax harmonisation between diesel for heating and for road transport by 2014	59
MAi1 Increase in tax on industrial fuels	Changing the fuel tax (ISP) on industrial fuels, so as to create an incentive structure for GHG emissions reduction	78
MAi2 Review of the Regulation on the Management of Energy Consumption (RGCE)	Definition of a new RGCE that promotes energy efficiency in the industrial sector through voluntary agreements	32
MAi3 Incentives to the substitution of oil co-generation by natural gas	Reduction or phasing-out of the tariff co-generation using oil	189

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Other policy instrument adopted by the Portuguese Government related to Climate Change was the participation of Portuguese companies in the European Union Emissions Trading Scheme (EU-ETS), which is pointed as a cost-effective way to reduce GHG emissions and achieve the environmental targets. The EU-ETS will cover two periods: the first period between 2005 and 2007 and the second period from 2008 to 2012, which will coincide with the first commitment period of the Kyoto Protocol.

The Portuguese National Allocation Plan for the period 2005-2007 (NAP I), was approved in March 2005, establishing the a total cap of 36,90 MtCO_{2eq} /year for the 244 installations covered by the EU-ETS, of which about 55% of the CO₂ allowances were allocated power plants.

In October 2006, the Portuguese Government notified the Portuguese National Allocation Plan for the period 2008-2012 (NAP II) to the European Commission. This NAP II establishes (provisionally) a cap of 32,82 Mt CO₂/year, which represents a decrease of 12%, when compared to NAP I. Recently, in order to new data, the Portuguese Government asked the Commission to deliver a new version of its NAP II.

The Portuguese NCCP also proposes policies and measures to the transportation sector, as well as their expected GHG emission reductions by the end of 2010. The measures proposed for the transportation sector are mostly under planning or starting its implementation. One of the most significant measures is the promotion of use of biofuels, by which Portugal has to ensure that a minimum of 5,75% of its total fuel consumption in the transportation sector must be assured by biofuels in 2010, according with the European Directive 2003/30/CE. In February 2007, the Portuguese Government decided to increase its target to 10%. The achievement of this target will be reached by the creation of energy crops to support the supply, and by the exemption of the biofuels of the Oil Products Tax, making them more competitive. This new target will enable the anticipation in 10 years of the target set by the European Union.

3.2 Promoting Renewable Energy Sources and Energy Efficiency

In February 2007, the Portuguese Government reviewed the goals set in its National Energy Strategy, in order to diminish Portugal's external energy dependence, issuing an official document, entitled "Energia e Alterações Climáticas: mais investimento, mais ambiente" (in English *Energy and Climate Change: More investment, More Environment*).

This document represents a milestone relatively to the measures and goals that configure the Portuguese Energy Policy priorities for the next years (being more detailed until 2012 and more generic until 2020). The main measures and goals set in this document are:

- Increase up to 45 % of the consumption by 2010, of the energy produced from renewable energy sources, which represents an increase of 6% relatively to the goal set by the E-RES Directive;
- Enhance the hydroelectric potential yet to explore, in order to achieve 70% of usage by 2020;
- Limit the dependence on natural gas for energy generation, and simultaneously reduce CO₂ emissions, by building, until 2020, a 800 MW clean coal power plant;
- Implementation of energy efficiency that enable reductions of about 10% of the energy consumption by 2015.

The main changes to the measures and goals, as well as the new goals, related to the promotion of renewable energy sources and to the energy efficiency, set by the Portuguese Government are described in the next two figures.

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Figure 7 - New measures for the renewable energy sources (Source: MEI, 2007)

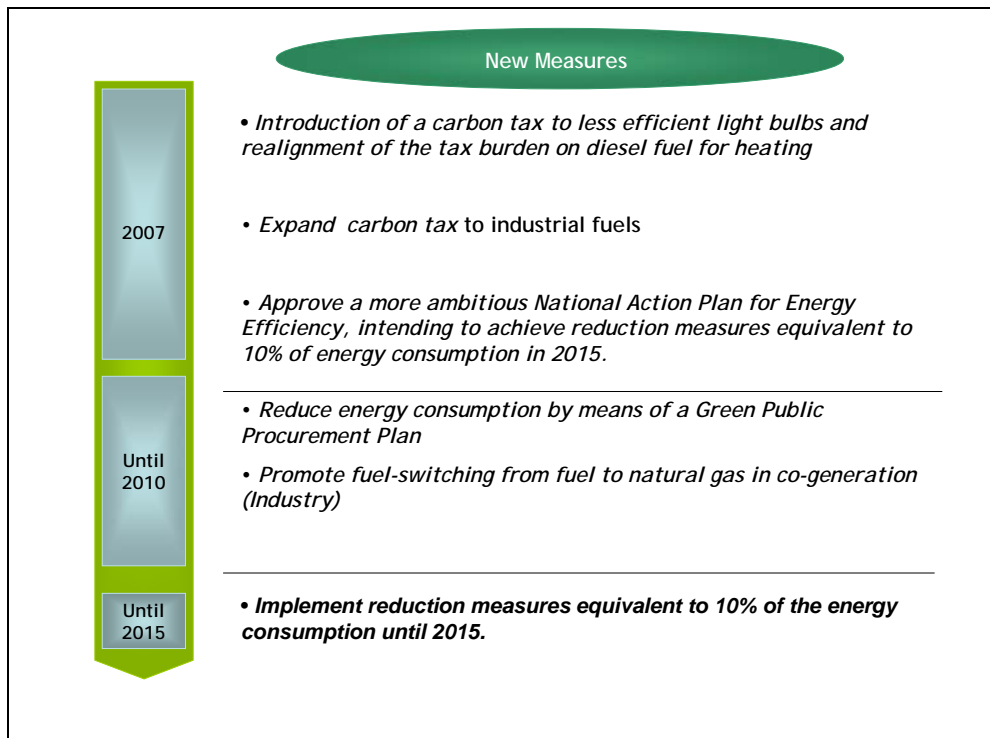


Figure 8 - New measures for Energy Efficiency (Source: MEI, 2007)

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4. Assessment of Policies and Measures regarding Climate Change against 3 A's

Below is presented an assessment of the policies and measures for the Energy Sector regarding Climate Change, adopted by the Portuguese Government. This assessment was only made for policies and measures already implemented in the energy sector.

4.1 Promotion of energy generation from renewable energy sources

In order to comply with the EU Directive 2001/77/CE, Portugal has to achieve an objective of 39% of the energy consumption produced from renewable energy sources. In 2001 was approved the E4 Programme (Energy Efficiency and Endogenous Energy). This programme proposed a set of measures promoting an integrated and coherent vision, from supply to the demand of energy, with the objective of improving the economy competitiveness and modernizing society. This programme was subsequently being reviewed: first in 2003, as part of the National Energy Strategy, then in 2005 with the publication of Portugal's Technological Plan (PG, 2005a), and more recently in February 2007 with the review of the energy policy, where it were settled new goals for the energy sector.

a. Promotion of wind power for electricity production

In 2005, the Portuguese Government reviewed the target for installed capacity of wind power, with an objective of 5100 MW for windpower capacity to be installed by the year 2012 (PG, 2005a).

Almost all the wind turbines can, and will, be installed in the east and north parts of the country, where there are the best potential spots to explore this energy source. In 2006 the Portuguese Government, by means of a public contest, has awarded new connexion points to the grid in order to guarantee an additional 1000 MW of wind power capacity, to achieve the new objective (5100 MW) proposed by the Government.

In February 2007, the Portuguese Government approved an extra 600 MW of wind power capacity, achieved by upgrading some of the already installed equipment. The new target for windpower capacity is to achieve 5100 MW of installed capacity in 2010.

Measure Assessment		
WEC CRITERIA	EVALUATION	COMMENTS
<i>Accessibility</i>	***	Wind energy is a mature and indigenous with low cost resource, however wind farms have yet high investment costs.
<i>Availability</i>	***	Although wind is a renewable and energy source indigenous energy source, with the increase of installed capacity of wind power, some problems of unpredictability and intermittency will occur.
<i>Acceptability</i>	****	Wind farms sometimes don't have public acceptance, due to visual, noise, birdlife impacts (NIMBY effect).

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b. Promotion of hydro for electricity production

Portugal as a high hydroelectric potential not yet used for hydro generation. Large hydro has a significant role by the importance that reversible capacity will have in the future to complement other renewable sources, such as wind, that have problems of intermittency of supply.

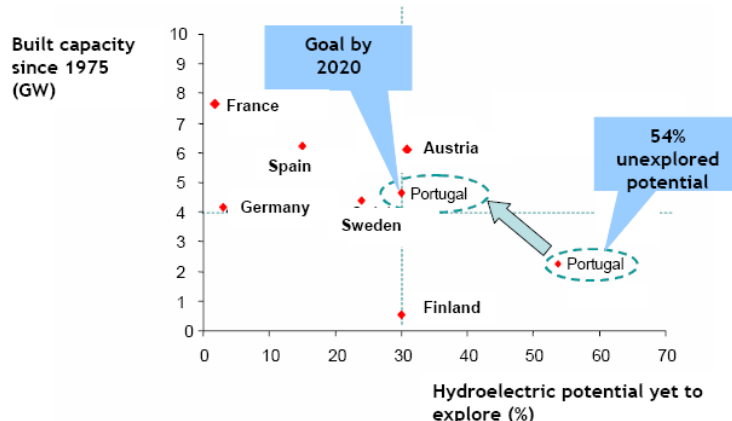


Figure 9 - Hydro potential unexplored vs. built capacity since 1975 (Source: MEI, 2007)

The Portuguese Government has assumed a 500 MW increase for small hydro installed capacity until 2012 (PG, 2005a). The evaluation of this policy is only done for small hydro plants.

Measure Assessment		
WEC CRITERIA	EVALUATION	COMMENTS
<i>Accessibility</i>	****	Small hydro technology is very mature with a high existing knowledge of using this technology.
<i>Availability</i>	****	Water is an indigenous and renewable energy source, and very predictable due to well known historic data. In some cases, small hydro power plants can have some storage capacity.
<i>Acceptability</i>	***	Small hydro plants not always have public acceptance especially from environmental reasons.

c. Promotion of biomass for energy production

Biomass is another indigenous resource, in which the Portuguese Government has given some incentives for its promotion. Portugal has a large extent of its territory covered by forest, and to manage all this potential, avoiding the consequences of forest summer fires, it is important to promote a "forest economy", including the use of biomass for electricity generation. The Portuguese National Energy Strategy assumed a target of 225 MW of installed capacity of biomass until 2012 (PG, 2005a). In 2006, the Portuguese Government awarded a public contest for the attribution 100 MW to new biomass thermal plants, beginning the achievement of the target (225 MW). In 2007, this target was revised, being now of 250 MW by 2010.

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Measure Assessment		
WEC CRITERIA	EVALUATION	COMMENTS
Accessibility	***	Biomass power plants cannot be built far away from forest waste collection centres, in order to make them more profitable.
Availability	****	A large extent of the Portuguese territory is covered by forests, what makes biomass an abundant resource.
Acceptability	*****	The use of biomass for electricity generation is well accepted as an indirect mean of avoiding forest fires. The collection of biomass is also very important to promote agricultural economy.

d. Promotion of other renewable energy sources for electricity production

The development and use of other renewable energy sources is very important for Portugal, which needs to reduce its oil dependency. In the Technological Plan, published by the Portuguese Government in 2005 (PG, 2005a) it were identified targets to improve the use of other renewable sources of energy (by example 80 MW of wave energy and 77 MW of photovoltaic systems by 2012). In 2007 these targets were reviewed, being now of 250 MW for wave energy and 150 MW of photovoltaic systems by 2010. On the 28th March 2007 it was commissioned in Serpa, a photovoltaic power plant with an installed capacity of 11 MW.

Measure Assessment		
WEC CRITERIA	EVALUATION	COMMENTS
Accessibility	*	The technologies are not yet very mature and still have high investment costs.
Availability	****	There is a very high potential to use energy technologies supported by the sea or sun. Portugal has a large extent of sea coast and a large number of sunlight hours. The use of these technologies can have some problems of intermittency.
Acceptability	*****	The acceptance of the use of this kind of renewable technologies is still very high.

4.2 Demand Side Energy Efficiency

The Portuguese NCCP establishes also a set of policies and measures to improve the energy efficiency on the demand side, which are expected to reduce the electricity consumption by about 1000 GWh in 2010. In this area, the Portuguese Government has endorsed two national programmes with the objective of promoting an increase of the demand side energy efficiency: the National Programme for Energy Efficiency in Buildings and the Solar Hot Water Programme. More recently, in August 2006, the Energy Services Regulatory Authority (ERSE) has published a Plan for the Promotion of Efficiency in the Consumption. Also in 2006 were approved new versions of the Regulation on Thermal Characteristics of Buildings and the Regulation on Energy and Acclimatization System. These two regulations, about 40% stricter than the older versions, foresee the introduction of solar panels for water heating in all public buildings built from 2006 onwards.

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4.3 Generation Side Energy Efficiency

a. Energy efficiency improvement in the electricity generation sector by reducing grid losses

Grid losses in electricity transmission and distribution induce increases in generation, thus increasing GHG emissions and higher fuel consumption. This measure is under way by the concessionaires of the electricity transmission and distribution networks and the Energy Regulator, in order to evaluate technical measures to reduce grid losses.

The obligation is to reduce the rate of losses in the electricity transmission and distribution networks by 8% in 2010. This measure will have as a consequence an expected GHG emission reduction of 146 ktCO_{2eq}.

Measure Assessment		
WEC CRITERIA	EVALUATION	COMMENTS
Accessibility	**	Some of the measures for implementation have very high investment costs
Availability	**	All the technological measures to achieve the target, mainly in the high-voltage grid, are already used. There is some potential to use some measures in the distribution network.
Acceptability	-	Not applicable

b. Energy efficiency improvement in the electricity generation sector by fuel switching

Since 2001 Portugal began to invest in less polluting natural gas combined cycle power plants, with two natural gas combined cycle power plants, one in the north (near Oporto) and another in the south (near Lisbon). In the next years, the increase of new thermal capacity will be made with natural gas combined cycle power plants, which will replace mainly existing oil power plants that are less competitive and more polluting. Until 2010, Portugal intends to build 8 new natural gas combined cycle power groups, representing 3200 MW of new installed capacity by 2010. Additionally Portugal has also set a reserve of 800 MW, in order to integrate a Clean Coal Power Plant from 2014 onwards.

Measure Assessment		
WEC CRITERIA	EVALUATION	COMMENTS
Accessibility	***	Natural gas power plants are nowadays a competitive investment, but due to volatile costs of this fuel, the competitiveness of this technology can have fluctuations.
Availability	***	Natural gas is an exogenous resource, and therefore it increases Portugal external energy dependency.
Acceptability	****	Combined Cycle natural technology has more public acceptance when compared to coal or oil.

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c. Energy efficiency improvement in the energy supply systems, considering electricity generation from co-generation

The main advantage of co-generation systems is that they can provide a distributed generation system, which can induce energy savings. The Portuguese NCCP sets a target of 18% of the gross national electricity consumption being generated from co-generation systems, by 2010.

Measure Assessment		
WEC CRITERIA	EVALUATION	COMMENTS
Accessibility	***	It's a mature technology very useful in some industrial sectors. The Portuguese tariff system for Special Regime Generators has also developed the use of this technology.
Availability	****	Co-generation provides a reliable supply not subject to intermittency problems. High potential to use this technology in some industry sectors and applications.
Acceptability	*****	Well accepted by the public

4.4 Cross-cutting policies and measures

Additionally to the policies and measures described above, the implementation of the EU-ETS is thought to be one of the major instruments in the Portuguese Climate Change Strategy.

a. European Union Emissions Trading Scheme

2005 was the first year of the EU-ETS. In Portugal, 244 installations were involved in this scheme, with a total CO₂ allowances allocation of 36,90 MtCO₂/year. Energy sector installations represent more than 55% of the total CO₂ allowances allocated for the 1st period of the EU-ETS.

The National Allocation Plan for the period 2008-2012 (PNALE II) stipulates a cap of 32,82 Mt CO₂/year, and it covers 228 installations. As said above, this document is in a revision process.

Measure Assessment		
WEC CRITERIA	EVALUATION	COMMENTS
Accessibility	***	This scheme is mandatory for all combustion installations with a installed capacity higher than 20 MW.
Availability	-	Not applicable
Acceptability	***	Market instruments are well accepted by the economic agents, because they are a cost-effective to achieve environmental targets that are defined

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b. Use of Kyoto Mechanisms

The Portuguese NAP II also foresees the use of other Kyoto Project Mechanisms, in order to achieve the target set out in the Burden Sharing Agreement. To do so, the Portuguese Government created in 2006, the Portuguese Carbon Fund. The purpose of the Fund is to invest in Kyoto Protocol mechanisms in order to achieve a reduction of 3,72 MtCO₂/year.

Measure Assessment		
WEC CRITERIA	EVALUATION	COMMENTS
Accessibility	***	These mechanisms promote technology transfer and the development in developing countries. Some bureaucratic problems can have consequences in the development of these projects.
Availability	-	Not applicable
Acceptability	***	There is a increasing demand that the most part of the effort to reduce GHG must be made with domestic measures, which means direct reduction measures.

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5. Summary of the Assessment of Policies and Measures regarding Climate Change

Table 3 summarises all the assessment made of the Portuguese Climate Change measures applied in Portugal, with the 3 A's criteria set by WEC.

Table 3 - Summary of the assessment

Measure	Accessibility	Availability	Acceptability
Promotion of energy generation from renewable energy sources			
Promotion of wind power for electricity production	***	***	****
Promotion of hydro for electricity production	****	****	***
Promotion of biomass for energy production	***	****	*****
Promotion of other renewable energy sources for electricity production	*	****	*****
Generation Side Energy Efficiency			
Energy efficiency improvement in the electricity generation sector by reducing grid losses	**	**	-
Energy efficiency improvement in the electricity generation sector by fuel switching	***	***	****
Energy efficiency improvement in the energy supply systems, considering electricity generation from co-generation	***	****	*****
Cross-cutting policies and measures			
European Union Emissions Trading Scheme	***	-	***
Use of Kyoto Mechanisms	***	-	***

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