



**“WISE PLANS”**  
**Co-operation between communities for Energy Action Plans**

Project – EIE/05/217/SI2.420182

Action: HKA1 – Sustainable Energy Communities

**Deliverable D5**  
**Report on the review of sustainability and energy plans**



**Green Land**



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**SUMMARY**

Seven partners (see Acknowledgements) are working together on a project called “*WISE Plans*”, within the European Commission’s Intelligent Energy - Europe Programme, to establish local Sustainable Energy Action Plans in parts of four countries: Wales, Italy, Sweden and Spain.

This report constitutes Deliverable D5 of the project; it describes a review of policies and plans that are relevant to the development of sustainable energy, with particular reference to the rational use of energy (energy-saving measures), and the substitution of fossil fuels with sources of renewable energy.

The report is based on information that was current in May, 2006 and, as the relevant policies and plans, and the laws that support them, are evolving rapidly, this document should not be used as a reference without consideration for these points.

**ACKNOWLEDGEMENTS**

This report has been assembled from information provided by the seven partners in the project:

Parco del Ticino (PDT), Italy.

Comitato Termotecnico Italiano (CTI), Italy.

Fundación Doñana (FDO), Spain.

Agenzia Andalus de la Energia, Spain.

City and County of Swansea (CCS), Wales.

Green Land Reclamation (GLR), Wales.

Skellefteå Kraft (SKE), Sweden.

**LIST OF ABBREVIATIONS**

AEEG	Authority for Electricity and Gas (Italy)
AONB	Area of Outstanding Natural Beauty (UK)
CCA	Climate Change Agreements (UK)
CCL	Climate-Change Levy (UK)
CCS	City and County of Swansea (UK)
CHP	Combined heat and power
CTI	Comitato Termotecnico Italiano (Italy)
DEFRA	Department of the Environment, Food and Rural Affairs (UK)
D-ERES	Directive on the promotion of electricity from renewable energy sources
DTI	Department of Trade and Industry (UK)
EA	Environment Agency (UK)
EEC	Energy Efficiency Commitment (UK)
EIA	Environmental impact assessments
EST	Energy Savings Trust (UK)
EU MS	European Union Member States
EU-ETS	European Union's Emissions Trading Scheme
FDO	Fundación Doñana (Spain)
GHG	Greenhouse gases
GLR	Green Land Reclamation (UK)
GRTN	Italian Independent Electric System Operator
HECA	Home Energy Conservation Act (UK)
HEES	Home Energy Efficiency Scheme (UK)
LPG	Liquefied petroleum gas
MAP	Ministry of Productive Activity (Italy)
MBT	Mechanical/biological treatment
MTCe	Million tonnes of carbon-equivalent
NAP	National Allocation Plan
NFFO	Non-Fossil Fuel Obligation (UK)
ODPM	Office of the Deputy Prime Minister (UK)
PDT	Parco del Ticino (Italy)
PER	Plan for Renewable Energies (Spain)
PFER	Plan for the Development of Renewable Energies (Spain)
PLEAN	Andalusian Energy Plan (Spain)
PPS	Planning Policy Statement (UK)
PV	Photovoltaics
REE	Electricity Grid (Spain)
RES	Renewable-energy sources
RO	Renewables Obligation (UK)
ROC	Renewables Obligation Certificate (UK)
RSL	Registered Social Landlords (UK)
RUE	Rational use of energy
SEAP	Sustainable Energy Action Plans

SKE	Skellefteå Kraft (Sweden)
SME	Small/medium enterprise
SOD	Sociedad para el Desarrollo Enenergetico de Andalucia (Spain)
SRF	Solid recovered fuels
TAN	Technical Advice Note (Wales)
TGC	Tradable Green Certificates (Italy)
TOE	Tonne of oil-equivalent
UDP	Unitary Development Plan (UK)
WAG	Welsh Assembly Government
WHQS	Welsh Housing Quality Standard
WID	European Directive on the incineration of wastes

## **1. INTRODUCTION**

Seven partners (see Acknowledgements) are working together on a two-year project called ‘*WISE-Plans*’, within the European Commission’s (EC’s) Intelligent Energy - Europe Programme to establish local Sustainable Energy Action Plans (SEAPs) in parts of four countries: Wales, Italy, Sweden and Spain. The action started on the 1<sup>st</sup> January, 2006, and hence it will be completed by the 31<sup>st</sup> December, 2007.

This report describes a review of policies and plans that are relevant to the development of sustainable energy, with particular reference to the rational use of energy (energy-saving measures) and the substitution of fossil fuels with sources of renewable energy. The report will form the basis of Deliverable D5 of the project, which is to be completed by the end of May, 2006.

Section 2 briefly describes the territories to be studied in the four countries, Section 3 sets the broad context for such policies and plans, taking account of decisions taken at the international and European levels. Sections 4, 5, 6 and 7 respectively extend that background of information to Wales, Italy, Sweden and Spain.



## 2. BRIEF DESCRIPTIONS OF THE TERRITORIES TO BE STUDIED

### 2.1 Swansea

The City and County of Swansea (CCS) is the local authority for the Swansea area of South Wales. Located by the sea, Swansea is the largest urban centre in South West Wales, and provides shopping, leisure, cultural and educational facilities that serve the whole area. Swansea covers an area of 378 km<sup>2</sup> and has a resident population that is currently estimated at 224,500 (7.6 per cent of the population of Wales); there are 113 identified communities within its boundaries. Whilst the majority of the population live within the city's boundaries, approximately 80 per cent of the area of CCS is rural in character and 50 per cent of that rural part provides habitats for wildlife that of international importance and are thus protected under European and UK legislation. To the west of the city lies the Gower Peninsular - the first recognised Area of Outstanding Natural Beauty (AONB) in the United Kingdom. To the north of the city lies the Mawr area, a region that is characterised by livestock-farming and open hillside, much of which is common land\*. There are a number of rural towns and smaller settlements within the countryside areas.

*Note: \*pieces of common land in England and Wales have single, registered owners, but some other people may have rights on that land, for example to graze cattle , sheep, horses, etc., or to collect wood or peat, etc. The term "common land" does **not** mean that everyone has a right of access to it.*

Swansea was a leader in heavy industry during the 19<sup>th</sup> Century, but that business steadily declined during the 20<sup>th</sup> Century, so the County was left with an industrial legacy of a degraded environment and was then inhabited by disadvantaged communities. In the mid-1960s, a series of major reclamation and regeneration projects were initiated, so the last 40 years have seen Swansea start to rise as a modern, post-industrial city of the 21<sup>st</sup> century. Despite this a significant proportion of Swansea's communities are still facing disadvantages. Thus CCS is currently developing a number of regeneration strategies, some of which are supported with European funds from the Objective-1 Programme.

The Community Plan for Swansea identifies sustainable development as one of its cross-cutting issues and the environment is one of its key themes. The sustainable use of resources and the creation and support of better houses and other buildings is one of the significant challenges identified by the Plan.

The plans for significant re-development of Swansea and its suburban areas and investment in the rural areas presents a number of potential opportunities for the development of rational uses of energy and the development of renewable energy sources.

In the WISE-Plans project, Swansea and its partners will develop a SEAP that will seek an integrated solution for a sustainable future by reducing its emissions of Greenhouse Gases (GHG) and use of resources. The focus will be on becoming a Sustainable Energy Community, and thus contributing to the regeneration of the City and County of Swansea.

Swansea's SEAP will include a series of strategic, high-level actions for the whole of CCS's area. To maximise the Plan's capacity to reduce Swansea's use of fossil fuels, priority areas for targeted action will be identified.

## **2.2 Ticino**

Ticino Park is situated in the north-west area of Lombardy Region and covers an area of about 91,000 hectares; it includes 47 municipalities in three provinces and has a total of about 448,000 inhabitants. The territory consists of:

- (a) about 22,000 ha (24 per cent), of natural reserves and protected areas, including the river and forests;
- (b) about 48,000 ha (53 per cent) of other rural areas with agricultural and forestry activities, 29,000 ha of which are cultivated with corn and rice; and
- (c) about 21,000 ha (23 per cent) of productive (industrial and agro-industrial) and urban areas.

In relation to these different types of territory, PDT is promoting energy-planning through different methods. First, as the institutional body having responsibility for the protected natural areas in Ticino Park, PDT is promoting energy-sustainability for these areas by planning actions to: (a) evaluate and reduce environmental impacts of infrastructure (e.g. thermoelectric plants); (b) evaluate, and directly lead, the utilisation of the resources of renewable energy within natural areas (e.g. by the correct exploitation of residues from forestry-management; river-flow and solar energy). Secondly, as an organisation that provides recognised leadership to farmers and farming associations, and having important co-operations with them, PDT intends to promote energy-sustainability for agricultural areas by planning actions to evaluate the potential for resources of biomass (including solid and liquid biofuels, and biogas, and activate their widespread exploitation to (a) sustain agriculture, (b) reduce the cost of energy and (c) create new sources of income for farmers.

Thirdly, as a public institution having a certain reputation and some persuasive power over the provinces, municipalities and energy actors (e.g. power producers, etc.) within its borders, PDT intends to promote energy-sustainability for urban/industrial areas by planning actions to rationalise supply and demand of energy services in industrial sites (e.g. by developing co-generation, district-heating and utilisation of biomass-residues) and elsewhere (e.g. by introducing energy-saving measures in civil buildings).

These three domains will be given due regard when providing guidelines for the replication of energy-planning in mixed natural, rural and urban areas. Moreover, PDT will use its seven Park Centres, which are visited by 50,000 persons a year and which are strictly connected to local communities and cover the entire Park territory, as reference-points to draw local stakeholders into the process of energy-planning and also, in some cases, to demonstrate the practical realisation of the above-mentioned actions.

### **2.3 Skellefteå**

The large municipality of Skellefteå is located in the north-east of Sweden, in the region of Vasterbotten; it covers an area of 7,217 km<sup>2</sup> and has a population of 71,800, and borders the Baltic Sea. The city of Skellefteå itself has a population of about 35,000 and is a modern place with full facilities, including an airport (the flight-time to Stockholm is one hour). About two-thirds of the countryside is forested and 20 per cent is covered by mires and rocky areas; only about 5 per cent of the land is used for agriculture.

Five large rivers flow through the municipality; there are 1,463 lakes, 23 reserves and conservation-areas and 739 farms. Along the coast of the Gulf of Bothnia there are several important sites for birds.

The municipality's administrative organisation (Skellefteå Kommun) is the largest employer in the district, having about 8,100 employees, 10 per cent of which have temporary jobs; 80 per cent of its employees are women.

Skellefteå's largest industries are associated with mining, forestry and wood products and energy. The largest private-sector employer is Boliden AB, which is an international mining company. It has an annual turnover of 2 billion Euros/year, 4,500 employees worldwide, and 1,225 employees in the area – there are several gold mines in Skellefteå.

Skellefteå Kraft (SKE), the next largest employer with 405 employees, is the fourth largest energy-utility in Sweden, and is wholly owned by the municipality. It has more than 20 hydro-power stations in the Skellefteå River and other waterways, and it also has some of the best examples in Europe of wood-fired power stations, district-heating systems, and systems for producing and using wood-pellets. It has an established reputation for applying high technology and for delivering green heat power with low environmental impacts and at competitive prices.

An organisation called Skeria, which has links with the Universities of Luleå and Umeå, promotes higher education, research and the development of skills in high-tech subjects and has a campus in the city that serves 2,200 students. Topics for research are focussed on various aspects of forestry and wood-products, which are Sweden's most important exported commodity.

At Hedensbyn, on the outskirts of city of Skellefteå, a power station fuelled with wood and some peat produces 36 MW of electricity, and puts about 60 MW of heat into the city's district-heating grid. An integrated plant at the same site produces over 100.000 tonnes a year of wood-pellets.

Although these systems have helped to achieve a high level of penetration of RES into local and more distant markets, especially in publicly-owned buildings and residential houses, some of the local industries have, until now, persisted in the use of fossil fuels. But the increasing price of oil has caused them to consider the possibility of connecting to the local district-heating grid. The retention of industry and the associated employment of local people in high-grade jobs are vital considerations in the local economy. So now more effort is needed to resolve important questions arising from a proposal to connect a large industrial user of fuel (presently oil) to an existing heating grid.

## 2.4 Doñana

Doñana is a terrain of high ecological value whose protection is of paramount importance; this accounts for the establishment of the national park, which surrounds protected areas and tourist cores that have experienced a number of conflicts in the context of development during the last decades.

The National Park of Doñana is located in the south-west of the Iberian Peninsula, between the provinces of Huelva and Seville, and is bounded by the Atlantic Ocean and the river Guadalquivir. To the north, it borders with the towns of Almonte, Hinojos, Aznalcázar and Puebla del Río; the south part is separated from Sanlúcar de Barrameda (Cádiz) by the river Guadalquivir. These lands were declared a national park in 1969. The UNESCO has granted to the Park the title of “*Reserve of the Biosphere*”, and in 1995 it became a “*World Heritage site*”.

Doñana has an area of over 280,000 ha, and about 160,000 inhabitants. Within it are: (a) a National Park of 54,251 ha, and (b) Natural Park of 53,000 to 54,000 ha, the areas of which overlap. A substantial amount of land is devoted to agriculture: (a) 7,029 ha are in “*ecological production*” of strawberries, olives and grapes, and (b) 18,852 ha are in “*integrated production*” of strawberries, rice and olives. In the vineyards, about 2,700 producers are active.

Tourism draws over 4 million visitors each year; research shows that 73 per cent of tourists are attracted by the seaside, while the balance is accounted for by nature, culture, sports and education.

The protection and maintenance of environmental quality is central to the goals of environmental conservation and sustainability of resources. This presents major challenges, for example in finding effective ways to reduce conflicts; increasing the compatibility of the several interests is to be achieved through building understanding, and then applying planning and a form of management that is grounded in environmental concepts and which allows for sustainable development. It was in that context that the need to harmonise the administrative and territorial system of such a valuable area as Doñana gave rise to the creation of the Sustainable Development Plan (SDP), within which tourism and agriculture are seen as the key sectors for the socio-economic development of the area.

The SDP has fostered the correction of structural, economic and social deficits, as well as reconciling the interests of the local population in promoting developments with those of nature-conservation. The Plan relies heavily on the inclusion of the small and medium enterprises (SMEs) in the strategy and programmes directed to sustainable development, through “*Etiqueta Doñana 21*”, a system of certification of companies. This label is of special interest, because it denotes Doñana as a model of sustainable development.

In this project, FDO and its partners will develop a SEAP that will fill a gap in its own Plan by addressing energy-related issues. To that end, consideration will be given to the various sectors and location (rural and protected natural spaces) within 14 municipalities throughout the provinces of Huelva, Seville and Cádiz, but giving priority to the municipalities of Almonte, Hinojos and Aznalcázar, which are directly linked to the national park. The main aim is to help businesses to use energy efficiently, and to benefit the environment through reducing waste and energy-consumption by the rational use of energy (RUE), developing sources of renewable energy (RES).

### 3. POLICIES AT THE INTERNATIONAL AND EUROPEAN LEVELS

#### 3.1 International policies

The readers of this report will be well aware that the broad consensus of relevant scientific opinion is that, to avoid disasters that will otherwise grossly damage human life and wellbeing, property and wild-life, concerted global efforts must be made to reduce emissions of GHG by developing and deploying RUE and RES, thereby greatly reducing the use of fossil fuels.

One or two decades ago, when public awareness of these issues was dawning and growing, support began to accumulate for a broadly-based carbon-tax, or derivatives from that basic concept, and several countries have adopted such a policy. But this idea was resisted by the American administration and by other powerful lobbies in the discussion leading to the Kyoto Protocol. The arguments levelled against the carbon-tax included:

- (a) It would be difficult to reach a global agreement on a single tax, and thus industrial competitiveness would face damage in those countries that imposed the tax at a given level while others imposed it at a lower level, or not at all.
- (b) It would fall with unfairly harsh impacts on the “*fuel-poor*”, i.e. both the inhabitants of undeveloped nations (some of whom are already facing extreme privation), and some sections of the people in wealthier nations, such as the UK.
- (c) A simple carbon-tax would not take account of other GHG (although, of course, that point could easily be dealt with).

These arguments were successfully deployed to build a wide (but not complete) consensus in favour of a kind of rationing system for emissions of GHG, which is sometimes referred to as “*cap and trade*”, as a basis for the Kyoto Protocol of 1997, which has been brought into force by the Conference of the Parties to the Climate-Change Convention that was held in Montreal in December, 2005.

A weakness of the cap-and-trade approach is the cost of delivery - the Kyoto Mechanisms carry with them a complex and costly bureaucracy that would be unnecessary with a simple carbon-tax collected by systems that are already in place. Nevertheless, the Mechanisms represent virtually the only basis for nearly global co-operative action today.

The USA and Australia are notable exceptions to the large number of countries who have moved forward together in this context, preferring a policy of promoting technologies to deal with climate-change. President Bush has made it plain that he will not espouse any policy that will threaten the standard of living (in terms of their incomes and freedom to run large cars on cheap petrol) of US citizens. Nevertheless, several individual US states are prepared to work with the cap-and-trade approach.

The Kyoto Mechanisms are binding on those richer countries, including the UK and other members of the European Union (EU), which have agreed to be listed in Annex 1 of the Protocol. These industrialised countries must to cut their combined emissions of GHG to at least 5 per cent below the levels of 1990 by 2008 to 2012. The total emissions of the 15 countries that were Member States (MS) of the EU in 1997 have to be reduced by at least 8 per cent (although some MS are allowed increases – see Section 7). The UK has an aspirational target for a cut of 20 per cent by 2010, and references are often made to the Royal Commission on Environment Pollution's recommendation (2000) for a 60-per-cent cut by 2050.

### **3.2 European policies**

The EC has at least two important roles within the context of this report: (a) it proposes European policies, laws (Directives) and other measures, and (b) it manages a large budget for research, development, demonstrations, education and other related activities. The European perspective here emphasises: (a) the security of supplies and the reduction of reliance on imports; (b) RUE and (c) RES.

The signature by the EU of the Kyoto Protocol, and the papers relating to its subsequent implementation at Montreal, required subsequent European measures to ensure compliance by MS with the commitments undertaken on their behalf. One such measure is the European Union's Emissions Trading Scheme (EU-ETS), which was established by Directive 2000/87/EC.

#### **3.2.1 The EU-ETS**

EU-ETS began on the 1<sup>st</sup> January, 2005; its first phase will run until the end of 2007 and then a second phase will run from 2008 to 2012 to match the Kyoto Commitment Period. Further five-year phases can be expected. The Governments of EU MS are required to impose caps on emissions of GHG from all installations covered by the Scheme.

A tradable allowance is allocated to each installation for its relevant emissions for each phase of the ETS. A record of these allowances is recorded in a National Allocation Plan (NAP). Trades can be made between parties who have kept below their caps (and thus have credits) and those who have exceeded their caps (and thus need to acquire credits to avoid fines). Those parties that are not covered by the scheme can also open an account with the central Registry that monitors the Scheme, and to buy and sell allowances. In the UK, the relevant part of the Registry is operated by the Environment Agency (EA).

MS must ensure that each installation covered by the Scheme has a Greenhouse Gas Emissions Trading Permit – a licence to operate and to emit carbon dioxide (CO<sub>2</sub>). Allowances are allocated annually before the 28<sup>th</sup> February and, before the 30<sup>th</sup> April of the following year, the operator of each installation must surrender a number of allowances equal to the quantum of emissions in the preceding calendar year. Emissions from each installation must be independently verified; the result of the verification must be submitted to the relevant Regulator (again the EA in England and Wales) by the end of March each year. A quantum of allowances equal to these verified emissions will be retired each year.

Penalties will be levied at the rates of 40 Euros/tonne of CO<sub>2</sub> in Phase 1, and 100 Euros/tonne of CO<sub>2</sub> in Phase 2, on those emitters of CO<sub>2</sub> that exceed their allocated allowances, unless they have purchased allowances elsewhere. Some trading in carbon/CO<sub>2</sub> began internationally before EU-ETS established a fully functional market, and prices reached 20 to 30

Euros/tonne of CO<sub>2</sub> in 2005. However, in May, 2006, they fell to around Euros/tonne as it became clear that some MS had issued more allowances than their industries needed.

In February, 2005 the UK proposed to the EC a revised National Allocation of 756.1 million allowances for Phase 1, to be shared among a large number of emitters of (CO<sub>2</sub>); after a legal argument, this was accepted. The four main categories of industries affected are:

- (a) Energy activities, including combustion (over a certain threshold of output), mineral oil refineries and coke-ovens.
- (b) Production and processing of ferrous metals.
- (c) Mineral industries, including the manufacture of cement, lime, glass and ceramics.
- (d) Manufacture of pulp, paper and board.

Temporary exemptions for many installations within these categories have been negotiated for Phase 1, but those will be removed for Phase 2. Phase 2 is still being developed but indications have been given of the UK's intentions to support *inter alia* the inclusion of (a) GHG other than CO<sub>2</sub>, and (b) emissions from aviation.

### **3.2.2 Other relevant European policies**

Other European Directives that are especially relevant to this report include:

- (a) The Directive on the landfill of waste. 1999/31/EC.
- (b) The Directive on the incineration of waste. 2000/76/EC.
- (c) The Directive on the promotion of electricity from renewable energy sources. 2001/77/EC.
- (d) The Directive on the energy performance of buildings. 2002/91/EC.
- (e) The Directive on the promotion of biofuels or other renewable fuels for transport. 2003/30/EC.
- (f) The Directive on waste. 2006/12/EC.
- (g) The Directive on energy-efficiency and energy services. 2006/32/EC

Directives require a rather long process of development, usually beginning with a proposal from the EC, but thereafter passing through the procedures of the European Parliament, and then through those of the European Council of Ministers. The EC can, however, move more swiftly to publish their influential Communications to the Council and the Parliament, which may be White Papers that contain proposals for action, or Green Papers that set out ideas for discussion. The following Communications are among those that are particularly relevant to this report:

- (a) White paper: an energy policy for Europe. COM 1995/682.
- (b) Communication on energy for the future: renewable sources of energy. White paper for a Community Strategy and Action Plan. COM 1997/599.
- (c) Communication on the implementation of the Community Strategy and Action Plan on Renewable Energy Sources (1998-2000). COM 2001/69.
- (d) White Paper: European transport policy for 2010: Time to decide. COM 2001/370.
- (e) Communication on the share of renewable energy in the EU. COM 2004/366.
- (f) Green Paper on energy efficiency. Doing more with less. COM 2005/265.
- (g) Communication on the support of electricity from renewable sources. COM 2005/627.
- (h) Communication on the Biomass Action Plan. COM 2005/628\*

*Note: \*because biomass represents a very considerable potential resource of RES, and yet progress has been very slow on exploiting that resource in many MS, this communication is especially important in the context of this project, and thus a “summary of measures” that are being planned by the EC is reproduced in Appendix 1.*

Quite a wide range of European measures impinge on sustainable energy, including those that provide (a) regional support and (b) part-funding for research, development and demonstration programme and related activities for education and dissemination of knowledge. The WISE-PLANS Project is an example of such measures, and could lead on to capital support for infrastructure, as is provided for within the EC’s CONCERTO Programme.



#### 4. POLICIES AND PLANS IN THE UK, WALES AND SWANSEA

The UK's economy is the fifth largest in the world (having recently been overtaken by China's), and its economy is growing. Its population is roughly 60 million and that number is also growing.

According to statistics published by the Department of Trade and Industry (DTI), in 2004, about 365 million tonnes of oil-equivalent (MTOE\*) of primary fuels were produced or imported, and about 174 MTOE\* were consumed. The difference was made up of about 116 MTOE of exports and storage in marine bunkers; about 74 MTOE of losses in conversion and distribution of energy and in internal use by the energy industry; and about 12 MTOE in non-energy uses (e.g. in the manufacture of chemicals and plastics). Including system-losses, but not exports, storage or non-energy uses, it can be estimated that the average *per-capita* use of primary fuels by the population of the UK (now about 60 million people) is about 4.2 TOE/year.

*Note: \* 1 MTOE is equivalent to 11.63 TWh.*

In 2003, the Government set out in its White Paper "*Our energy future – creating a low-carbon economy*" policies emphasising the development of RUE and RES in achieving the goal to reduce the UK's emissions of fossil CO<sub>2</sub> by 60 per cent by 2050, with "*real progress*" by 2020, while maintaining security of supplies, maintaining sustainable economic growth, and to get rid of "*fuel-poverty*".

Also in 2003, a Sustainable Energy Act was passed, which required annual reports to be made by the relevant Secretary of State on "*progress towards sustainable-energy aims*", and the publication of "*at least one energy-efficiency aim*" for residential accommodation in each of England and Wales. The Act also gives power to the relevant Secretary of State to require "*Energy Conservation Authorities*", which were established by the Energy Conservation Act, 1996\*, to take such measures that "*are likely to result in achieving ... an improvement ... in the energy efficiency of residential accommodation; and [be] practicable and cost-effective*". This has resulted, for example, in the Policy Agreements in Wales referred to in Section 4.5.

*Note: \*attention should also be paid to the Home Energy Conservation Act (HECA), 1995; reference to it will be made in Section 4.5.*

In the Energy Act, 2004, the duty on the relevant Secretary of State to give an annual report was made more specific in several respects, and was extended by the requirement to publish a strategy for the promotion of microgeneration\* in Great Britain.

*Note: \* this term means the use of any plant to produce electricity and/or heat from solid biomass, liquid biofuels, fuel-cells, photovoltaics (PV), water (including waves and tides), wind, solar power, geothermal sources, combined heat-and-power sources, etc.*

In the past six months, there has been a great resurgence of political interest in energy, because of (a) several examples of instability in markets and fears that, for example, supplies of gas might fail, and (b) accumulating evidence of climate-change. Supporters of nuclear energy have seized upon this opportunity for the debate on the fate of the nuclear industry (which will slowly decay to nothing unless policies are changed). As a result, in January, 2006 the Government put in hand another review "*Our energy challenge – securing clean, affordable energy for the long term*", and Ministers stated that all aspects of energy-policy were open for debate.

The Climate Change and Sustainable Energy Bill started as a Private Member's Bill, but has gained substantial report and is now fairly close to being enacted (it has passed through the House of

Commons and seems unlikely to be obstructed in the House of Lords). It can be seen as a further step towards action, rather than action

*per se*: it will provide for (a) annual reports to Parliament on steps taken by Government Departments to reduce emissions of GHG and the levels of GHG in the UK; (b) national targets for microgeneration; (c) modification of other laws to assist microgeneration, including a review of planning law in England, and a small change to Building Regulations; (d) reductions in carbon emissions by gas transporters and suppliers, and electricity distributors and suppliers (this refers also to microgeneration); (e) promotion of community energy schemes; (f) powers of Parish Councils and Community Councils (the lowest tier of local government); (g) renewable heat; etc.

In March, 2006 DTI published its “*Microgeneration Strategy*”, announcing a new system of grants was set up - the *Low Carbon Buildings Programme* will encourage both energy-efficiency and microgeneration technologies, and will allocate £80m of grants over a period of the three years 2006 to 2009. In April, 2006, the Government also published its response to the report of the Biomass Task Group

It is quite difficult for a general reader to keep track of all of the relevant changes in policy that the Government are considering in this field. Within a year or so of the period of this project, there have been, are or will be: (a) reviews by DTI of the Renewables Obligation (see Section 4.1) and of energy policy generally (see above); (b) a consultation by DTI on microgeneration-strategy and a low-carbon building programme (see above); (c) a review of its Climate Change Programme by the Department of the Environment, Food and Rural Affairs (DEFRA)\*; (d) the issue of an upgraded version of Building Regulations (see Section 4.3); (e) a consultation on a *Code for Sustainable Homes* for the Office of the Deputy Prime Minister (ODPM); (f) publication of the ODPM’s *Sustainable Development Action Plan* (which promises a wide range of changes, for example in the field of planning consents); (g) the Stern Review for H.M. Treasury of the costs of climate-change; (h) an “*innovation review*” in the field of RUE, carried out in 2005, as a joint initiative of H.M Treasury and DEFRA and (i) a review of wastes-disposal policy for England recently announced by DEFRA.

*Note: \*in March, 2006,DEFRA published its UK Climate Change Programme 2006*

Although the recent trend of the Government’s policies and actions on climate-change has been towards a complex mixture of a regulatory approach with cap-and-trade measures aimed at various aspects of RUE and RES, the UK does impose relevant taxes in some sectors; Excise Duties are levied on transport-fuels- see Section 4.2, and the so-called Climate-Change Levy (CCL) is applied to the electricity and fossil fuels used by industrial sector (until recently it has been charged at about 0.72 Eurocents /kWh for electricity and about 0.25 Eurocents/kWh for gas). Increases in the rates of CCL from April, 2007 have been recently announced.

The revenue from the CCL has been quite limited because 10,000 companies have negotiated large rebates by entering Climate Change Agreements (CCA), which require them to carry out reductions in their uses of fossil fuels. According to the recent Budget Speech of the Chancellor of the Exchequer, the CCL and the CCA have already cut the UK’s emissions by a total of over 28 million tonnes of carbon, and are expected to contribute further cuts of 6 million tonnes in each of the next five years.

For the purposes of this report, it is perhaps helpful at this point to consider a rather oversimplified picture of the way in which energy is used, and to state that, roughly speaking, energy-use is split into more-or-less equal thirds for three categories (a) the generation of electricity, (b) transport and (c) space-heating. Each of those categories has special characteristics and, although there are

theoretical possibilities for interchanges (e.g. using electric vehicles), they bring considerable complexity into the picture.

The UK's policies on energy and related matters are obviously closely constrained by the relevant, existing European laws and policies, and indeed by proposals by the EC for further actions, but some parts of policy and of the market have gone through a sea-change as a result of the privatisation of the electricity industry in 1989/90. Probably the most obvious changes are in (a) the ownership of the electricity industry and (b) its structure for pricing – see Section 4.1.

#### **4.1 Electricity**

Whereas, before 1989, virtually the whole of the UK's electricity industry was controlled within a single state-owned structure, it has been substantially changed by privatisation and now consists of the following main actors:

- (a) Some very large generating companies, all of which are also own integrated businesses for supplying electricity.
- (b) Some smaller generating companies, many of whom are producing renewable electricity; some of these are also suppliers of power.
- (c) Some independent suppliers.
- (d) The National Grid Company and eight other companies that own the transmission and local distribution networks.
- (e) ELEXON, the company that manages the arrangements for Balancing and Settlement of flows on electricity, within a competitive market, where supplies and demand vary constantly.
- (f) OFGEM – the industry's regulator.

According to the DTI's Digest of UK energy statistics (DUKES), in 2004, about 400 TWh\* of electricity were supplied and about 340 TWh were used (the difference being accounted for by losses in transmission and distribution). This means that the average *per-capita* use of electricity in the UK is about 5,700 kWh<sub>e</sub>/year, or an all-hours average of 0.64 kW<sub>e</sub>.

*Note.* \*1 TWh = 10<sup>9</sup> kWh.

For the purposes of this report, it is sufficient to consider the following sub-topics related to electricity:

- (a) Measures to promote electricity from renewable sources.
- (b) Incentives for combined heat and power (CHP).
- (c) Incentives for technologies for reducing power-consumption.

During the privatisation of 1989/90, it became clear (and as a shock to the then Government) that the nuclear part of the portfolio of generators could not be sold or otherwise funded in the open market because of the excessive costs and risks associated with it. To overcome that severe problem, the Government kept the nuclear generators temporarily in state-ownership, and put in place a mechanism that (a) forced the twelve regional, newly privatised, monopoly suppliers of electricity (which at that time were kept separate from the two large, privatised generators National Power and Powergen) to buy nuclear power at the enhanced price of about 10 Eurocents/kWh. That

mechanism was called the Non-Fossil Fuel Obligation (NFFO). The EC approved this mechanism to be applied as a temporary measure for eight years to allow the Government to build up a fund to pay for (some of) the previously hidden costs of nuclear power. The rules for NFFO allowed the suppliers to pass on their extra costs to their customers.

Until that point, apart from some long-established hydro-power stations that were commercially competitive with those using fossil fuels, there had been very little development of green electricity in the UK, partly because green technologies have higher costs and also because the terms of operation allowed to private-sector generators were unfavourable before 1990. Once NFFO had been established for nuclear power, however, the smaller generators who wanted to develop green power successfully lobbied for its extension to renewables, and several *tranches* of NFFO for green power were issued by the Government over the coming years.

The essence of NFFO for renewables in England and Wales was competitive bidding by aspirant developers within technology-bands; successful bidders received contracts (originally for eight years, but later for 15 years) at fixed prices, with corrections for inflation; the prices varied according to the technology. The NFFO for renewables led to some initial developments, especially in the area of wind-power, for which especially favourable starting conditions were created, and for some kinds of power from biogas, especially landfill gas.

In all, about 400 projects received NFFO contracts but, despite attempts to promote a range of technologies, the emphasis was on continuous convergence of electricity-price with that of the major generators using fossil fuels, so there was little room for innovation apart from selected projects that benefited from grants under the research and development programmes of the EC and the UK. But those programmes hardly produced any progress in the field, for example, of power from wood; even today in the England and Wales, biomass is represented only by a few stations burning straw and poultry-litter, and single station burning wood at Slough.

As already noted, the EC introduced in 2001 the Directive on the promotion of electricity from renewable energy sources (D-ERES), which is binding on the MS of EU-15, and introduced the concept of tradeable Green Certificates, which can bring extra income to producers of green power. At about the same time, the new Labour Government in the UK decided to replace the NFFO a more market-based financial instrument, the Renewables Obligation (RO). In introducing the preliminary consultation noted, the then Secretary of State for Trade and Industry, Stephen Byers, wrote: *“We ... feel that it is no longer Government’s job to pick winners or to introduce artificial distortions into the marketplace ... the future role of DTI will be one of action but not direct intervention ...”*.

The RO requires licensed suppliers of electricity to include within their supplies of power at least the percentages of eligible RES that are specified in the Orders that support the RO; the first two of such Orders were published in 2002 and 2004. The current target is 5.5 per cent for April/March 2005/6, and that for 2006/7 is 6.7 per cent; the Obligation will rise to 15.4 per cent by 2015/6. The eligible sources of renewable electricity currently include: landfill gas, sewage gas, hydropower with capacity exceeding 20 MW<sub>e</sub> commissioned after April, 2002, any hydropower less than 20 MW<sub>e</sub>, onshore and offshore wind-power, biomass (see below), geothermal power, tidal and tidal-stream power, wave-power and PV.

D-ERES proposes that Green Certificates should be issued for all power made from *“the biodegradable fraction of products, waste and residues from agriculture (including vegetal and animal substances), forestry and related industries, as well as the biodegradable fraction of industrial and municipal waste”*. In the UK’s RO, however, the scheme for eligibility is more complex:

- (a) The generation of electricity is always eligible in the cases in which the fuel is solely biomass. Until recently, a maximum limit of 2 per cent has been imposed on the energy content derived from non-biomass fractions (e.g. plastics) – see below.
- (b) In the case of co-firing (usually with coal), any biomass can be co-fired until the 31<sup>st</sup> March, 2009 with no minimum percentage of energy-crop; but, from the 1<sup>st</sup> April, 2009 until the 31<sup>st</sup> March, 2010, at least 25 per cent of the biomass must be from energy-crops; and, from the 1<sup>st</sup> April, 2010 to the 31<sup>st</sup> March, 2011, at least 50 per cent of the biomass must be from energy-crops; and from the 1<sup>st</sup> April, 2011 to the 31<sup>st</sup> March, 2016, at least 75 per cent of the biomass must be from energy-crops. Co-firing ceasing to be eligible after 31<sup>st</sup> March, 2016. The maximum percentages of any individual supplier's Obligation that can be met with ROCs for co-firing are: 25 per cent until the end of March, 2006; then, until the end of March, 2011, 10 per cent and, thereafter, 5 per cent.
- (c) In the case of mixed wastes, eligibility is restricted to power produced from the biodegradable fractions by “*advanced conversion technologies*” (ACT), i.e. *via* cycles including pyrolysis, gasification or anaerobic digestion.

The reasons given for introducing these rather complex rules include the need to support the introduction of (a) energy-crops and (b) more efficient technologies, but not much progress has yet been made with either of these aims, although public grants have been given to research and to specific demonstration projects.

The essence of the RO is that a generator of eligible green power is awarded an RO Certificate (ROC) for each MWh<sub>e</sub> generated, and suppliers are required to meet their Obligation by a combination of (a) generating their own green power, (b) buying ROCs from others, and/or (c) paying a buy-out price (BOP) of £30\* (about 50 Euros\*\*)/MWh<sub>e</sub> into a special fund, which is re-distributed to suppliers *pro rata* to the number of ROCs they have redeemed against their Obligation.

*Notes:*

1. \*inflated by the Retail Price Index.
2. \*\*in this report, a conversion-rate of 0.60 Pounds Sterling to 1 Euro is used.

The RO, which has completed its fourth year of operation, is managed by OFGEM; it can be calculated from data OFGEM's third annual report (2005) that, in 2004/5, the level of the Obligation met by the redemption of ROCs (rather than by paying the BOP) was about 70 per cent. In fact, the RO is constructed in such a way that there is always likely to be a shortfall of ROCs because, at the point at which the number of ROCs theoretically reaches the level of the Obligation at any particular time, the next ROC to be generated has a value of zero. Therefore, generators of green power have a built-in incentive not to generate too many ROCs, and the ensuing shortfalls of ROCs generates in a market for ROCs that sets a variable price for a ROC that is above the buy-out price. Each generator of green power then earns for each MWh<sub>e</sub> of that power the sum of (a) the electricity sale-price, and (b) the value negotiated for the ROC.

OFGEM's report gives useful data for the numbers of accredited power stations, their installed generating capacities and the ROCs awarded in 2004/5 for the green electricity generated using various technologies, which is reproduced here in Table 4.1.

**Table 4.1. Data for 2004/5 for the numbers (and generating capacities in kW) of power stations, and percentages of ROCs awarded to the various green technologies in the three countries of Great Britain.**

Type of technology	Stations in England	Stations in Scotland	Stations in Wales	Stations in Gt Britain	Percentage of ROCs awarded
Landfill gas	269 (619,059)	20 (44,309)	10 (19,921)	299 (683,289)	33.6
Co-firing	28 (1,168,705)	2 (3,4560)	0 (0)	30 (1,203,265)	19.5
Hydro	34 (13,543)	78 (439,032)	24 (75,802)	136 (528,377)	18.0
Onshore wind	70 (189,546)	38 (504,202)	27 (230,896)	135 (924,644)	15.9
Biomass	11 (147,725)	2 (12,677)	0 (0)	13 (160,402)	7.6
Offshore wind	3 (63,800)	0 (0)	1 (60,000)	4 (123,800)	2.6
Sewage gas	94 (74,793)	1 (1006)	6 (1,509)	101 (77,308)	2.3
Micro-hydro	18 (702)	31 (12,297)	4 (129)	53 (13,128)	0.4
ACT	3 (3,219)	0 (0)	0 (0)	3 (3,219)	0.1
Photovoltaics	12 (243)	1 (1)	0 (0)	13 (244)	0
Wave power	0 (0)	1 (750)	0 (0)	1 (750)	0
Totals (GW)	542 (2.28)	174 (1.04)	72 (0.39)	788 (3.72)	100

*Notes:*

1. The table is arranged to list the technologies in the order in which they produced most ROCs.
2. To be eligible for the RO, hydro-power stations have a declared capacity of less than 20 MW.

From the same data-source, it can be found that the total numbers of ROCs (including SROCs) that were issued in England, Scotland and Wales, respectively, in 2004/5 were approximately: 6.9 million, 3.1 million and 0.85 million, giving a total of about 10.9 million ROCs. If the population of the UK is assumed to be 58 million people, of which 50 million are in England, 5 million are in Scotland and 3 million are in Wales, then the ROCs (including SROCs) awarded in 2004/5 can be expressed by country in *per-capita* terms as: UK – 0.19, England – 0.14; Scotland – 0.62, and Wales – 0.28. The causes of the large differences between these ratios can possibly be explained by differences in policies adopted and by differences in geography.

In addition to the ROCs awarded to projects commissioned outside NFFO, ROCs are also awarded to the power produced from those other extant projects that are still subject to NFFO-contracts, but these NFFO-ROCs are then auctioned to suppliers, and the proceeds are then returned to H.M. Treasury (i.e. not to the generators of green power nor to customers for electricity).

This has had the effect of making it seem that support for green power is considerably higher than it actually is. As a result, the Public Accounts Committee of the House of Commons has criticised the RO as being too expensive a method of reducing emissions of fossil CO<sub>2</sub> and has pressed for ways of reducing that cost. For example, it has argued that, because of the savings made by replication, developers of land-based wind-power and power from landfill gas do not need so much subsidy.

In 2005, DTI carried out a review of the RO, as a result of which a third Renewables Order (2006) was published in March, 2006. It widens the eligibility of solid biofuels to allow 10 per cent of energy content derived from contamination (see above). Also, electricity from the combustion of waste for CHP has now been made eligible for ROCs according to a formula that takes account of both (a) the biodegradable fraction of the wastes and (b) the efficiency of the process in terms of the amount of usable energy (both electricity and heat) produced and used. The detail of this intention to take account of ‘*high-quality CHP*’ follows a practice used in the operation of the Climate Change Levy (CCL) – see Section 4.4, but the point of greater significance is the proposed

change of law, at least in this corner of the market, to allow combustion as a treatment-process on a par with pyrolysis, gasification and anaerobic digestion.

DTI has also made two other important announcements, that it intends to (a) reduce the value of the RO to developers of landfill-gas projects (but not to do so for wind-power) – see the remarks on the Public Accounts Committee, above; and (b) reconsider the rules for co-firing biomass with fossil fuels as part of the current Energy Review. These steps are unfortunate in the sense that they send signals to developers and their sources of funding the message that the Government may change the rules at will of an instrument that DTI claimed upon its introduction to be a market-oriented measure (see above).

At the end of March, 2006, suppliers of electricity faced a great reduction in the amount of their Obligation that they can fulfil with ROCs from co-firing (see the drop in the cap from 25 to 10 per cent, explained above). As the largest “suppliers” are mostly the same large companies that produce electricity by burning coal, they are unhappy about this and have been lobbying the Government to change the rules again in their favour.

On the 1<sup>st</sup> March, 2006, the Minister for Energy announced that, although no such change would be brought into the third Order, the issue would be included in the general review of energy being carried out now by the Government. This announcement has caused dismay among the smaller generators of green energy, because it could well destabilise the value of ROCs and diminish confidence among investors, etc.

The design of the RO does not favour more expensive or risky technologies; in Scotland it is proposed to award “double ROCs” to power from marine technologies (e.g. wave-power and tidal-stream machines) on the grounds that it will encourage new industries there. The UK Government has deployed some other devices to establish at least some examples of the various technologies, for example by giving capital grants by various routes. One interesting example is the use of money arising from the so-called BIG Lottery, which has several schemes for diverting some of its revenues to projects that are judged to be for the public good. For example, it runs “Awards for all”, from which grants of the equivalent of between about 800 and 80,000 Euros are made to community-based projects. Sometimes, much larger grants are given and, in March, 2006, a total of the equivalent of about 80 MEuros was allocated to wood-fired projects, large and small, and to an offshore wind-farm.

In 2000, the Government set a target to achieve by 2010 at least 10,000 MWe of installed capacity of “Good Quality CHP” (GQCHP). To help to achieve that target, the Government stated that, by 2010, at least 15 per cent of the electricity used in its own estate must be derived from GQCHP. And in April, 2004, Defra published the “Government’s Strategy for CHP to 2010”. That Strategy includes measures to support the growth of CHP capacity needed to meet the target, for example (a) allowing fiscal discounts (such as reductions in VAT and CCL); providing grants; and (c) including CHP in the measures considered in the CCA.

## **4.2 Transport**

The use in the UK of 56.8 MTOE of petroleum-based fuels for transport means that the average *per-capita* use of those fuels is roughly 1 TOE/year. Expressed in terms of litres of diesel-oil, this means an average annual *per-capita* use of about 1,200 litres/year. But levels of specific use vary greatly, depending partly on mode of transport; one key issue here is the rapidly growing use of air-transport, much of it for leisure-related journeys.

Whereas a kind of carbon-tax can be seen in the imposition of significant levels of Excise Duty on most petroleum fuels for road-going vehicles, aircraft fuels are exempt, and much lower rates of tax are charged on “*red diesel*” or gas-oil used in stationary plant and agricultural machinery, etc., and on heating-oils. Taxes on fuels are unpopular with farmers and road-haulage companies, which have several times organised protests of sufficient strength to cause the Government to moderate its previously declared intention to continue to increase such taxes. These taxes are summarised in Table 4.2.

High taxes on fuels for cars do not seem to have limited the appetites of many domestic users to buy and use large, heavy fuel-greedy vehicles. Sometimes the reason given for this is the need to have stronger (= heavier) vehicles to protect the occupants, but no doubt the whims of fashion are strongly influential. There is a very popular English television-programme (*Top Gear*), in which expensive, heavy, very fast and fuel-greedy cars are celebrated; there is no such widely popular support for sustainable transport.

Although sizeable lobbies exist to support the reduction of the use of private vehicles in favour of increasing the use of public transport (for example the so-called “*environmental non-governmental organisations*”), they seem to have made rather little impact, because the freedom to drive one’s car is widely cherished in most of Britain.

**Table 4.2. Taxes levied on transport-fuels in the UK.**

Types of fuel	UK pence/litre	Approx. Eurocents/kWh*
Ultra-low sulphur petrol and diesel oil	47.10	7.82
Other non-leaded petrol	50.19	8.34
Other diesel oil, except “ <i>red oil</i> ” – see below	53.27	8.85
Other light oil (such as leaded petrol, which is not now in use)	56.20	9.33
Biodiesel	27.10	5.06
Marked gas-oil for use in exempt vehicles (e.g. farm-tractors)	6.44	1.07
Aviation-fuel	28.1	4.67
	UK pence/kg	
Liquefied petroleum gas (LPG)	9.00	1.18
Compressed natural gas	9.00	1.12

*Note: \*In this calculation a density of liquid fuels of 0.85 kg/l has been assumed, and the following Lower Heating Values have been assumed:*

*Petrol, diesel and aviation fuel: 11.8 kWh/kg*

*Biodiesel: 10.5 kWh/kg*

*Liquefied petroleum gas (LPG): 12.7 kWh/kg*

*Natural gas: 9.5 kWh/Nm<sup>3</sup>*

More than 10 million people live in Greater London; it is fairly well served by public transport, and its streets are sometimes nearly choked with moving and parked vehicles, so there is a considerable disincentive to own a vehicle. Something similar can be seen in the other larger conurbations of the UK but, in the outer suburbs and beyond, the reverse becomes increasingly true, as population-density decreases – poorer public transport, and less congestion.

Nevertheless, in the context of climate-change, a good deal of attention is being given to the transport sector, and measures such as the planning of new towns having integrated transport-systems, and congestion-charges in cities, and tolls on new bridges and roads have been/are being



tried. A future step might be to introduce more general ‘road-pricing’, under which measure motorists would be required to pay for the use of their cars on many public roads, and the Department for Transport (DfT) is studying this option.

A summary of the Government’s transport-policy, taken from the White Paper of 2004, is included at Appendix 2. It will be seen to cover a wide range of policies, and makes a passing reference to novel fuels. The European Directive on the promotion of biofuels or other renewable fuels for transport was passed in 2003 and has now come into effect; it requires the MS of EU-15 to set targets for sales of liquid biofuels (e.g. biodiesel and bioethanol); ‘reference-values’ set by the Directive are:

- (a) such liquid biofuels amounting to at least 2 per cent, calculated on the basis of energy-content, of all petrol and diesel for transport, should be on the market by the 31<sup>st</sup> December, 2005, and
- (b) 5.75 per cent by the 31<sup>st</sup> December, 2010.

The UK will set Renewable Transport Fuel Obligations at 2.5 per cent for 2008/9 and 3.75 per cent for 2009/10.

Several innovations can already be seen in the UK: imports of liquid biofuels of various kinds have increased and the processing of recovered cooking-oils is spreading to several sites. It is believed that a large plant for producing biodiesel from rape-seed grown in the UK is under construction in northern England.

#### 4.3 Space-heating\*, and energy-efficiency of buildings

*Note: \*The provision of domestic hot-water is included under this heading.*

Consideration of the third large category of energy-use, space-heating, leads to the an examination of the statistics of the use of fuels for domestic purposes, which turns out to account (at 34.1 MTOE in 2004) for more natural gas – presumably for central heating, hot water and cooking – than that used for the generation of electricity (29.1 million TOE in 2004). The distribution network for natural gas has been extended to most areas in the UK, so that only a minority of people nowadays use other fuels (heating-oil, LPG, coal, wood, ground-source heat-pumps, solar panels, etc.) for heating.

Part of the reason for the current high level of consumption of fuels for space-heating is that a considerable part of the stock of existing buildings (especially those more than twenty years old) have poor levels of thermal insulation. Typically, they were built without insulation of their floors, walls or roofs, and without double glazing or attention to air-leaks, etc. But, in his recent Budget Speech, the Chancellor of the Exchequer said “... *our third ambition is for Britain’s homes and businesses to be the most energy-efficient in the world*”.

The Carbon Trust (2005), in its contributions to the Government’s consultations on energy-efficiency and climate-change has recommended an extension of the concept of emissions-trading to cover both (a) less energy-intensive businesses (including haulage companies) and (b) the public sector. The Carbon Trust’s estimates of the potential for savings in emissions estimated are reproduced in Table 4.3.

**Table 4.3. Scope for energy-efficiency in business and the public sector (from the Carbon Trust, 2005).**

	Energy-intensive industries	Large non-energy-intensive industries	Public Sector	Small and medium-sized enterprises (SME)
<b>Number of Entities</b>	2,400	13,200	65,300	909,000
<b>Carbon emissions in 2002 – MTCe*</b>	25	13	6	10
<b>Cost-effective savings by 2020 – MTCe</b>	3.3 (13%)	2.3 (18%)	0.8 (15%)	1.6 (15%)
<b>Technical potential savings by 2020 – MTCe</b>	4.5 (20%)	4.3 (33%)	1.6 (15%)	2.6 (25%)

*Note\*: MTCe stands for millions of tonnes of carbon-equivalent.*

An important point to note is that, whereas the Government has provided a mechanism to support green electricity (the RO – see Section 4.1), and fossil fuels for transport mostly carry a considerable burden of tax, measures of that kind do not apply in the field of space-heating. There is hardly any tax on gas or oil used for space-heating, and the system for grants to support green heat has been unsatisfactory (Biomass Task Force, 2005). Thus, bearing in mind that installing a boiler or a stove to run on wood-pellets can be considerable more expensive to run on than traditional equipment fuelled with oil or gas, the market for green heat is growing slowly, even though the prices of fossil fuels are rising markedly – see Table 4.4.

**Table 4.4 Comparison of domestic heating-fuels.**

Fuel-type (Note 1)	Calorific value – kWh/litre (kWh/Nm <sup>3</sup> for natural gas and kWh/kg for solids) (Note 2).	Efficiency of a good boiler – per cent (Note 3)	Price of fuel – pence/litre (pence/kg for solids) (Note 4)	Fuel-cost of delivered heat – pence/kWh (Note 4)
Heating-oil	10	85	35	4.1
Heating-oil	10	85	30	3.5
LPG	7	92	34	5.3
LPG	7	92	28	3.5
Natural gas	9.5	92	Natural gas is sold by the kWh	2.7
Coal	8	80	24	3.8
Wood-pellets	4.8	92	14	3.2
Wood-pellets	4.8	92	10	2.3

*Notes:*

- 1. It is assumed that coal is delivered in a limited number of 25-kg bags at £6 each, but that the wood-pellets are delivered in bulk by a blower-lorry.*
- 2. The properties of coal can be very variable.*
- 3. Based on information from the National Energy Foundation.*
- 4. Prices are those of March, 2006, but there are some local variations to be taken into account.*

Several attempts have been made by various parties to convince the Government to introduce measures to make green heat more attractive to potential customers, and DTI has stated that it is considering what to do. A decision on this might emerge from the current Energy Review, and further opportunities might flow from the Climate Change and Sustainable Energy Bill (see above).

As mentioned above, in 2005 the Biomass Task Force recommended the Government to increase incentives for renewable heat and, in April, 2006 the official “*Response of the Government to the Biomass Task Force report*” was published. This announced the following measures: (a) the identification of problems in area of land-use planning, and consequently issue of a new Planning Policy Statement (PPS) on the subject of the reduction of carbon-emissions from new developments; (b) the launch of Low Carbon Buildings Programme (a £80 million capital-grant scheme for microgeneration systems in buildings – see above); (c) another, new five-year capital-grant scheme for biomass heat and biomass- CHP projects, to be introduced at the end of 2006; and (d) the amendment of the Building Regulations to facilitate wood-fuelled installations.

Standards for the energy-efficiency of new buildings have been raised very markedly within the past couple of decades and more improvements in such Standards can be expected. The European Directive on the energy-performance of buildings (2002) represents an important milestone in this context; its principal requirements include:

- (a) minimum standards of energy-performance of all new buildings, and all large existing buildings that are subject to renovation; and
- (b) energy-certification of all buildings - frequently visited buildings providing public services will be required to display prominently an energy-certificate.

Legislation to implement the Directive in all MS of EU-25 should have been in place by January, 2006. In the UK, specifications for buildings are covered by the Building Regulations, a new version of Part L (Conservation of fuel and powering dwellings) of which will come into force in April, 2006. According to H.M. Treasury, these new Regulations will improve the energy-efficiency of new buildings by 40 per cent compared to 1997 standards. In the DTI’s consultation paper on “*Microgeneration strategy and low-carbon buildings programme*” (2005), it is stated that the Sustainable and Secure Buildings Act, 2004, which amends the Building Act, 1984, will *inter alia* “allow Building Regulations to apply to existing buildings in certain circumstances. The Sustainable Development Commission is working with the Office of the Deputy Prime Minister (OPDM) on how best to use these new powers”.

The recent Directive on energy-efficiency (2006/32) will intensify the actions that the MS will have to put in place. It has set a target of 9 per cent for energy-saving in the ninth year of its implementation, with some flexibility for the intermediate years. And the OPDM has recently issued a consultation paper on the introduction of a Code for Sustainable Homes (2006). As is usual in this field currently in the UK, this document entwines the themes of countering climate-change and eliminating fuel-poverty.

It can be seen from the above text that, as things stand, the issues of RUE and RES are popular topics for discussions among politicians but, as things stand, they are only partially covered with a patchwork of measures. Various suggestions are being made for the gaps to be filled, for example, the Carbon Trust (2005), in its contributions to the Government’s consultations on energy-efficiency and climate-change has recommended for an extension of the concept of emissions-trading to cover both (a) less energy-intensive businesses (including haulage companies) and (b) the public sector.

The Carbon Trust has also called for strong enforcement of Building Regulations. Further suggestions on RUE have been made as a result of (a) a recent “*innovation review*” carried out as a joint initiative of H.M Treasury and the Department of the Environment, Food and Rural Affairs (DEFRA) (2005), and (b) work by the Energy Savings Trust (EST) on the household sector (2005).

The EST has suggested that, in the household-sector (a) there is significant potential to cut the 40 MTCE/year (about 30 per cent of the UK's total emissions), (b) existing technologies offer cost-effective savings by 2020 of 7.5 MTCE (20 per cent) in space- and water-heating and of 1.5 MTCE (4 per cent) in appliances. They indicate a technical potential of nearly 20 MTCE (50 per cent), but this would be difficult to achieve.

In 2002, the Government introduced the Energy Efficiency Commitment (EEC), which requires suppliers of energy to meet targets (based on their numbers of domestic customers) to save energy in the next three years. Half of the savings had to be targeted at poorer households that receive income-related benefits or tax-credits. The sum of the targeted savings for the first three years of the EEC was 62 TWh; (about 5 per cent of the domestic use of energy). The energy-savings measures envisaged included: (a) better lighting; (b) better insulation; (c) better heating, and (d) better appliances. Those customers who were able to pay a contribution to the improvements were offered discounts of various kinds (for example, British gas offered rebates on local tax), and poorer customers were offered support by social programmes through local authorities and housing associations. The target of 62 TWh of energy-savings in three years was oversubscribed (a total of 103 TWh was achieved), and the utilities have been allowed to roll over the over-shot quantum into the target of 130 TWh of energy-savings for the next three-year period (2005 – 2008).

There are also relevant other schemes for grants for poorer people, including the *Warm Front Scheme* in England and the *Home Energy Efficiency Scheme (HEES)* in Wales; these two schemes provide grants of up to the equivalent of about 4,000 Euros for improvements to insulation and central heating.

#### **4.4 The Welsh Assembly Government's policies and plans**

The Welsh Assembly Government (WAG) exerts important influences on sustainable energy in several ways. For example, the concept of sustainability is embedded in the Welsh constitution, and informs policy-making in a wide range of fields.

As a consequence of the targets for fossil-fuel savings recently set by the UK Government, WAG published in 2005 a consultation-document for the establishment of a "*Route map to a clean, low-carbon and more competitive energy future for Wales*". The final document is expected later this summer. Various actions are proposed to address both global warming and energy-security. The document sets out WAG's strategy in the following main streams:

- (a) Energy-saving;
- (b) Development of renewable energy - WAG will consider the promotion of wind-power, heat and electricity from biomass, and marine energy;
- (c) The use of coal, with carbon-capture and storage;
- (d) Improvement of security of supply; and
- (e) Strengthening of infrastructure.

Perhaps the most definite field of direct relevance to WISE-Plans in which WAG currently has powers is land-use planning. Responsibility for granting planning consent for larger power stations (those having capacities of over 50 MW<sub>e</sub>) lies with the UK's Government (under the provisions of Section 36 of the Electricity Act, 1989), but the consideration of planning-consent for smaller power stations fall within the Welsh system, which is informed by policies that are set out in the document *Planning Policy Wales (PPW, 2002)*, the purpose of which '*is to set the context for sustainable land-use planning policy, within which local planning authorities'\** Unitary

*Development Plans (UDPs) are prepared and development-control decisions on individual applications and appeals are taken*". PPW, 2002 includes a section (Section 12.8) on sustainable energy, which is reproduced in Appendix 3; **attention is drawn in particular to its Sub-sections 12.8.9 and 12.9.1.**

*Note: \*there are 25 local planning authorities in Wales, of which CCS is one.*

It should be understood that, in the UK as in other countries, the gaining of planning-consent is a key hurdle to the development on many projects for the production of renewable energy (as it is for most other kinds of development). The population-density of the UK is relatively high in absolute terms, and much of the infrastructure is concentrated in a relatively small fraction of the land. There is therefore often strong opposition to further development, both in urban settings, and what is seen as unspoilt countryside.

The planning process is an interesting part of the British culture, featuring participation within it of several kinds of actors, who can be grouped as follows:

- (a) the potential developers, who make applications to their relevant planning authorities in an agreed format;
- (b) the advisors to the developer;
- (c) the local planning authority's officials;
- (d) the local politicians who determine the proposal (accept or reject it);
- (e) the advisors to the local planning authority;
- (f) the statutory consultees (there can be a long list of them) and their advisors; and
- (g) the general public, some of whom can be classed as "*objectors*" who sometimes organise themselves into identifiable pressure groups, and their advisers.

If a planning-consent is rejected (and sometimes when it is granted), then a party may appeal, and the matter is then considered by the Planning Inspectorate of Wales or, in a few cases, by WAG.

As may be imagined, the obtaining of planning-consent can be a lengthy and costly business. In the case of one example of a failed proposal to build a biomass-fired station in Wales, the proposers' costs amounted to hundreds of thousands of Euros. This kind of result can apply a considerable brake to the progress of other projects for RES. It should also be noted that, although there is broad support in for the concept of sustainable development, many British people do not like looking at wind-farms, and do not want to live anywhere near developments associated with wastes-disposal, and indeed objections can be expected to almost anything that makes impacts on the landscape or increases road-traffic, etc.

*A Ministerial Interim Planning Policy Statement of July, 2005 repeated a considerable part of the stances taken in PPW, 2002, but also stated *inter alia* that: "the Assembly Government's energy policy is that 800 MW<sub>e</sub> of renewables capacity should be provided [by 2010 – but see text on TAN 8, below] from strategic onshore wind-energy development – mostly in the form of a small number of large wind-farms. A further 200 MW<sub>e</sub> should be provided from offshore wind and other renewable technologies ...the need for wind-turbines is established through a global environmental imperative ... therefore the land-use planning system should steer developments to the most appropriate locations. Development of a few large-scale (over 25 MW<sub>e</sub>) wind-farms in carefully located areas offers the best opportunity to meet the national renewable energy target."*

The Statement quoted above refers to *Technical Advice Note 8 (TAN 8, 2005)*, which includes a broad statement on Wales's targets: "*Electricity from renewable sources was one of the key issues*

*in the UK White paper [2003] as it is in the Welsh Energy Strategy. The UK has set a 15 per cent renewables target to 2015, and we have set a 4 TWh per annum renewable electricity production target by 2010 and a target of 7 TWh by 2020 as stepping-stones to our ambition of 60 per cent carbon-savings by 2050 ... The Wales target of 4 TWh/year equates to an installed capacity of about 1500 MW<sub>e</sub>\*".*

*Note: \*this statement implies a level of availability of about 2,666 hours/year or 30 per cent. This level of availability might be appropriate for a wind-farm, but it would be considered very disappointing for some other technologies.*

TAN 8 gives further information about the seven “*Strategic Search Areas*” (SSAs) in which the WAG expects the large wind-farms to be sited; part of one of them (near Pontadawe) lies within the territory of CCS. The total “*indicative capacity*” shown in TAN8 for the seven SSAs is 1,120 MW<sub>e</sub> but this is “*not to be seen as the definitive capacity [because] there may be practical, technical and/or environmental reasons why the capacity may be more or less ...*”.

TAN 8 covers more topics than just the SSAs for large wind-farms; in its Section 3 it includes text on:

- (a) Anaerobic digestion of human sewage, animal wastes and kitchen and catering wastes;
- (b) Biofuels for vehicles;
- (c) CHP;
- (d) Community or (district) heating. No mention is made here of heating individual buildings with wood or ground-source heat-pumps, which might well turn out to be some of the technologies of the greatest interest in Swansea in the context of WISE-Plans. However, suitable references are made in the annexes;
- (e) Energy from waste. “*Some of the output from energy-from-waste plants is deemed to be renewable, but the Assembly Government’s priority is to see the amount of waste reduced with the energy recovery usually only coming after recycling and composting ...*”;
- (f) Fuel-crops;
- (g) Hydro-power. No mention is made of wave-power or tidal power, but the planning process for offshore developments is different, although it may be necessary for local planning authorities to look at ancillaries, such as the apparatus to accept the import of electricity by cables onshore, etc;
- (h) Methane (here in TAN 8, landfill gas is coupled with mine-gas, although under both D-ERES and the RP, the first is legally renewable whereas the latter is not; and
- (i) Solar thermal and photovoltaic.

TAN 8 also states: “*The inclusion of a large amount of detail relating to renewable energy is not appropriate in local development plans, and local planning authorities should consider producing ... Supplementary Planning Guidance (SPG) to cover detailed technical guidance (there is advice on SPG in the reference-document “National Assembly for Wales, 2001”)*”. CCS is engaged in the development of draft documents to comply with these policies.

There is another relevant Welsh planning document: *The Wales Spatial Plan* (2004), which sets Swansea in the context of the larger area of Swansea Bay, its waterfront and the Western Valleys, which it visualises as “*an area of planned sustainable growth and environmental improvement, realising its potential, supported by integrated transport ... and spreading prosperity to support the revitalisation of West Wales*”. Interestingly, the document makes no specific references in its text in this area to sustainable energy, although it does so for another area (Pembrokeshire). Another

document: *Creating Sustainable Places* (2005), which includes a copy of *Planning Policy Wales, Technical Advice Note 12: Design*, gives guidance to architects and developers.

Despite this large amount of effort, there is still some variation in the level of clarity between provisions between various topics – UDPs do contain indications of specific areas for the development of land for other purposes (e.g. housing), but not for renewables.

Another aspect of energy-use that is relevant to this project is associated with Policy Agreements made between WAG and Local Energy Conservation Authorities (which include County Councils) as a result of several Acts of Parliament (see the first part of Section 4). In particular, within Policy Agreement 7, Part A refers to agreed targets

(6 per cent in three years, with respect to the consumptions of Year 2003/04) for energy-reduction for buildings that form part of the estates of the authorities (Council offices, schools, etc.), and Part B refers to such targets for the stock of domestic housing. In brief, if those targets are met, the Council receives extra money from WAG. This benefit carries with an extra administrative cost, of course, and each Council has to produce an annual “*HECA*” report on progress. WAG also supports energy-efficiency through publishing information (e.g. in *‘Energy Saving Wales’*) on relevant subjects.

WAG now has control of policy for Wales in the area of wastes and has published its policy-document: *Wise on Wastes*. This emphasises the expected strategy, i.e.: (a) reduction of wastes being sent to landfill (in accordance with the Landfill Directive; (b) increased waste-prevention, recycling and composting (= aerobic or anaerobic digestion). The recovery of energy from waste is set at a lower level of priority, following the lead from the EU and England. A review of this particular issue might be expected within the coming years, as it becomes better understood that:

- (a) there is a need to find adequate resources of energy at affordable cost from a wide-range of sources, especially as supplies of low-cost fossil oil and gas are being depleted, and the need to apply high-tech processes to them and to coal to avoid emissions of undue amounts of CO<sub>2</sub> from the generation of electricity will increase their costs substantially\*;
- (b) “*composting*”, in the form of aerobic digestion, of biodegradable fractions of wastes releases large amounts of CO<sub>2</sub> without taking the benefit of recovering green energy - anaerobic digestion is therefore a better choice in some cases;
- (c) whereas aerobic or anaerobic digestion of uncontaminated biodegradable wastes from gardens and parks can yield high-grade composts, the biodegradable fraction of other waste-streams, unless it is very carefully separated, may contain sufficient levels of contaminants (e.g. glass, plastics, heavy metals) to prevent the re-incorporation of composts made from them into land, or at least limit it to low-grade uses, and thus much of it might have to be landfilled, which could cause difficulties in meeting targets of the Landfill Directive, etc.;
- (d) “*Mechanical Biological Treatment*” (MBT- see below) does not necessarily, on its own, reduce the biodegradable fraction sufficiently to meet the targets of the Landfill Directive, etc.;
- (e) reliable technologies exist for the recovery of energy by the thermal treatment of solid recovered fuels\*\* without causing unacceptable emissions of solids, liquids or gases; and
- (f) (as noted at the end of Section 4.1.1.1) DTI is proposing to allow ROCs to be granted to electricity generated from the biodegradable fraction of wastes in high-quality CHP plants.

Notes: 1. \*Recent projections by DTI suggest cost-increases of over 40 per cent.

2. \*\* “*Refuse-derived fuels*” (RDF) are now more properly called “*solid recovered fuels*” (SRF) for which European Standards are being drafted.

Annex 4 of the UK Government's response (2006) to the report of the Biomass Task Group sets out WAG's position on several issues of relevant policy. Unfortunately, it states again that: "*The Welsh Assembly Government launched the National Waste Strategy for Wales 'Wise about Waste' in 2002. This document advises that the energy from waste should only be considered when all other options e.g. recycling/composting have been undertaken and energy production is the best practical environmental option. Anaerobic digestion and energy from waste are the preferred options for dealing with residual waste*". Perhaps the recently published Directive on waste will promote a more favourable approach to the recovery of energy from waste in Wales, as it rates energy-recovery as **equal to** materials-recovery.

Measures for the promotion of RUE and RES have been considered by WAG in the last years. In March, 2006 a consultation paper "*Microgeneration action plan for Wales*" was published, (a) advocating the greater use of microgeneration in public buildings, (b) encouraging the formation of ESCOs, (c) foreseeing possible new planning instruments and (d) discussing dissemination activities.

WAG also set up a programme for the diffusion of small renewable installations called the "*Green Energy Cluster*". It aims to gather all the SMEs that operate in the RES sector in Objective-1 areas, and to provide to them legal and technical assistance.

Concerning the improvement of the energy-performance of buildings, and beyond above-mentioned measures, all new houses built in Wales by "*Registered Social Landlords*" (RSL) - e.g. Housing Associations - using the Social Housing Grant must comply with the ECO Homes Standard, which sets energy-efficiency standards significantly above that were required by Building Regulations before their recent revision.

In 2002, WAG introduced the Welsh Housing Quality Standard (WHQS) in a drive to improve the living conditions of homes throughout Wales. "*Better Homes for People in Wales*" sets out WAG's vision that all households in Wales are given the opportunity to live in good-quality homes. All houses owned by Local Authorities should meet the WHQS by 2012.

The WHQS requires houses to be:

- (a) in a good state of repair;
- (b) safe and secure;
- (c) well heated and fuel-efficient;
- (d) contain up-to-date kitchens;
- (e) be located in attractive and safe environments;
- (f) suit the specific requirements of the household; and
- (g) well managed.

#### **4.5 The City and County of Swansea's plans**

In February, 2006, CCS's Cabinet agreed to sign the "*Welsh Declaration on Climate Change and Energy Efficiency*", which had been prepared by WAG and Welsh Local Government Association (WLGA) and submitted to the individual local authorities for their acceptance. The Declaration commits CCS to: "*include consideration of climate-change issues within Community Strategies*" and more specifically to:



“(a) Make a public declaration, in line with agreed targets with the WAG, to :

- (i) deliver a significant reduction in GHG,
- (ii) improve energy efficiency in council buildings and homes, and
- (iii) increase the use of green energy from renewable sources.

(b) Encourage local residents and businesses to take action to reduce emissions of GHG and, where appropriate, publicise their actions.

(c) Work with key building operators e.g. health authorities, businesses and development bodies to seek ways to adapt to potential effects of climate-change on our communities.

(d) Encourage the development of practical, economically viable, sustainable energy.

(e) Encourage production of combined heat and electricity from these sources e.g. biomass.

(f) Encourage local manufacture of energy efficient equipment for producing heat and power.

(g) Monitor the progress of our plan against the actions needed and publish the results.

(h) Take the necessary action to rectify any deviation from the plan where required”

As noted above, the Sustainable Energy Act, 2003 gives power to the relevant Secretary of State to require “Energy Conservation Authorities” to take such measures that “are likely to result in achieving ... an improvement ... in the energy efficiency of residential accommodation; and [be] practicable and cost-effective”, and that has resulted in the Policy Agreements in Wales. In Swansea, that has led to the appointment of a senior officer to deal with energy-efficiency of buildings in CCS’s corporate estate. It also bears on the state of CCS’s estate of domestic buildings (“council-houses”) – see below.

CCS currently provides 14,000 council-houses for rent. At the time of the Local Government Review in 1996 (which led to the formation of CCS as a Housing Authority), CCS owned approximately 17,500 council houses or flats. Since that time, the size of the stock has dropped to just below 14,000 largely as a result of tenants buying the properties under the “Right to Buy” scheme, through rationalisation where demand is non-existent, and through selective transfers to other social-housing providers (Housing Associations). The remaining stock includes a mix of accommodation, including 13 high-rise blocks of flats.

The Council’s housing-estates are spread throughout Swansea but main concentrations are in the central, northern and eastern regions and include estates at Blaen-y-Maes, Portmead, Penlan, Townhill, Mayhill. and Bonymaen. The Authority has a statutory responsibility to have in place a strategy that ensures sufficient numbers of “affordable housing” in the locality. Of CCS’s tenants, approximately 80 per cent receive some form of Housing Benefit. Broadly speaking, many of CCS’s tenants are some of the most economically and socially disadvantaged in the community.

There is no direct incentive for landlords to improve accommodation for energy-efficiency, but Councils that own stock are all required to submit average data using a Standard Assessment Procedure (SAP)\* to the Government as part of their returns on performance-measurement. SAP has a scale of 1 to 120; 1 being very poor, 120 being excellent. A typical SAP for a house in England is about 45. A rating on a house built to current Part L of Building Regulations would be in the range of 80 to 100 or perhaps better. The average for the housing stock in CCS is currently 48.

Note \*SAP is the Government's recommended system for home-energy rating. A SAP rating is required for all newly built dwellings and those which are undergoing significant alteration (such as the addition of an extension to the dwelling).

A survey of the condition of the housing-stock has shown that to improve it so that it will conform to WHQS will cost £371 million over the next ten years. But, under current Government policy and

financial regulations that control public expenditure, CCS cannot raise all of the investment needed - the Council can raise £176 million for this purpose, but that leaves a shortfall of £195 million.

Following an appraisal of the options, CCS concluded that under current Government policy, the only financially viable way of ensuring the homes are improved to the Standard is to transfer the ownership and responsibility for them to an organisation that **can** have access to the necessary finance.

CCS's *Housing Futures Project* is creating the organisational and financial framework to allow development in that direction. CCS's proposals are to establish a new, local, not-for-profit organisation, which would be a "*Community Housing Mutual*". It would be regulated by the WAG and called "*Tawe Housing*". Tawe Housing would be able to raise the required finance to improve the stock without financial disadvantage to the tenants as it would be subject to financial rules different from those within which CCS must operate. Its principal way of achieving that position would be by not having to repay historic housing debts, which the Council is obliged to pay and accounts for over 30 per cent of the current rental income.

Tawe Housing would be a form of Housing Co-operative with a board of management comprising one-third of representatives of tenants, one-third of representatives of CCS and one-third of representatives of the wider community. For the project to proceed, the tenants must approve it and they are likely to be balloted on this proposal in the Autumn of 2006.

If the stock-transfer goes ahead, it is proposed that:

- (a) Rents would be guaranteed to be no more than what tenants would have paid if they had remained with the Council;
- (b) CCS's historic debt would be written off by the UK Government, enabling Tawe Housing to start off debt-free;
- (c) The new organisation's provisional business-plan will secure the financing of the whole investment programme;
- (d) WAG would provide gap-funding to support the new organisation in achieving the WHQS;
- (e) Tawe Housing would receive the rent-income, and Housing Benefit would continue to apply; and
- (f) CCS would continue to perform its statutory obligations in relation to the housing strategy, homelessness and support to the private housing sector.

Within the context of land-use planning in Wales described above in Section 4.4, CCS is a Local Planning Authority, and one of its duties is to prepare and publish a Unitary Development Plan (UDP) for the period to 2016. The development of the UDP follows a series of steps and, at present, comments made by interested parties on the "*deposit draft*" are being considered by CCS. A public enquiry is likely to be held in the autumn of 2006, and the Inspector who will lead that inquiry is expected to make a report in the early months of 2007. After further modifications, perhaps the final version of the UDP will be published at the end of 2007 (if so, it will coincide with the final report on WISE-Plans).

The UDP is a document of nearly 200 pages, which are packed with information about many issues relevant to the development of Swansea over the next ten years. It identifies five strategic goals:

1. *Sustain a healthy, attractive and ecologically rich environment;*
2. *Help promote the sustainable growth of the local economy;*
3. *Ensure the full range of house and facility needs of the community can be accommodated;*

4. *Make more efficient and **sustainable use of the area's resources**.* [emphasis added]; and
5. *Maximise access opportunities for all by various modes of transport*”.

As a result of a trend in development-planning policies in the UK in general and in Wales in particular towards clearing away obstacles to the rapid growth of RUE and RES from a low starting-point, CCS is preparing SPG. It is important that this opportunity is fully seized, particularly as the UK Government seems ready to take steps to weaken the effects of public resistance to other key developments in the field of energy – the current Energy Review will consider such steps in the context of both nuclear power stations and large gas-storage facilities.

One of the key features of SCC's territory in the context of WISE-PLANS is that it has had a low level of Gross Domestic Product (GDP)\* compared with Wales as a whole and with the UK, which as already noted, has one of the largest economies in the world.

*Note: \*The term “Gross Value Added (GVA) per head” is now being used as an indicator of the health of the economy. The Annual Progress Report (2005) of the Local Transport Plan states that “Swansea’s economy has continued to perform strongly, with GVA per capita rising by 5.7 per cent, ahead of the Welsh average of +4.6 per cent and the UK average of +4.7 per cent. This has been reflected in the strong growth in employment (workplace totals) which has risen by 6.7 per cent in Swansea, as compared to +1.6 per cent for Wales as a whole and +0.5 per cent for the Great Britain average”.*

Other documents, however, point out that a significant percentage of the male population is not fully active in gainful employment. Leaving aside the unemployed, there are large numbers of people drawing Disability Benefit for various reasons. For this reason, there is strong local emphasis on such topics as health, education and training and economic growth. Thus, perhaps one can appreciate why no direct reference is made in the five goals above to facing the problems of the depletion of fossil fuels or climate-change, but the underlined phrase in bold type in Goal 4 is relevant to WISE-PLANS. One can hope, however, that reductions in the use of fossil fuels will receive greater proportionate attention in the future.

Within each of the five goals, the UDP identifies several objectives; the fifth objective of Goal 4 (i.e. Objective 4.e) is *“To support renewable-energy projects which would make a positive environmental contribution”*. Another one of them (Objective 1.m) is *“to promote resource-efficient buildings and layouts in all new development”*. However there is no obvious link made here between Goal 2 – economic growth – and RUE and RES.

The UDP derives 15 strategic policies (SPs) from these goals and objectives; one of these, SP11, states: *“The upgrading of infrastructure and the generation of energy from renewable sources to meet the needs of existing and new development will be favoured, provided that environmental impact is kept to a minimum”*.

The Sustainable Development Team of CCS has been active in the preparation of draft Supplementary Planning Guidance on the development of RUE and RES, for the benefit of developers of two kinds: (a) individual occupiers of existing buildings who are considering reducing their fuel-bills; and (b) developers of new buildings. The completed documents are expected to be made available in the summer of 2006.

The UDP develops the 15 SPs into a large number of individual policies under the headings of (a) general development principles, (b) the historic environment, (c) shop-fronts and advertisements, (d) villages and rural development, (e) countryside protection, and (f) health and the environment.

The UDP next considers developing the economy within SCC's territory, again under several headings: (a) industrial and business land and premises, (b) retailing, (c) rural employment and agriculture and (d) tourism. The next chapter covers *“providing homes and community facilities”*, and the following one deals with resources and waste-management, setting out policies under the following headings (a) minerals (which includes text on the recovery of coal-bed methane), (b) infrastructure (which refers to the development of RES\*) and (c) waste-management.

*Note: \*the text includes the statement that “the Council is to undertake an assessment of the potential of all renewable-energy resources, technologies and energy-efficiency and conservation measures for the County. This information will accordingly inform future reviews of this policy” (see also Appendix 3).*

Strategic Policy SP12 reads: *“Proposals aimed at waste minimisation, appropriate recycling and the creation of energy from waste with the minimum environmental impact and disposal of residuals will be favoured. The landfill of waste will be kept to the lowest practical level and a range of waste-management facilities will be supported”*; and the next chapter of the UDP addresses waste-management, applying principles that are broadly in line with the policies of the EU and the UK Government.

It concludes that *“this complements the Council’s Municipal Waste Management Strategy, which seeks to minimise waste, maximise re-use, recycling and composting with the development of a residual waste-treatment facility located in Swansea, which will utilise either MBT and/or waste-to-energy technologies.”* It also notes that: *“The Regional Waste Plan forms a material consideration when assessing any planning-application for waste-management facilities in the County.”* It is understood that CCS is currently developing more specific proposals in this area, and has inserted a call for proposals in the European Official Journal.

The next Chapter of the UDP covers *“accessibility”*, which includes policies on public and private road-transport, rail services, ports and docks, and Swansea Airport. CCS has a Local Transport Plan (2000), which is supported by annual progress reports (APRs). The APR for 2005 emphasises the development of park-and-ride schemes that alleviate congestion in the centre of Swansea, safe travel to and from schools, improvements to facilities for cycling, and attention to safety.

As already noted, transport probably accounts for about a third of the energy used in Swansea; certainly schemes such as park-and-ride coupled with dedicated bus-routes can cut the use of fossil fuels, but there are other policies that should also be considered, for example, CCS could investigate to what extent it can encourage the use of biofuels in transport, over and above the penetration of such fuels that will be fostered by the Biofuels Directive (see Section 3.2.2). It might be worth noting, for example, that buses in Stockholm are fuelled with scrubbed biogas (methane).

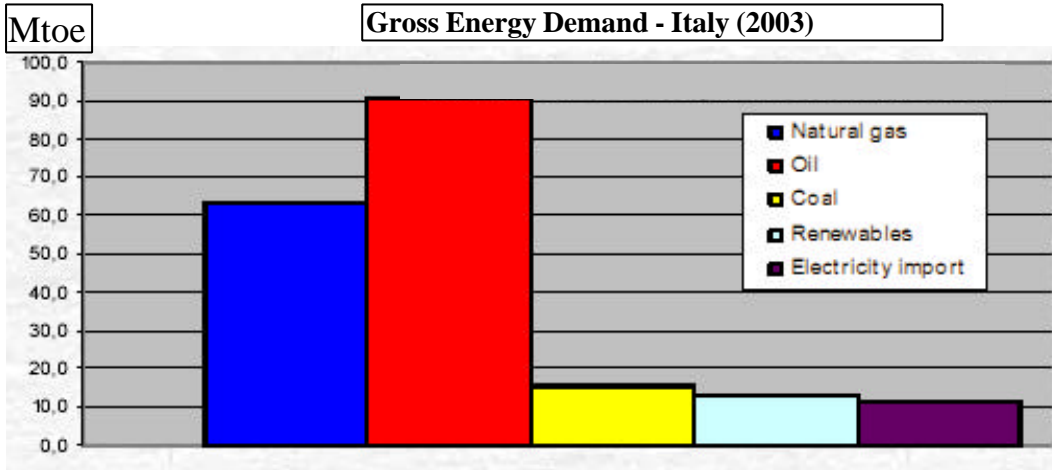
Fuel-poverty is considered as a big political issue in the UK; it stems from a combination of significant numbers of people on low incomes and the existence of a very large number of poorly insulated buildings; the second of these facts is traceable to two more root-causes: (a) the generally equable climate of the British Isles, and (b) the long-term (until recently) ready supply of low-cost fuels.

DTI has defined fuel-poverty: “A *fuel-poor household is one that cannot afford to keep adequately warm at a reasonable cost. The most widely accepted definition of a fuel-poor household is one which needs to spend more than 10 per cent of its income on fuel-use and to heat its home to an adequate standard of warmth. This is generally defined as 21°C in the living-room and 18 °C in other occupied rooms*”. According to data published by WAG, about half of the people who live in properties owned by Welsh local authorities, and about a quarter of owner-occupiers, are fuel-poor by this definition. It is estimated that there are about 26,000 households in Swansea that experience fuel-poverty.

In 2002, WAG committed itself to eradicating fuel-poverty by 2018, and Swansea now has an *Action Plan for Affordable Warmth for 2005 to 2008*. Its main tools include some already mentioned above, i.e. HEES and EEC. The Action Plan also relies on WAG’s advice to local authorities (e.g. CCS) on good practice in assessing energy-efficiency in their housing stocks. To assist in paying for such measures, RSLs can draw on WAG’s Social Housing Grants.

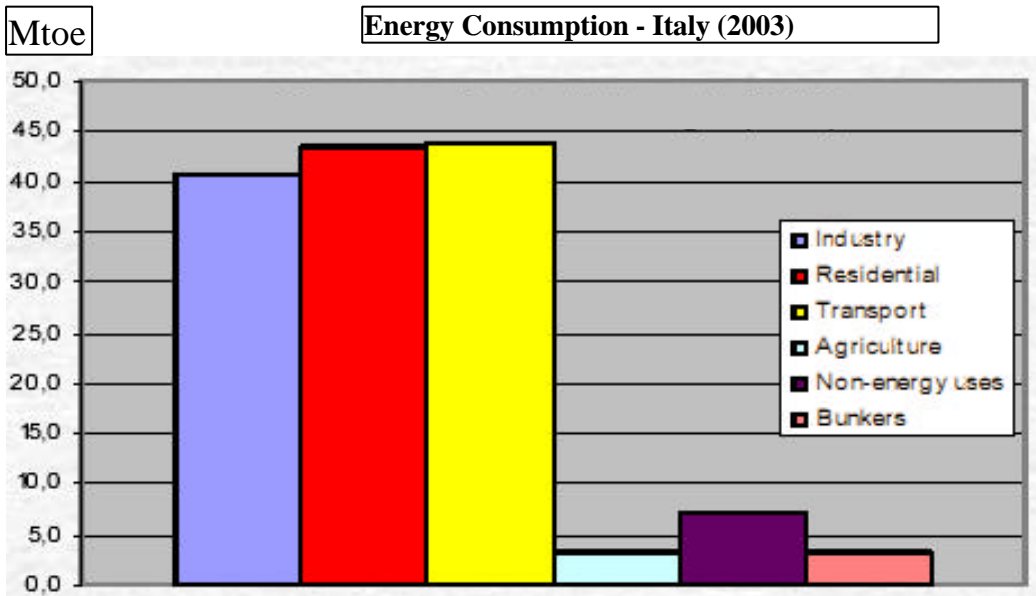
**5. POLICIES AND PLANS IN ITALY, LOMBARDY AND TICINO**

In Italy the total demand for energy in 2004 was 195.5 MTOE, and was heavily dependent on fossil fuels. Oil and its derivatives provided 45 per cent; natural gas – 34 per cent, solid fuels - 8.7 per cent; renewables -7.2 per cent; and imported electricity – 5.1 per cent – see Figure 5.1.



**Figure 5.1 Gross demand for energy in Italy in Year 2003.**

Most consumption of energy occurs in the industrial, residential and transport sectors, the last being the most important and fastest growing – see Figure 5.2.



**Figure 5.2 Energy-consumption by sector in Italy, year 2003.**

The country does not have enough installed capacity (in power plants) to satisfy the increasing demand of electricity, so Italy is a big importer of electricity, which causes high electricity prices; this is illustrated in Figures 5.3 and 5.4.

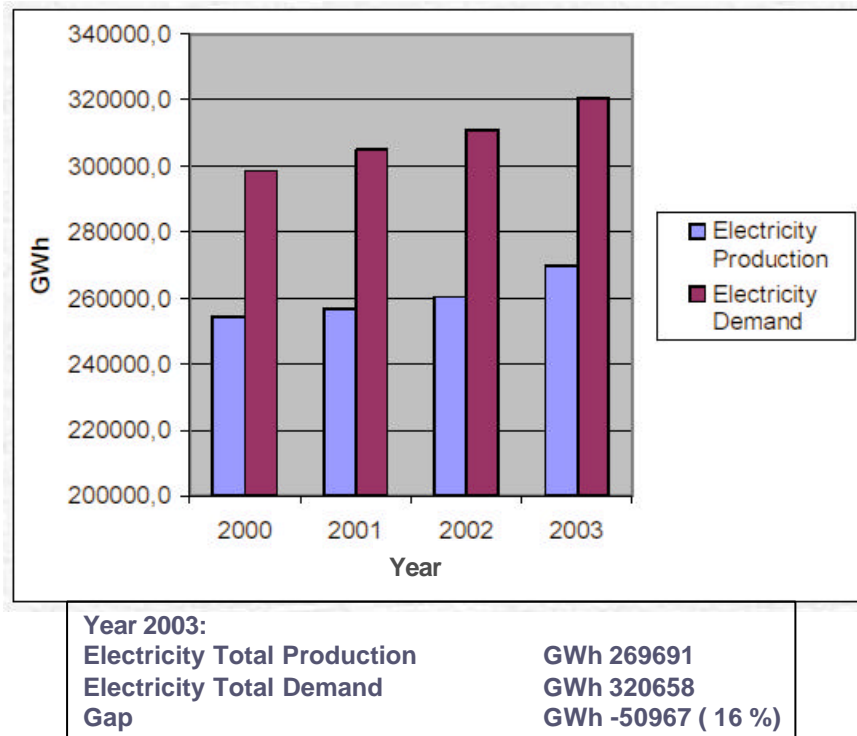


Figure 5.3 Demand for, and production of, electricity in Italy.

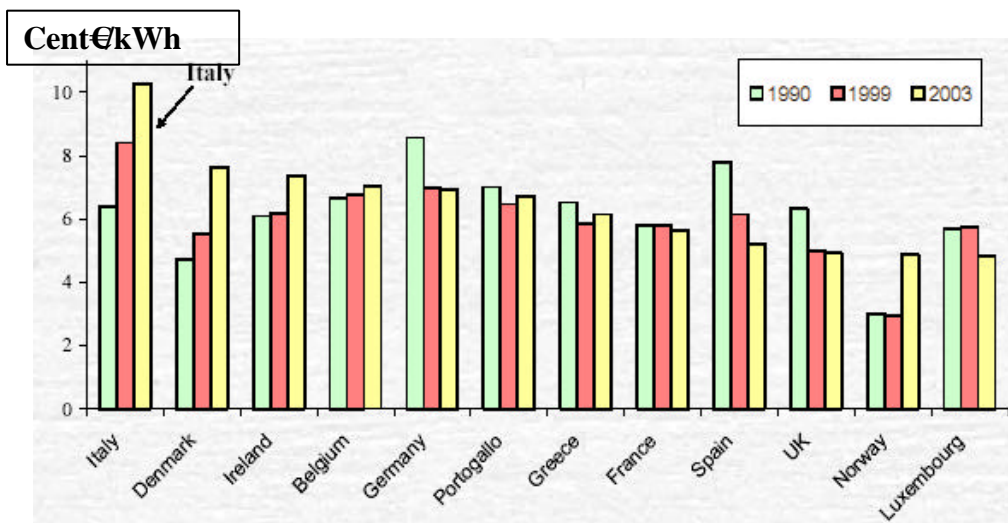


Figure 5.4 Average prices of electricity in 12 European countries.

An inability to adjust supplies of electricity to meet demands, especially in summer-months, caused interruptions in the electrical service programmed by the independent operator of the electricity network (GRTN)\* in the summer of 2003\*\*.

Notes:

1. \*Italian Independent System Operator;
2. \*\*To deal with this situation, the Government introduced Decrees 158 of the 3rd July 2003, and 239 of the 29th August 2003, which allowed the larger thermal power stations to function with relaxed requirements for their gaseous emissions.

## 5.1 National energy policies

During the last 15 to 20 years, various policies and programmes oriented towards the objectives of security of supply and sustainability have been defined. The first relevant document is the National Energy Plan (PEN, 1988), which defined objectives that are still considered to be of the highest priority: i.e. the promotion of RUE (including energy-saving) and the development of RES.

The PEN established objectives for RES, and suggests the adoption by all the Regions of Action Plans to promote them on their territories

During the 1990s several more measures were produced to support RES and RUE, of which the most important were:

- (a) Law 9/91\*, which introduces measures to sustain the production of RES, and the consequent Decree 6/92, widely known as “CIP 6”, which fixed incentives for RES for up to eight years from the starting of the production-plant\*\*.

*Notes:*

1. \*Law 9 of the 9<sup>th</sup> January, 1991 “Norms for the application of the new National Energetic Plan: institutional aspects, hydroelectric plants, long-distance power lines, hydrocarbons and geothermal energy, auto-production and fiscal provisions”.
2. \*\*CIP 6 also establishes the conditions of energy-efficiency necessary to obtain the status of “assimilated to RES”.

- (b) Law 10/91\*, which introduced several standards (most of which are still not applied\*\*) RUE and RES.

*Notes:*

1. \* Law 10 of the 9<sup>th</sup> January, 1991 “Standards for the implementation of the National Energy Plan on RUE and RES”.
2. \*\* One of the most important standards is DPR 26/08/1993 n° 412 “Regulation providing standards for design, installation, and operating processes of the civil thermal plant to reduce energy consumptions”.

- (c) Law 488/98, which introduced a carbon-tax on fossil fuels. The purpose was to reduce emissions of GHG in accordance with the undertakings given at Kyoto\* objectives, but this tax was later abolished.

*Note: \*The objective is to force changes in the use of fuels, rather than simply to collect revenue; indeed, the tax should be revenue-neutral because other taxes are being reduced.*

The main laws that have modified the state of energy sector in Italy in recent years, introducing stronger criteria of efficiency, liberalisation and sustainability include:

- (a) Decree 79/99 “Application of Directive 96/92/CE, containing common regulations for the internal market of the electricity” It establishes the concepts of (i) Certificati Verdi (“Green Certificates”) to stimulate the utilisation of renewable sources, and (ii) Titoli Efficienza Energetica (also called “White Certificates”) to increase the efficiency of the final uses of electricity, deferring to later decrees details of its application. As regards renewable



electricity, it is stated that, starting from 2001, the producers or importers of electricity (from non-renewable energy sources) have to feed into the grid a quota\* produced from RES from plants that started operating after the 1<sup>st</sup> April, 1999.

*Note: \* The minimum quota is 2 per cent and the obligation is applied to net imports or production greater than 100 GWh/year.*

- (b) Decree 164/00, "Application of Directive 98/30/CE, containing common regulations for the internal market of natural gas, according to Art. 41 of Law n. 144 dated 17/05/99". It applies the TEE to increase the efficiency of the final uses of natural gas, deferring to later decrees details of its application.
- (c) Two Decrees of the 24<sup>th</sup> April, 2001, which were replaced by Decrees of the 20<sup>th</sup> July, 2004; they set quantitative targets for energy-savings in end-use sectors. The policy-package combines command-and-control type of measures (mandatory quantitative targets) with market-based instruments (certificate-trading) and elements of tariff-regulation (cost-recovery mechanisms *via* electricity and gas prices). The implementation of the whole mechanism is under the responsibility of the Regulatory Authority for Electricity and Gas (AEEG). AEEG has the task to fix the guidelines that establish in the details the operation of the mechanism: the methodologies for the evaluation of the obtained savings, the least dimension for the admitted interventions, the entity of the recovery in the rate and the economic sanctions. The Decrees settle the obligation for the distributors providing electricity and gas to more than 100,000 end-users (distributors with less than 100,000 end-users will be regulated later) to execute interventions to install technologies for the efficient use of energy by the end-users. In this way there will be a saving of energy in the next five years. The distributors can carry out the projects of efficiency in three ways:
  - (i) intervening directly;
  - (ii) through owned or controlled companies; or
  - (iii) purchasing the certificates of energy efficiency released by the Energy Market Operator (GME)\* to Energy Service Companies (ESCOs).\*\*

*Note:1 \* Electricity Market Operator;  
2\*\* Energy Service Company.*

- (d) Decree 387/03 "Application of Directive 01/77/CE relevant to the promotion of the electricity produced by renewable sources in the internal market of electricity".
- (e) Law 239/04 "Rearrangement of the energy sector, as well as delegation to the *Government for the re-organisation of the regulations in force relevant to the energy*", which allows Green Certificates to be awarded to the energy produced by cogeneration-plants combined with district-heating, limited to the share of thermal energy actually used for district heating\*.
- (f) Law 316/04 "Conversion into law, with modifications, of Decree 273/04, containing urgent provisions for the application of Directive 03/87/CE relevant to the exchange of shares of greenhouse gases emissions in the European Community".

*Note: \* See also the Decree of the 24<sup>th</sup> October, 2005, "Directives for regulating the award of Green Certificates to the production of energy, as stated in Law 239 of 2004". The right to Certificates extends to "the electrical energy produced ...by cogeneration plants combined with district-heating, to the limitedly of the thermal energy that is used for district heating". Such*

*cogeneration plants include those fed by biomass, which are already entitled to Certificates for the production of electricity. It might be argued that biomass-CHP should be entitled to double Certificates, but this interpretation is not accepted by the Decree.*

Moreover, after fixing more rules in the field of sustainable energy (in particular to the efficiency of final use\*), the Law for the ratification of the Kyoto Protocol (Law 120/02) accelerated policies for promoting RES, and set down\*\* a *'National plan for the reduction of the greenhouse gas emissions: 2003-2010'*, which assigns an important role to RES in the national strategy to reach the objectives agreed at Kyoto.

*Notes:*

- 1. \*A Ministerial Decree of the 24th April, 2001, substituted by the Decree of the 20th July, 2004 fixes quotas for energy- saving to be achieved in the period from 2005 to 2009 by distributors of electricity and natural gas.*
- 2. \*\* Decision CIPE 123/2002, "Revision of the guidelines for the policies and national measures on reduction of greenhouse gas emissions".*

## **5.2 National actions on energy**

National actions include:

- (a) **In the industrial sector:** increase the use of efficient CHP in small and medium-size industries, energy from waste and distributed microgeneration;
- (b) **Supplies from RES:** programmes for the installation of passive solar heating and PV that have been instituted by the Ministry of the Environment are expected to produce annual reductions in emissions of CO<sub>2</sub> of 15,700 tonnes and of 60,000 tonnes, respectively. Funds have also been dedicated to promote the construction of small electricity-generating plants using biomass, small-scale wind-power and solar energy; the approved projects receive capital grants of up to 30 per cent of eligible costs;
- (c) **In the household sector:** levels of efficiency for end-uses have been prescribed; and
- (d) **In the transport sector:** provisions has been made to encourage the development of cars and trucks that use less fuel and new infrastructure; pilot projects for new engines have been planned.

An important advance for RES has been accomplished by the above-mentioned Law 387/03\*, implementing the D-ERES, so that:

- (a) RES have the priority in the dispatching of electricity;
- (b) Tradable Green Certificates are granted to RES plants built or renewed after April, 1999 over the first eight years of operation (12 years for biomass);
- (c) The original obligation for suppliers (2 per cent) is increased by 0.35 per cent each year in the period from 2005 to 2007 and a penalty for non-compliance is set at 1.5 times the price of missing Green Certificates;
- (d) The market for Green Certificate markets is separate from the market for electricity; the values of Certificates are not influenced by type of energy-source or conversion-technology;
- (e) The price of Certificates depends on market but is subject to a maximum level; and
- (f) Generators and importers sustain extra costs but pass those on, so that consumers bear the

increases in final electricity prices.

Note: \* Law 387 of the 29<sup>th</sup> December, 2003, “Implementation of Directive 2001/77/CE on the promotion of electricity produced from RES in the internal electricity market”.

Further changes are under discussion, see Figure 5.5.

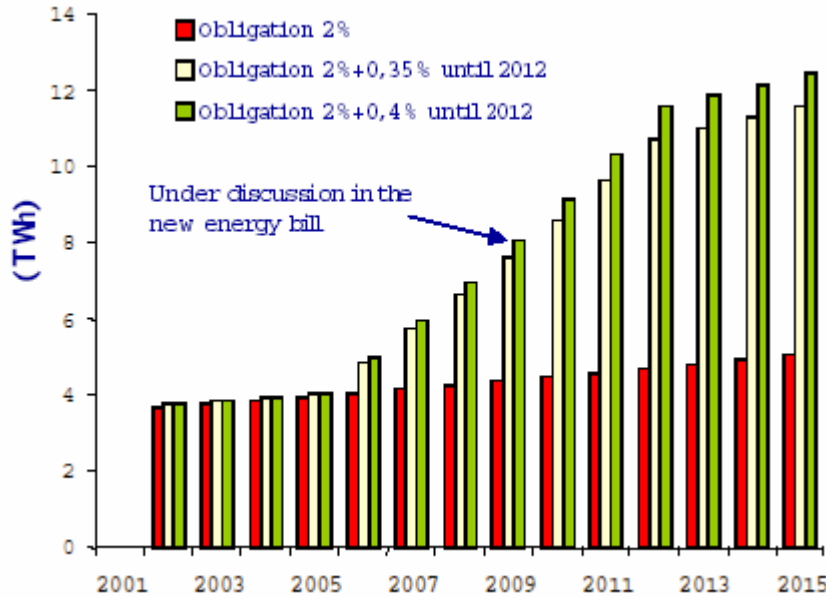


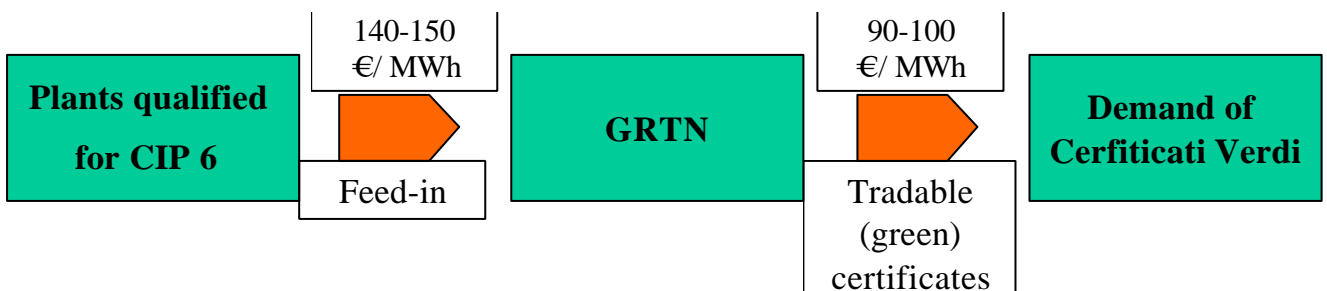
Figure 5.5. Annual obligations for the supply of RES in Italy.

### 5.3 Introduction of Green Certificates in the electricity market

To ensure the smooth development of RES, Italian regulators adopted an initial “*feed-in tariff*” before applying the market-driven Green Certificates mechanism. Initial supplies were stimulated by the guarantee of a fixed and high level of remuneration for RES and CHP.

The mechanism operated as follows (see also Figure 5.6):

- (a) GRTN set an offer-price for Tradable Green Certificates (TGC) at the difference between the CIP6-price for RES and the pool-price for other electricity.
- (b) GRTN issued a quantum of TGC with no physical backup.
- (c) Given a lack of supply, no producers were willing to sell at less than GRTN’s reference-price, which was 97.4 €/MWh in 2004, and 108.9 €/MWh in 2005.
- (d) GRTN carefully considers the CIP6 portfolio and its evolution so as to balance its revenues from TGC with the costs of CIP6.



## Figure 5.6. Operation of the mechanism for Tradable Green Certificates in Italy.

### 5.4 Implementation of emissions -trading

A further, though minor, impulse to the development of RES will come from the implementation of Directive 2003/87, establishing a scheme for trading of allowance of emissions of GHG (see Section 3.2.1)., could increase the demand of energy produced by renewable sources. It might be said that the equivalent current value of a Green Certificate in Italy is around 120 Euros per tonne of CO<sub>2</sub> avoided, whereas the price of tradable certificates within EU-ETS has oscillated between 15 and 25 Euros per tonne of CO<sub>2</sub> avoided.\*

*Note: \*Prices of international CDM or JI (so-called flexible mechanisms) certificates are around 5-10 € per ton of CO<sub>2</sub> avoided. As they can be used in EU market (according to Directive) they could therefore contribute to lower prices in the European emissions market.*

### 5.5 Additional measures to support RES, especially for biomass-CHP with district heating

The Ministry of Productive Activity (MAP) brought in a Decree on the 24<sup>th</sup> October, 2005 to cover: “Updating of the directives for the incentives of the electricity produced by renewable sources according to Art. 11, Clause 5, of Decree 79 of 16<sup>th</sup> March, 1999”. The right to Green Certificates is extended beyond the first eight years and for four more years for a quota corresponding to 60 per cent of the net annual production of electricity. This extension is not granted to projects which have obtained capital incentives under Law 387/03 (see below).

Law 239/04 and Decree 387/03 have introduced concessions and incentives for small-scale renewable and CHP\* power plants (i.e. plants having outputs of less than 1 MW<sub>e</sub>). The rules for prices paid for RES by GRTN are summarised in Table 5.1.

*Note: \* According to Law 239/2004, micro-cogeneration plants (< 1 MWe) are subject to simplified authorisation procedures.*

**Table 5.1. Rules for prices paid for RES by GRTN.**

Electricity produced by plants having the following characteristics	Prices
< 10 MW <sub>e</sub> (programmable or not, any date of operation)	Guaranteed minimum prices are paid for first 2 million kWh/year generated by plants < 1 MWe – see below
≥ 10 MW <sub>e</sub> (non-programmable)	The selling price paid to distribution companies*
Hybrid plants < 10 MW <sub>e</sub>	The selling price paid to distribution companies for RES qualified and/or CHP; unitary variable prices are guaranteed for electricity generated by thermoelectric plants utilising commercial fossil fuels
≥ 10 MW <sub>e</sub> (programmable hybrid plants**)	Prices are determined by bids in the electricity market

*Notes:*

1. \* Green Certificates are awarded to those plants that were put into operation after the 1st April, 1999.
2. \*\* Hybrid plants are those that utilise both renewable and non-renewable sources, including co-firing plants.

Selling-prices to distribution companies are determined by the *Acquirente Unico* (Single Buyer\*) in relation to different rate-periods or as undifferentiated prices averaged over the period considered. Recently determined selling-prices are reported in Table 5.2.

*Note: \*This is the company that is vested with the task of procuring electricity for captive customers under criteria of continuity, security and efficiency of electricity-supply, thereby passing on the benefits from liberalisation of the sector to such customers.*

**Table 5.2. Selling prices to distribution companies – Eurocents/kWh.**

	2004									2005
	May	June	July	August	September	October	November	December	January	
F1				1	12.6		16.1	13.4		
F2					6.6	6.6	6.6	5.6	9.1	
F3					6.2	6.2	5.0	4.5	7.2	
F4					4.0	3.5	3.6	4.0	4.2	

In the first column of Table 5.2 there are four codes (F1 to F4) for “rate-periods” because prices vary according to the date (to follow variations in demand, etc.). The codes for year 2005 are summarised in Table 5.3, overleaf.

As mentioned in Table 5.1, for RES plant having capacities greater than 1 MW<sub>e</sub> (including waste-to-energy plants, but excluding hybrid plants), there are minimum guaranteed prices for the first 2 million kWh/year generated, which are defined as follows:

- (a) for the first 500 MWh/year- 95 Euros/MWh;
- (b) from 500 to 1,000 MWh/year - 80 Euros/MWh; and
- (c) from 1 to 2,000 MWh - 70 Euros/MWh.

On outputs over 2,000 kWh/year, the selling price reverts to the ordinary price paid to distribution companies (per rate period or undifferentiated)\*.

*Note: \*40 per cent of these prices are updated yearly according to the ISTAT index (consumer-price index), to take into account inflation-rate.*

Within the various arrangements for incentive, fiscal facilities have considerable economic importance. They include an exemption from fuel-taxes, which has been in force for a long period, for renewable fuels and for fossil fuels used in CHP. The rate of VAT paid by the final user is 20 per cent for fossil fuels and 10 per cent for heat from district heating.

Table 5.3. Rate-periods for 2005 (Decision 235/04 of AEEG).

	MONDAY-FRIDAY																							
Hours:	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1-9 January	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4
10 jan-11 mar	F4	F4	F4	F4	F4	F4	F4	F2	F2	F2	F2	F2	F3	F2	F2	F2	F2	F2	F2	F2	F3	F4	F4	F4
14 mar-29 apr	F4	F4	F4	F4	F4	F4	F4	F3	F2	F2	F2	F3	F3	F3	F3	F3	F3	F3	F3	F3	F3	F4	F4	F4
2-31 may	F4	F4	F4	F4	F4	F4	F4	F3	F2	F2	F2	F2	F3	F2	F2	F2	F2	F3	F3	F3	F3	F4	F4	F4
6-30 june	F4	F4	F4	F4	F4	F4	F3	F2	F1	F1	F1	F1	F2	F2	F1	F1	F1	F2	F2	F2	F2	F2	F4	F4
1-29 july	F4	F4	F4	F4	F4	F4	F3	F2	F1	F1	F1	F1	F2	F2	F1	F1	F1	F2	F2	F2	F2	F2	F4	F4
1-5 august	F4	F4	F4	F4	F4	F4	F4	F3	F2	F2	F2	F2	F3	F2	F2	F2	F2	F3	F3	F3	F3	F4	F4	F4
6-21 august	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4
22 aug-16 sept	F4	F4	F4	F4	F4	F4	F3	F2	F2	F1	F1	F1	F2	F2	F2	F1	F1	F2	F2	F2	F2	F3	F4	F4
19 sept-18 nov	F4	F4	F4	F4	F4	F4	F3	F2	F2	F2	F3	F3	F3	F3	F2	F2	F2	F2	F2	F3	F3	F4	F4	F4
21 nov -7 dec	F4	F4	F4	F4	F4	F4	F3	F2	F2	F2	F2	F3	F3	F2	F2	F1	F1	F2	F2	F3	F4	F4	F4	F4
12-23 december	F4	F4	F4	F4	F4	F4	F3	F2	F1	F1	F2	F3	F3	F2	F2	F1	F1	F2	F2	F3	F4	F4	F4	F4
24-31 december	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4
	SATURDAY-SUNDAY AND WEEK HOLIDAYS (*)																							
1 gen - 31 dic	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4	F4

(\*) 1-6 january, easter Monday, 25 april, 1 may, 2-3 june, 15 august, 31 october, 1 november, 8, 9, 25 and 26 december

In the framework of the taxation on emissions of CO<sub>2</sub>, and measures to reward the reduction thereof, fiscal incentives have been introduced which are directed to those final users who connect to district-heating networks fuelled with biomass. These incentives are effective tools to acquire new clients quickly, making commercial promotions largely superfluous, but they do not directly affect investments in district-heating systems.

Law 448/98 (in its Article. 10, Clause (f)) awards a tax-credit of 20 lire\*/kWh to the users in Climatic Zones E (most of the flat plain around the River Po is in this Zone) and F (mountainous areas), as an incentive to reduce polluting emissions. For the future the incentive has been increased by 30 lire/kWh, but with a limited scope in time – it has been confirmed so far only for 2006. Considering the significant amount involved (a total of 50 lire/kWh), the user can accept a more expensive tariff, thus transferring part of the incentive to the system supplying the district-heating service. In the following analysis, it has been deemed reasonable to increase the tariff by 20 lire/kWh (10.33 Euros/MWh), leaving to the user the other 30 lire/kWh.

*Note: \*2000 lire (the previous currency of Italy) approximate to 1 Euro.*

Article 21 of Law 388/00 (the Financial Law for 2001): grants a tax credit of 40,000 lire (20.66 Euros) per kW of contracted power to the users who connect to a district-heating network fuelled by biomass.

Law 387/03 introduces the possibility of particular “*technical, economic, regulatory and organisational measures*” to favour (a) the recovery of residues from forest-maintenance, green areas, street-trees and food-processing industries, and (b) the identification of agricultural areas suitable for cultivation for energy-crops, which may contribute to an increase in local availability of virgin biomass.

As a result of the process of decentralisation. Laws 59/97, 112/98 and 3/01 have provided for all administrative functions for energy that are not specifically reserved to the national Government to be delegated to the regions and to their municipalities. The regions operate through initiatives connected to Regional Energy Plans, where evaluations of the potential and on the environmental impact and benefits are made; financing of projects is established through specific bids.

## **5.6 Security of supply**

Law 290/03 (upgraded from Decree 239/03) guarantees a suitable level of generation of electric power, and provides a derogation from limits on levels of emissions to the 30th June, 2005. That gave the Government time to re-plan (a) the use of hydroelectric plants, (b) the re-opening of plants that had been mothballed for long time, and (c) increasing arrangements for demand-management to reduce the risks of severe power-cuts. A scheme has been introduced, covering a total of 3,500 MW<sub>e</sub> of interruptible power; has been introduced in two steps: (a) 1,750 MW<sub>e</sub> can be closed without warning with a compensation of 21 Euros/MWh, and (b) a further and 1,750 MW<sub>e</sub> can be closed with warning and with a payment of 8 Euros/MWh. This law assigned to the MAP the measures to the development of national grids for electricity and natural gas.

Decree 279/2003 defined a remuneration system for electrical power to cover national demand, including the necessary margins of reserve. A payment for capacity, introduced in transitory form by the AEEG’s Decision 48/04), has two elements: (a) a specific compensation for plant depending on their availability in specified, critical days, and (b) further compensation that considers the trend of the price in the market.

An increase of capacity of electric power could be achieved by (a) an improvement in availability of the generating plants - in June, 2003 only 63 per cent of the nominal capacity was available - and (b) the building of new plants - in 2003, two new thermal power stations of 900 MW<sub>e</sub> were inaugurated, the building of new plants of 12,637 MW<sub>e</sub> of capacity were authorised and authorisations were sought for a further of 45,000 MW<sub>e</sub> of capacity.

### 5.7 Other recent national actions to promote sustainable energy

The Government has undertaken new (and partly corrective) actions to reach its targets in the improvement of energy-efficiency, the reduction of GHG, the security of energy-supply and spread of the use of RES.

MAP enacted a Decree on the 16<sup>th</sup> June 2005 to facilitate development-plans to improve energy-efficiency and the spread of RES. The available budget is 50 MEuros from the national resources of the Fund for Technological Innovation and additionally 30 MEuros from the European Fund for Regional Development. To be eligible, the cost of a plan must fall in the range between 1.5 and 5 MEuros and the aim must be to produce energy from RES or to reduce emissions of CO<sub>2</sub>, energy savings and alternative fuels. A plan must be completely implemented within 18 to 24 months.

MAP, in collaboration with the Ministry of the Environment, enacted another Decree on the 28th July 2005 to stimulate the production of electrical energy from PV. The systems must (a) have a power between 1 kW and 1 MW, (b) be connected to electric system and (c) be in working order after the 30th September 2005. The value of the incentive depends on the power of the photovoltaic plant: (a) for a power of less than to 20 kW, the value is 0.445 Euro/kWh, (b) between 20 and 50 kW, it is 0.460 Euro/kWh; and (c) between 50 kW and 1 MW, it is 0.490 Euro/ kWh. Besides, these different categories of plants receive different prices for the electricity that they produce – see Table 5.4.

**Table 5.4. Schedule of prices for E-RES from plants of different sizes.**

Plant Scale (kW)	Subsidy (c€/kWh)	Electricity price (c€/kWh)	Note on subsidy	Required guarantee (€/kW)	Subsidised power (MW)	Plant realization (months)	Plant running after (months)
1 – 20	44,5	14	Decreasing annually by 2% from 2007	no	60	12	18
20 – 50	46	9,5	Decreasing annually by 2% from 2007	no		24	30
50 – 1000	49	8,5	Decreasing annually by 2% from 2007 (tender mechanism)	1.500	40	24	30

Source: Italian Energy Agency (ENEA)

To encourage a quick response, projects submitted after 2006 will have their incentives reduced by 2 per cent. These incentives will last for twenty years.

This Decree initially foresaw subsidies for the rapid installation of 100 MW<sub>e</sub> (the national target then being 300 MW<sub>e</sub> of PV-capacity installed by 2015), but a new Decree enacted on the 6<sup>th</sup>



February, 2006 has increased to 300 MW<sub>e</sub> the capacity that is eligible for the feed-in tariff (and the target for 2015 has been raised to 500 MWe of capacity of PV).

AEEGs will establish the methods to provide the economic resources and the methods to distribute the incentive values.

Law 128/2005 promotes the use of biofuel and other renewable fuels to replace petrol diesel in transport. The national objectives were set to achieve a level of consumption of biodiesel and renewable fuels equal to (a) 1.0 per cent of the total consumption of petroleum in transport by the 31st December, 2005, and (b) 2.5 per cent by the 31<sup>st</sup> December, 2010. These aims will be achieved through several actions. The first of these is set out in Law 311/2004, which provides that, from the 1st January, 2005 to 31st December, 2010, biodiesel is exempted from excise duty for a quantum of up to 200,000 tonnes/year. Blends of petroleum-diesel with biodiesel containing up to 5 per cent of biodiesel, having the characteristics of diesel required by the relevant regulations, can be included.

Legislative Decree 192/2005 sets out the principles of, and the methods for, reducing energy-consumption in buildings\*, to promote the development and integration of RES. In particular, this Decree decides: (a) the methodology for calculating the energy-efficiency of the buildings, (b) the general rules for the energy-certification of buildings, and (c) the promotion of the RUE through the active provision of information to end-users.

Signature of this Decree followed technical consultations with representatives of the Regions and the National Government, and parliamentary approval on some specific aspects. The text gives the Government 120 days to provide regulations on new methods for determining such performance. The main simplification introduced is that certification will be required for all new buildings and for those submitted to major renovation also in case of rental or sale, excluding the other existing buildings.

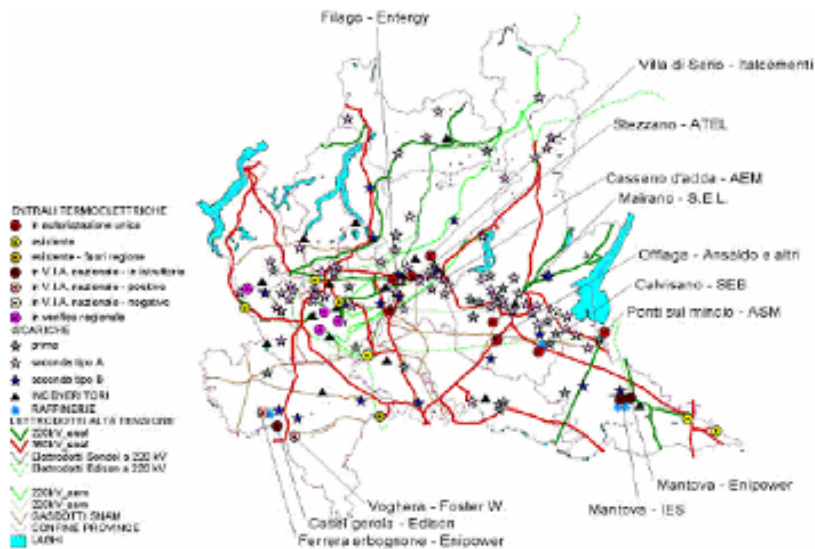
*Note: \*the Decree applies both to new buildings and to those that are being restructured.*

### **5.8 Programmes for national energy-infrastructures**

Another important issue connected to the production, distribution and use of energy in Italy, and in particular in the Region of Lombardy, is the environmental impact of energy-production plants and networks for transportation and distribution of fuels and of electricity (gas/oil pipelines and the electricity grid).

Lombardy is highly urbanised and densely populated in some areas. New infrastructure has to be designed and built carefully, and without increasing the already high levels of impact of the existing built environment (roads, highways, urban centres, etc.) on the natural environment (fauna, hydro-geological conditions, ecological corridors).

**Figure 5.7. Infrastructures for energy conversion and distribution, presently running or under construction in Lombardy**



National and regional programmes for the development of infrastructures also must take into account European legislation on Environmental Impact Assessment and also the more recent legislation on Strategic Impact Assessment\*.

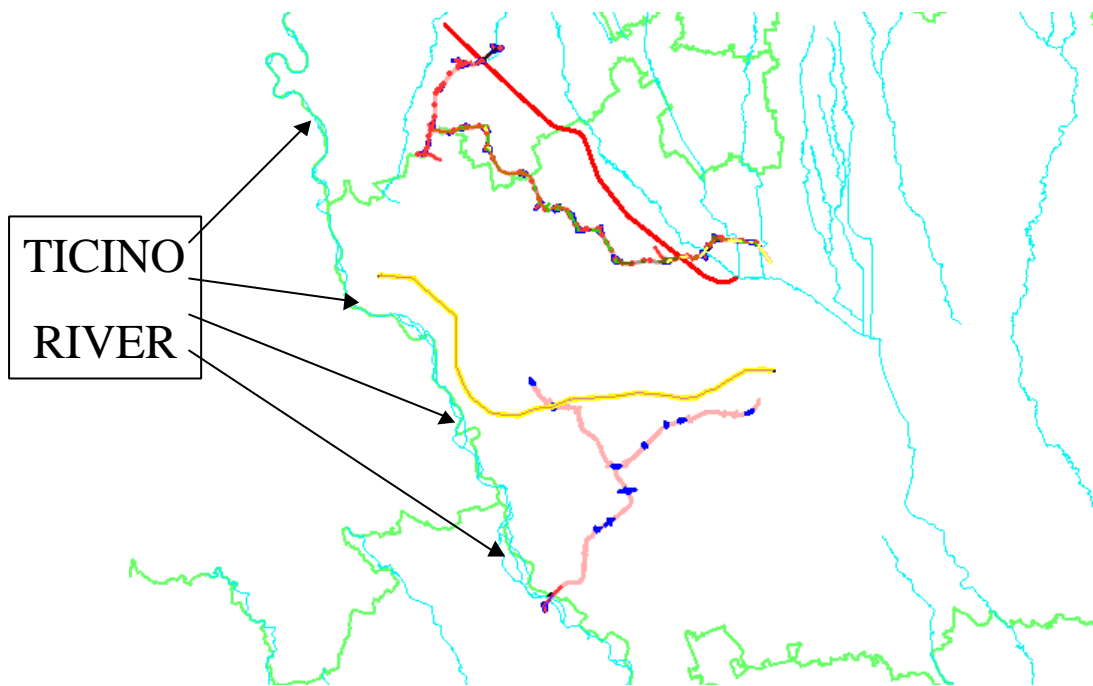
Proposals for the construction of infrastructures may be subject to Environmental Impact Assessments (EIA\*\*). EIA Directive (85/337/EEC, amended by 97/11/EC and 2003/35/EC) requires an EIA to be carried out for projects “likely to have significant effects on the environment”. The Directive provides lists of types of projects in two annexes; the first annex describes projects that **must** be subjected to an EIA, and the second annex lists projects that must be examined to provide a decision about the need for an EIA. In Italy, a further list is used to identify those Annex-II projects for which EIA, whose application has been included in the jurisdiction of Regions\*\*\*, is mandatory. Other Annex-II projects are subject to EIA provided that they are in natural protected areas (including Ticino Park\*\*\*\*); otherwise they are screened using a combination of thresholds and case-by-case examination.

#### Notes:

1. \* Strategic Impact Assessment requires to evaluate not single projects/installations, but entire plans/programmes for development of a territorial unity (e.g. a Region or a Province).
- 2.\*\* Valutazione di Impatto Ambientale (VIA) in Italy.
- 3.\*\*\* Application of EIA for projects included in ANNEX I of the EIA Directive is in the jurisdiction of the State.
- 4.\*\*\*\* Regional Deliberation: d.c.r. 26.11.03, n. 919.

In the Area of Ticino Park, it is possible to identify two sites in the category of projects that subject to the national level of EIA: (a) Malpensa Airport and (b) a thermoelectric power plant at Turbigio (owned by Edipower). Various other projects (plants for production of electric/thermal energy, industrial plants and other infrastructures, e.g. roads, natural gas pipelines and electricity lines) are subject to regional EIAs, some of which are now in progress.

**Figure 5.8. Examples of infrastructures subject to EIA in the territory of Ticino Park (electricity lines – yellow; roads and railways – red and pink).**



### 5.9 The policies and programmes for sustainable energy in Lombardy

All (21) Italian Regions have to develop Regional Energy Plans to achieve objectives that are defined in national legislation on energy, namely the increase of energy-efficiency (for example through the White-Certificates mechanism), development of local renewable energies (through the Green-Certificates mechanism), reduction of harmful emissions, security and economy of supply, promotion of research activities, innovation and technology-transfer for high-efficiency systems.

Lombardy approved its Regional Energy Plan in April, 2003; detailed information on the plan is provided above.

Other laws and programmes introduced by Lombardy in the sector of energy include:

- (a) Regional Law n° 17, 27/03/2000 (amended by Regional Law n° 38, 21/12/2004) – Measures for energy saving in external lighting and to counteract light pollution;
- (b) Regional Resolution (DGR) 22/10/99 – Identification of regional energy areas;
- (c) Regional Resolution (DCR) 3/12/2002 – Approval of Regional Energy Policy Application of EU Structural Funds for Regional Development – Calls for Tenders (21/06/2002 and 31/01/2005) for the realisation of renewable energy plants (wind, solar, geothermal, hydro up to 10 MW<sub>e</sub> and virgin vegetal biomasses) and of interventions for energy-saving, to be applied to satisfy energy-demand in the institutional buildings of local authorities;
- (d) Regional Law n° 26 of 12/12/2003 - General Regulations for waste management, energy, utilisation of underground and of water resources. The Law introduces, as regards energy, general guidance about objectives to be pursued. In particular, CHP, district-heating and RES must play a major role in regional policy, along with the liberalisation of the market to increase competition within the energy sector, to reduce prices of services for consumers;
- (e) Regional Law n° 1 of 16/02/2004 – Control of energy-consumption in buildings by means of metering of heat (mandatory for the buildings licensed after 30/06/2000);
- (f) Regional Resolution (DGR) 2/7/2004 – Guidance for the realisation of a regional registry for civil thermal plants; and
- (g) Regional Law n° 39, 21/12/2004 – Regulations for energy-saving in building and for reduction of harmful emissions responsible for climate-change. This Law introduces some important measures and programmes to reduce consumption in buildings, such as: (a) the

reduction by 25 per cent of the volumetric heat-loss coefficient\* for new and restructured buildings; (b) programmes for the realisation of energy-records for heating-systems and of their corresponding heated spaces; and of energy-diagnoses for the registered building/heating system.

*Note: \* Coefficient CD (coefficiente dispersione) in Italy; G Value in UK.*

Lombardy accounts for about 20 per cent of total Italian energy-demand, and it has to import almost 50 per cent of electricity it uses from other Italian Regions, or from abroad (Switzerland). The contributions from RES have increased very slowly in the first years of the 21<sup>st</sup> century – an increase of only 1.2 per cent was achieved from 2002 to 2003 while the regional energy-demand increased by 3.8 per cent.

This situation induced the Region to define a Regional Energy Plan (Programme) during 2003, whose strategic objectives are: (a) the reduction of the cost of energy; (b) reduction of harmful emissions responsible for climate change, (c) promotion of new technologies and, (d) safeguard of people health and of the weakest segment of population.

In more concrete terms, the Plan is directed at maximising the utilisation of local Renewable energy sources (biomass and waste, hydro), developing clean fuels for transportation and for residential heating, and increasing efficiency in some sectors (such as the civil and service sectors) that offer great margins for improvement. The Plan considers the current situation and a reference-scenario for 2010.

On the side of supply, the target is to reduce imports of electricity to about 10 per cent by 2010, by exploiting RES and by transforming existing thermoelectric plants into highly-efficient combined-cycle gas-turbine (CCGT) plant fed by natural gas. A summary of data is given in Table 5.5.

**Table 5.5. Summary of data relating to electricity from Lombardy's Energy Plan.**

Demand in 2010	GWh	82,000
Required production by 2010	GWh	73,800
Production in 2000	GWh	38,600
Increase from RES by 2010	GWh	1,600
Required increase from conventional sources 2010	GWh	33,600
Required new power (5,500 hrs/year)	MW	6,100
Power to be obtained by transforming plant CCGT	MW	3,000
Power already authorised (EIA)	MW	2,000
Additional power required by 2010	MW	1,100

To contribute to the promotion of RES and other rationalisation measures, financing mechanisms are included in the Plan; Regional contributions to investments are defined in relation to the various initiatives, as follows:

- (a) Biomass and CHP: 20 to 40 per cent;
- (b) District-heating: 20 per cent;
- (c) Solar PV: 60 to 75 per cent;
- (d) Solar thermal: 25 per cent;
- (e) Heat pumps: 40 per cent;

- (f) Geothermal (low enthalpy): 40 per cent;
- (g) Mini-hydro: 20 to 60 per cent; and
- (h) Wind-power: 20 per cent.

Other funds have been established to support programmes for sustainable transport:

- (a) 9 M Euros for financing the purchase of LPG- or methane-fuelled cars.
- (b) 5 M Euros for the conversion of private cars to run on LPG/methane.
- (c) 3 M Euros for the purchase and conversion of commercial cars running on LPG or methane.
- (d) 3 M Euros for the purchase of mopeds or motorcycles.
- (e) 6 M Euros (in 2005) for discount-cards for the purchase of LPG or methane.
- (f) Funds (not yet quantified) for the purchase of taxi-cabs and vehicles for public transport.

The Regional Plan will be revised during 2006, especially looking at:

- (a) The retrofitting of power plants, through bilateral agreements with the Italian Government to favour the conversion of plants currently running on oil (the efficiency-target for retrofitted power plants is set at 58 per cent, to be reached, for example, by means of CHP);
- (b) The potential of RES;
- (c) Energy-efficiency in buildings; and
- (d) Coordination of actions by the Region with those of its Provinces and Municipalities, especially for the realisation of policies on buildings.

At the beginning of 2005, Lombardy launched an Action Plan to support local authorities to implement Agenda 21. The main objective is to stimulate an improvement in the capacities of local authorities, and of public and private actors, to programme and realise measures and actions for sustainable development. In the area of energy, five paths towards energy sustainability have been identified:

- (a) The biomass chain: valorisation of local energy sources for the production of power and heat for residential users (district-heating systems) and/or firms, with recovery of peripheral rural areas and promotion of local ventures in the agro-forestry sector;
- (b) Energy sustainability in tourism: rationalisation and savings in the hotel sector and diffusion of RES;
- (c) Sustainable mobility: reduction of consumption of fossil fuels by increases in vehicle-efficiency and in the use of bio-fuels (e.g. bio-diesel) and other cleaner fuels (LPG or methane);
- (d) Building regulations: introduction of tighter energy standards for construction, by means of compulsory interventions (condensing boilers, solar collectors for sanitary water, single-dwelling metering of heat, double glazing) and voluntary interventions (flat or pitched green roof) that may be promoted through case-by-case incentives; and
- (e) Local energy-management: attribution of the role of energy manager to a single person within each local authority, to be responsible for analysing patterns of energy-consumption within the public and private sectors.

The guidelines for the new Regional Rural Plan (for the period from 2007 to 2013), which was prepared at the end of 2005, include the promotion of RES, and in particular in the agro-energy sector. A key action recognised in the Plan in the commercial field is the development of new channels for sales of agro-forestry products (non-food production, renewable-energy materials).

On the environmental-protection front, the Plan again foresees aid to the development of RES as a key intervention, and this is also mentioned under the topics of "*quality of life and diversification of rural economy*".

### 5.10 The case of biomass energy in Lombardy Region

As it has been pointed out in the section about the Regional Energy Plan, biomass is reckoned as the main renewable source on which Lombardy will rely to increase its energy sustainability and also to create new sources of income for rural, agro-forestry areas.

Utilisation of biomass for energy production (in power/cogeneration plants, plants for district heating and distributed heating systems/boilers) is however liable to environmental legislation (both national and regional), as reported hereafter.

In the Decree of the March 8<sup>th</sup>, 2002, (Regulation of characteristics of fuels relevant for air pollution as well as of technological characteristics of combustion systems), the only material that is classified as solid biofuel is "virgin biomass", that is agro-forestry materials which have been treated only mechanically.

In Italy, materials that have undergone any chemical treatment are excluded from the solid-biofuel category, even though (a) their combustion is encouraged by the Decree of the 5<sup>th</sup> February, 1998 (on simplified procedures for energy recovery of waste), and (b) in European law, such materials are "accepted" (i.e. excluded from legislation on incineration of waste), unless they contains organic halogen compounds or heavy metals\*.

The Italian approach will be reviewed, however, to produce harmonisation with the Decree for the actuation of European Directive on the incineration of wastes (WID).

Biomass that is not exempted from legislation on incineration of waste and is sent to combustion in Lombardy Region is subject to:

- (a) All of administrative requirements contained in the "Ronchi Decree" (22/1997) and its subsequent modifications, and those in the subordinate Decrees covering its application (including Decree of 5<sup>th</sup> February 1998).
- (b) the restrictions set by the above-mentioned Decree 5/2/1998, that are relevant to the control and prevention of atmospheric pollution.
- (c) Specific measures introduced by the Lombardy Region within the legislation on air quality maintenance.

*Note: \* Draft European Standards being prepared by the relevant CEN Technical Committee 335 (Solid Biofuels) define biomass as "solid biofuels originating from the following sources:*

- products from agriculture and forestry;
- vegetable waste from agriculture and forestry;
- vegetable waste from the food processing industry;
- wood waste, with the exception of wood waste which may contain halogenated organic compounds or heavy metals as a result of treatment with wood preservatives or coating, and which includes in particular such wood waste originated from construction and demolition waste;
- fibrous vegetable waste from virgin pulp production and from production of paper from pulp, if it is co-incinerated at the place of production and heat generated is recovered."

The Regional Decision VII/6501, dated the 19th October, 2001\*, fixed special limits on emissions to air in some areas. The regional territory is divided into three categories with respect to air-quality (Figure 5.9): Critical Areas, Restoration Areas and Maintenance Areas\*\*. In Critical Areas, it is not allowed to build biomass-fired plants for the production of electricity alone, though it is permitted to install biomass-fired CHP plants attached to district-heating systems\*\*\*. The limits on emission fixed by the national Decree of the 5<sup>th</sup> February, 1998, are changed only for NO<sub>x</sub> (80 mg/Nm<sup>3</sup>, at an oxygen content of 11 per cent in dry gas).

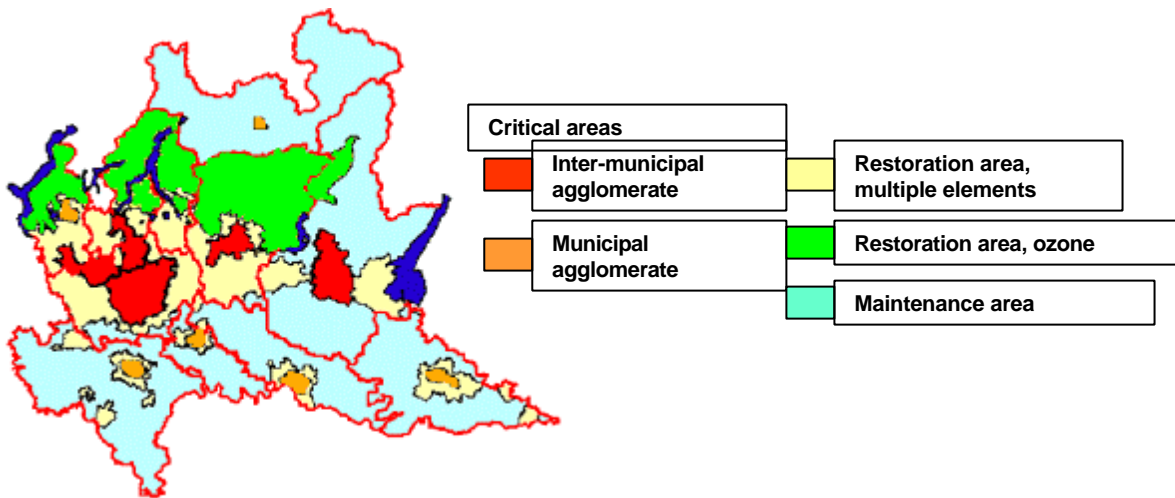
Notes:

1.\* It should be noted that this Regional measure was introduced before the national Decree of the 8th March, 2002, hence the only national legislative reference is the Decree of the 5th February, 1998, which implies no distinction between virgin and treated biomasses. Within the next months, however, the measure will be modified to be harmonised with the later national Decree.

2.\*\*In the area of Ticino Park the following districts are classified as “Critical Areas”: Gallarate and Somarate in the Province of Varese, and Pavia in the Province of Pavia. 31 other districts in the Provinces of Milan, Varese and Pavia are in a “Restoration Area”, and 13 districts in the Province of Pavia are in a “Maintenance Area”.

3.\*\*\* In winter, the capacity employed for the heat production has to be more than 50 per cent.

**Figure 5.9. The Lombardy Region divided into areas for air-quality control.**



In Restoration Areas the installation of power plants is allowed if the limit of  $80 \text{ mg/Nm}^3$  for  $\text{NO}_x$  emissions is respected. District-heating plants fired with biomass have to comply with the limits fixed by the national Decree of the 5<sup>th</sup> February, 1998, except for  $\text{NO}_x$  ( $110 \text{ mg/Nm}^3$  with the oxygen content at 11 per cent in dry gas).

It is therefore clear from the above text that utilisation of biomass for energy production is not accepted without questions in Lombardy Region.

As an example, it can be cited the regional decree (14/02/2006) that was issued at the beginning of 2006 to counteract a situation of serious atmospheric pollution in critical areas. The decree prohibited (till the end of March 2006) use of wood for residential heating in critical areas and in buildings where other heating systems (fuelled by oil, natural gas, LPG) are available.

In this sense, promotion and adoption of higher-quality appliances (e.g. modern pellet boilers), possibly endowed with abatement systems, may be an optimal solution to combine the advantage of an important renewable source with an adequate protection of the environment.

*Note:\** It is indeed important to underline that climatic conditions in some periods of the year (autumn-winter) cause severe problems of air pollution in some areas of Lombardy Region.

### 5.11 Local programmes and plans in Ticino

All of the three Provinces (Milan, Pavia and Varese) that have lands that form part of Ticino Park are developing programmes, plans and policies for energy-sustainability. The most important measures and actions included in these documents are reported hereafter, by Province.



The Province of Milan is developing an energy-efficiency programme, which was issued for consultation in November 2005. It includes an Action Plan that identifies five sectors for demand-side initiatives:

- (a) information – education, international cooperation, demonstration activities;
- (b) buildings - certification, reductions of consumption in different categories of (i) buildings and (ii) uses;
- (c) SMEs – new services, higher efficiency in production processes, micro-cogeneration, research and development;
- (d) public Administration – advice to municipalities on local regulations, retrofit of public buildings, models for services contracting; and
- (e) mobility – to be defined.

Milano Province has moreover created a forum and local discussion tables on certification of buildings and on buildings codes (guidelines for municipalities).

The Province of Varese has developed a Sustainability Provincial Action Plan in which several actions for energy-sustainability are proposed. Among them:

- (a) promotion of thermal utilisation of solar energy;
- (b) promotion of the energy utilisation of forestry biomass;
- (c) buildings codes for energy saving;
- (d) high-efficiency public lighting;
- (e) energy savings in commercial buildings and in small-medium industries, by applying electric engines from the EU Project "*Motor Challenge*";
- (f) promotion of the creation of energy service companies (ESCOs); and
- (g) education for citizens, schoolchildren, etc.

The Province has also defined a Plan for integrated waste management in which some options for energy-recovery are proposed, also by producing and using SRF (e.g. through bio-stabilisation of waste). It has, moreover, created a local Agenda 21 process to promote discussions on several themes regarding sustainability and, in particular, energy (e.g. on building-codes aimed at saving of energy).

The province of Pavia has developed some preliminary documents that are necessary for correct energy-planning, namely an Energy-Balance for the Province and a study of opportunities for the exploitation of RES. An Energy Plan is still under discussion (a draft will be available in Summer 2006). The Province has also created a local Agenda-21 process, and a specific forum on energy to discuss opportunities for sustainability (e.g. the recovery of energy from waste, building-codes applicable to achieving (a) higher efficiency of boilers, (b) improved insulation and (c) the greater exploitation of solar energy and rain-water.

Relevant Agenda 21 processes that may be found within the Municipalities of the Ticino Park include:

- (a) a municipal plan for energy-saving, developed by the Municipality of Pavia, which has already been given access to some funds dedicated to Agenda 21 Programmes; and
- (b) a plan developed by the Municipality of Lonate Pozzolo, which has defined rules and criteria for better-quality energy- and environmental-systems for civil and industrial sites.

## 6. POLICIES AND PLANS IN SWEDEN AND SKELLEFTEÅ

According to statistics published by the Swedish Energy Agency, in 2003, about 53.7 million tonnes of oil-equivalent (MTOE\*) of primary fuels were produced or imported, and about 34.9 MTOE\* were consumed. The difference was made up of about exports, storage, losses in conversion and distribution of energy and in internal use by the energy industry; and in non-energy uses.

*Note: \* 1 MTOE is equivalent to 11.63 TWh.*

The population of Sweden is about 9 million, so the annual consumption of energy *per capita* is about 3.9 TOE.

The Swedish Energy Agency is responsible for the Swedish national programme for making energy-use more efficient in Sweden. In 1997, a new political decision was made on the overall goals to be attained through the more efficient use of energy. The Agency has, since 1998, allocated a sum of around 200 MEuro to support research and development within the area of efficient use of energy.

### 6.1 Electricity and gas in Sweden

One of the powerful features of the WISE-Plans Project is the wide range of circumstances of the four MS represented within it. This shows up in several ways, one of which is in the production and consumption of electricity – see Table 6.1.

**Table 6.1 Production and consumption of electricity in the four WISE countries in 2002\*.**

Country	Production – TWh/year						Per-capita use – MWh/year
	Fossil Fuel	Nuclear power	Hydro-power	Biomass and waste	Total Production	Import/Export	
UK	285	88	9	5	387	8	6.2
Italy	228	0	53	4	285	51	5.4
Sweden	7	72	67	4	146	5	15.7
Spain	143	63	35	5	246	5	5.7

*Note: \*this data is from the International Energy Agency and does not express the recent growth of renewables in the four WISE countries, but it nevertheless shows some striking differences between the countries.*

For example, it can be seen that nuclear power was the largest source of electricity in Sweden; indeed, no other country produces as much nuclear power *per capita*. In 1980, the Government decided that nuclear power should be phased out by 2010. A start on this was made in 1999 with the closure of one station, but further progress since then has been slow because of resistance from the nuclear industry; only one further station has been closed.

The high level of *per-capita* use of electricity in Sweden is caused by a concentration of intensive energy-using industries there.

The production and trading of electricity are carried out within a competitive framework established in January, 1996. The network for the transmission of electricity, however, continues to consist of local monopolies. The Energy Markets Inspectorate ensures that (a) the network

operation is run efficiently, (b) network-charges are reasonable and (c) the network-operators apply terms to promote competition within the electricity business.

As from the 1<sup>st</sup> August, 2000, corresponding rules have applied to the natural-gas market. Since the 1<sup>st</sup> November, 1999 all consumers have been at liberty to choose which electricity-trader they wish to buy power from.

Changing suppliers costs the customer nothing and can be done at the end of any month. No licence from the Inspectorate is required to trade in electricity and free competition should prevail in the electricity-trading field.

Producers of electricity that use combustion-processes pay a tax on their emissions of sulphur oxides and a levy on their emissions of oxides of nitrogen from larger boilers and gas-turbines. The sulphur-tax is currently charged at about 3.15 Euros\*/kg of SO<sub>2</sub>, and the NO<sub>x</sub>-levy at about 4.21 Euros\*/kg of NO<sub>x</sub>. The levy is rebated in proportion to the total production of useful energy, providing an incentive to minimise levels of emissions of NO<sub>x</sub> per unit of useful energy.

*Note: \*in this report, an exchange-rate of 9.5 Swedish Kronor to 1 Euro is assumed.*

Electricity-production at combustion-plants is not subjected to a tax on energy or CO<sub>2</sub>. For CHP plants, the part of the fuel that is allocated to the production of heat is also exempted from the energy-tax, but is charged 21 per cent of the tax on CO<sub>2</sub>.

Electricity produced at nuclear stations is subjected to a “power-tax”, which works out at about 0.3 Eurocents/kWh, and also to two other lesser levies. Owners of nuclear plant are also required to set aside capital for de-commissioning and waste-disposal.

For further information about the taxation on energy in Sweden see Appendix 4.

Sweden’s national grid is integrated with those of her neighbouring countries; imports and exports of power within the Nordic Pool are strongly dependent on the flows of water in the rivers that feed the hydro-power systems. For example, whereas Sweden’s net imports were 12.8 TWh<sub>e</sub> in 2003, 2 TWh<sub>e</sub> were exported in 2004.

Customers have to sign two contracts to secure a supply of electricity: (a) one to obtain a connection to the distribution network, and (b) another for the supply of the electricity. Customers have the higher-priced “open-ended contracts” if they have not agreed either fixed-price or variable-price terms. Typical prices for electricity under open-ended contracts in January, 2005 ranged between about 5.1 Eurocents/kWh for a domestic customer living in an apartment and using about 2 MWh/year, down to about 4.0 Eurocents/kWh for a small industrial customer using about 350 MWh/year.

Typical network charges are about 4.9 Eurocents/kWh for a domestic customer living in an apartment and about 1.8 Eurocents/kWh for a small industrial customer. Taxes\* (including VAT) add about 2.0 Eurocents/kWh for a domestic customer but only about 0.05 Eurocents/kWh for an industrial customer. Thus the total cost of electricity for a domestic customer living in an apartment is about 12 Eurocents/kWh.

*Note: \* Taxes and levies are applied to the consumption of electricity, and vary according to the types of users and where they are in the country (north or south). From the 1<sup>st</sup> January, 2005 the energy-tax on electricity for domestic users was about*

*2.7 Eurocents/kWh in the south of Sweden, and about 2.0 Eurocents/kWh in the north. VAT is then applied at the rate of 25 per cent. Such taxes are also applied to the supply of gas, heat and water. Industrial consumers, however, pay much lower taxes (note the stark contrast with the taxes in the UK, which are focused on industry rather than the domestic consumers) – about 0.05 Eurocents/kWh.*

An Act to promote the Energy Efficiency Improvement Programme was introduced in January, 2005, which allows some industrial companies exemption from the energy-consumption taxes if they participate in five-year programmes to improve energy-efficiency.

Since the 1990s, Sweden has operated several programmes to support electricity from RES. Investment-grants have been provided to projects to produce power from biomass, wind and small-scale hydro-stations, and production-subsidies have been given to wind-power plants (in 2005, these were about 1 Eurocent/kWh for onshore plants, and about 1.7 Eurocents/kWh for offshore turbines).

There have also been some voluntary systems for purchasing green power, but those have not been adequately successful. Since 2003, Sweden has operated a market for Green Certificates for electricity from eligible RES using an obligation broadly similar to that in the UK, but with a few differences, for example, the larger scale of operations in Sweden. The obligation was here 10.4 per cent in 2005, and will reach 16.9 per cent in 2010. In 2004, Certificates were issued for 7.8 TWh<sub>e</sub> at a weighted average price of about 24.3 Euros/MWh (which is added to the value of the electricity in the ordinary market).

Some natural gas is imported by Sweden and distributed through a network in the south-west of the country only, although several plans are in hand to extend it. Total sales amount to about 10 TWh in 2004. In tune with the adoption of a European Directive on the liberalisation of markets for gas in 2003, Sweden has progressively opened its gas-market. Today, all non-domestic customers (who represent about 95 per cent of the country's consumption of gas) can choose their suppliers and the market will be fully open by July, 2007.

Typical prices for natural gas in 2004, including taxes, ranged from about 8.3 Eurocents/kWh for a domestic customer down to about 2.9 Eurocents/kWh for CHP plants and efficient power plants.

## 6.2 The district-heating market in Sweden

Nowadays, district-heating is very well established in Sweden; for example, it is the most common form of heating in apartment-buildings in 232 of the 290 Swedish municipalities. It supplies about half of the heat used in the totality of residential and commercial buildings in the country. In 2003, the total output was 47.5 TWh.

District-heating has played an important role in Sweden's energy-policies for many years. In the 1970s and 80s, it was one of the tools used to mitigate the effects of the oil-supply crises and a few years later, it took on new significance in the context of the national debate about the closure of the nuclear sector (at that time, a good deal of heating was provided *via* electricity). At present, the key feature of policy is addressing environmental issues, including climate-change, although the increasing use of indigenous and renewable fuels is also relevant to energy-security. Since 1981, emissions of CO<sub>2</sub> from Swedish district-heating plants have fallen by 20 per cent.

Air-quality in towns has improved as a result of large numbers of small boilers (some not in the best condition) being replaced by district-heating plants. Where district-heating is coupled with electricity-production in plants that are well-designed and properly built and operated, high levels of efficiency of fuel-conversion are achieved.

The district-heating market was covered by the liberalisation of the electricity market in 1996. Before that, local authorities' utilities were governed by an Act that embodied the principle that prices for district-heat must reflect costs, and that all customers in a given category (e.g. domestic customers) should pay the same price, provided that costs for the service remained constant. This arrangement was changed by the Electricity Act, 1997/857, which required district-heating to be carried out on a commercial basis. This has caused the proportion of facilities owned by municipalities to fall in relation to those owned privately or by the State. In 2004, prices across Sweden varied in the range from about 3 to about 7 Eurocents/kWh.

The distribution network that carries hot water to customers is the basis of a natural monopoly. A customer wishing to change from district-heating to another source of heat (say a boiler burning wood-pellets) faces considerable costs, which naturally reduces customer-mobility. In December, 2002 the Government appointed a District Heating Commission, which suggested a new Act to provide better rules for the market.

A Green Tax reform was introduced in Sweden in 2001, with the aim of transferring about 3 billion Euros of the tax-burden in the period to 2010 from other sources to energy. The emphasis was on higher taxes for electricity and fossil fuels; district-heating was affected mainly through the tax on CO<sub>2</sub> and the energy-tax. Although, as already noted, the production of electricity is exempted from the tax on CO<sub>2</sub>, and CHP-plants receive a reduction of 79 per cent, heating-plants pay the full tax at the rate of about 9 Eurocents/kg of CO<sub>2</sub>. The energy-tax affects producers of district-heat depending on their choice of fuel: the tax is paid on fossil fuels and on one biofuel (tall oil), but not on wood, which (at 17.7 TWh) was by far the largest source of fuel for district heating in 2003.

Many grants from various forms of public subsidies have been given to district-heating schemes. The Climate Investment Programme is a public subsidy scheme aimed at reducing climatic impacts; it provided about 16 million Euros to support district-heating in 2004.

### 6.3 The rapid rise of the use of high-grade solid biofuels in Sweden

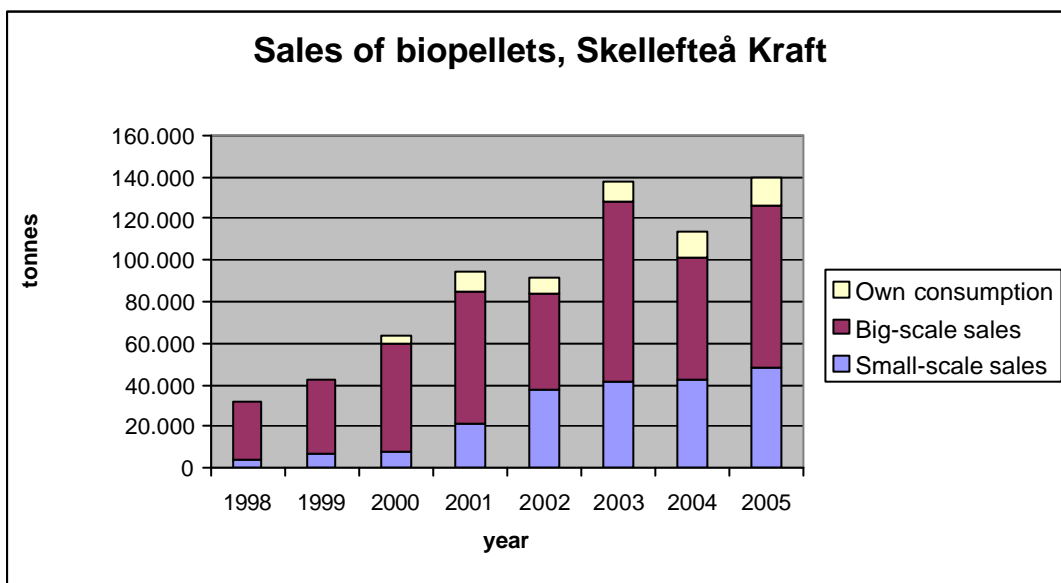
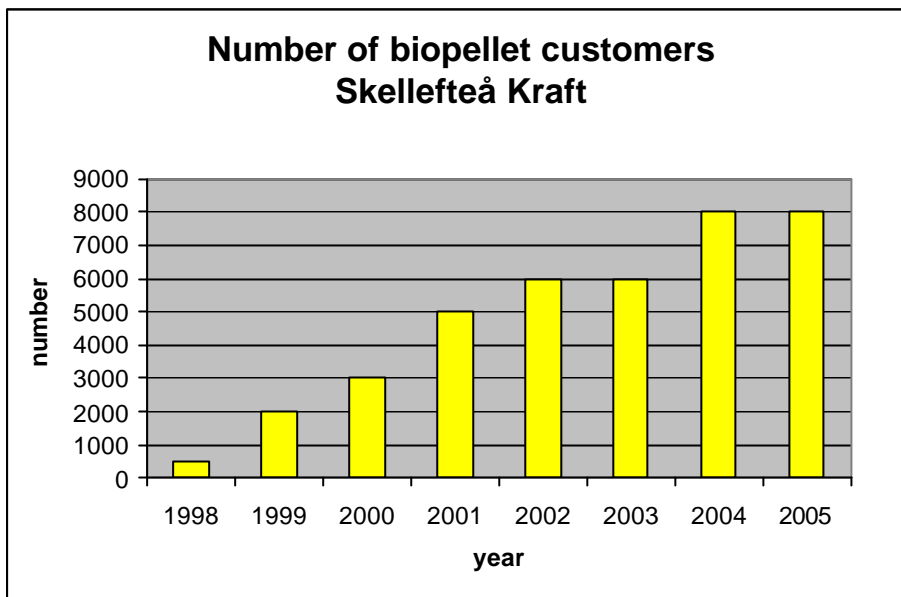
The total use of biopellets in Sweden in 2005 during was 1,473,000 tonnes, which is equivalent to an energy-content of 7.1 terawatt hours (TWh). The total market increased by 19 per cent, and the sales of pellets to private houses increased by 33 per cent.

A similar rise is expected during this year (2006), which would mean that the use of biopellets by private house-owners will have more than doubled during a three-year-period. This represents a substantial a breakthrough for pellet-burning in private houses.

Sweden is Europe's leading producer of biopellets; it hosts about 30 big factories as well as a number of small producers. Sweden is at the same time a considerable importer of biopellets – about a fifth of the pellets being consumed in Sweden are imported.

Production of pellets is rapidly increasing through expansion of existing factories and establishment of new ones – currently, investments are being made in new factories, among others, at Vansbro in the county of Dalarna, at Storuman in Lapland and at Kinnared in the county of Halland. Several existing factories are expanding to respond to the rapidly increasing demand.

Skellefteå Kraft's share of the Swedish biopellet-market is about 9.3 per cent. Its focus is to develop the market mainly in the northern parts of Sweden. Systems for (a) responding to customers and their orders, and (b) delivering biopellets with special lorries directly to the final customer, have been developed. Substantial investments in infrastructure, coupled with the marketing of pellet-burners to private houses, connected with delivery-contracts for biopellets, have now secured substantial levels of business-activity – see Figure 6.1.



**Figure 6.1 Development by SKE of the market for biopellets over the last eight years.**

**6.4 Fuels for transport in Sweden**

In 2003, the fuels used in transport in Sweden included 4.2 MTOE of petrol, 2.9 MTOE of diesel/gas oil, 1.7 MTOE bunker and other medium/heavy oils, 0.8 MTOE of aviation fuel, 0.2 MTOE of electricity, 0.08 MTOE of ethanol and 0.01 MTOE of natural gas - a total of about 9.92 MTOE, or about 1.1TOE/year *per capita* (compare this with this figure for the UK of about 1 TOE/year *per capita* that was given in Section 4.3).

Göran Persson, the prime-minister of Sweden declared that he will personally be responsible for the taskforce that will break Sweden’s dependency on oil by 2020.

Almost 15 per cent of all new cars sold are equipped with the FlexiFuel system – flexible fuel-injection that can adapt to various blends of ethanol and petrol. This is an explanation why Sweden reached a level of use of 2.7 per cent of liquid biofuels in the transport sector in 2005, well above

the EU's goal of 2 per cent. Germany also reached that goal, but the other MS still face a challenge to catch up.

The global production of ethanol is rapidly growing and it is now possible to produce it from sugarcane for less than the market-price of petrol. New ethanol-production plants have been built in Germany and a lot more production-capacity of grain-based ethanol plants is foreseen; some is already under construction. In Sweden, rapid progress is being made in the production of ethanol from cellulose; the goal is to start building the world's first modern production-unit in 2007.

The first hybrid car powered with ethanol was presented by Saab at the Stockholm Car Exhibition in 2005. Scania are delivering their first ethanol-powered buses to Europe and international interest is growing by the day. The number of filling-stations that offer ethanol in Sweden has recently passed 350 and the share of ethanol bought from each station is increasing rapidly. The Swedish experience in the introduction of ethanol will be shared with the rest of Europe in a project called BEST (BioEthanol for Sustainable Transport). FlexiFuel Cars and ethanol-powered buses will be introduced in six countries during the coming year.

### **6.5 Plans in Skellefteå**

In Sweden, local authorities have traditionally been given a strong role in society. Each of the 290 municipalities has a politically-elected administration, which conducts its own affairs, including levying taxes and taking care of many day-to-day aspects of life, including aspects related to energy, environment and transport. Since 1977, local authorities have been legally obliged to promote the efficient use of energy in their planning. During recent years, all the municipalities of Sweden have become active with Agenda 21, within which the focus is mainly on environmental and social questions.

The Swedish Energy Agency is responsible for the national energy-restructuring process in Sweden. The objective of this restructuring is to build a sustainable and effective energy system. The five-year Sustainable Municipality Programme, which was launched in 2003, is one of the efforts to achieve this objective. Five participating municipalities individually draw up their local objectives and action-plans for this Programme. The results and experiences will be used in the subsequent work with sustainable growth in all the municipalities of Sweden. Broad-based collaboration takes place between local commerce and industry, municipal administrations and political managements, and other relevant parts of the local community.

SKE's objective in establishing a local SEAP for the city of Skellefteå is to address all of the relevant matters, and to find an optimal way of further developing their energy-facilities to provide advantages to all of the local stakeholders. SKE also has established energy-facilities in several more northern Swedish municipalities and thus has the potential to make wider use of the lessons learned in this project.

The Swedish government has adopted a new national strategy for apartment buildings in wood. New building techniques have been developed in Skellefteå for building apartment-blocks in wood up to eight floors in height. The Municipality has a new plan for sustainable building and energy-saving that will demonstrate this new technique.

SKE's work with more efficient energy use will be based on a systematic perspective, which means that "*efficient energy use*" includes not only saving resources, but also must be seen as one component in a greater entirety, within which all relevant issues, including fuel-production, and the transforming, distribution and use of energy, have to be considered.



SKE plans to expand its district-heating system to further residential districts. One area under consideration is located at the outskirts of the existing district-heating network. Planning includes making information available, and marketing the concept, to prospective customers. It also includes designing the future strengthening of district heating pipes for better delivery-capacity. Economic calculations obviously have to be made to check commercial feasibility, etc., and the proposed expansion will obviously increase the size of the production base at Hedensbyn.

In that context, SKE is already planning improvements in production systems for biofuels, and aims to promote the technical development of machines and other equipment suitable for the optimal recovery of various raw materials. In this development it will be important to locate, and secure the use of, nearby forest-land for the full-scale testing and evaluation of new forest-machinery technology, including new forest-harvesting systems.

Such testing will be performed in association with local and regional forest-owners: possible partners are to be found among state-owned and municipal bodies, and private owners of forest. Active partners will be organised in a triple-helix, including major parts in the chain from the production area to the final use and refinement of biofuels in a “*bioenergy combination*” at Hedensbyn.

Linked to the harvest of forest-related biofuels, it is important to consider a multiple use of neighbouring land such as energy crops from set-aside land or other farm land suitable for alternative crops. This will optimise the financial outcomes for the landowners through more efficient harvesting, administration and transport etc. Benefits will also be gained by many other businesses, and by individual people who live and work in the same areas.

Skellefteå has its own environmental plan, a copy of which is included at Appendix 5. The Municipality is also working on a new plan for environmental goals, which will define how to achieve a sustainable lifestyle in Skellefteå by 2012.

## 7. POLICIES AND PLANS IN SPAIN, ANDALUCIA AND DOÑANA

As already noted above, the EU, within the framework of the Kyoto Protocol, has committed itself, by 2008-2012, to reduce emissions of GHG, by 8 per cent, compared with 1990. The method of reaching this objective by the different MS, according to their social-economic status, allows some of them to **increase** their emissions. Spain is allowed an increase of up to 15 per cent, if necessary.

This national obligation should be regionalised with objectives so that the Autonomous Communities, such as the Region of Andalusia, discharge their share of responsibility and set up effective programmes and measures to reach the common goal.

### 7.1 Policies and plans in Spain

#### 7.1.1 Overview of main relevant Spanish regulations

The Electricity Sector Law 54/1997 transposed to the Spanish legal framework the European Directive 96/92/EC of the 19th December, 1996 on the common regulations for the internal electricity market, which declares, among its objectives, the guarantee and quality of supply at least cost, the improvement of energy-efficiency, the reduction of consumption of energy and the protection of the environment. This Law establishes the principles of an operating model based on free competition, which in turn encourages the development of installations that produce electricity under a special regime (self-producers or installations that use non-consumable RES, biomass or any other type of biofuel or non-renewable residue, and whose installed power does not exceed 50 MWe). The Law also establishes the objective that RES should cover, as a minimum, 12 per cent of the total of primary energy in 2010.

Royal Decree 436 of the 12<sup>th</sup> March, 2004 established the methodology for the realisation and systemisation of a legal and economic system for the production of electricity in special regime. It follows the path initiated by Royal Decree 2818 of the 23<sup>rd</sup> December, 1998 on electricity production by installations supplied with RES, or energy from waste or cogeneration, and also allows such plants to take advantage of the stability that has been provided by Royal Decree 1432 of the 27<sup>th</sup> December, 2002, which provides a methodology for the approval of the average, or reference, electricity tariff.

Under Article 22 of Royal Decree 436/2004, the owner of an installation can opt to sell either the whole production, or some surplus, of electricity either:

- (a) to the distributor, accepting a reduction in regulated tariffs for each programming periods, based on a percentage of the average electricity-tariff, or the reference-tariff regulated in Royal Decree 1432/2002, or
- (b) directly in the daily market; in this case, the price negotiated in the market is enhanced with an incentive for participating in that market and a premium. This incentive and the premium are also defined generically in terms of a percentage of the average, or the reference, electricity tariffs.

The Government's intention is that the impact of this Royal Decree will be that, by 2010, close to one-third of the demand for electricity in Spain will be met with highly efficient technologies and/or by RES.

Table 7.1 shows prices for electricity paid for the various technologies as a result of Royal Decree 436/2004, taking account of data for market-prices.

**Table 7.1 Prices (Euros/MWh) for electricity available for the various technologies as a result of Royal Decree 436/2004.**

Group	Royal decree 436/2004	
	Market	Tariff
a.1.1 and a.1.2 (P<1 MW)	-	68.17
a.1.1 and a.1.2 (1<P<10 MW)	87.57	60.84
a.1.1 and a.1.2 (10<P<25 MW)	76.58	42.52
a.1.1 (25<P<50 MW)	76.58	38.85
a.1.2 (25<P<50 MW)	65.58	38.85
a.2 (P<10 MW)	69.24	46.18
a.2 (10<P<25 MW)	65.58	42.52
a.2 (25<P<50 MW)	61.91	38.52
b.1.1 (P<100 kW)	-	423.70
b.1.1 (P>100 kW)	248.84	222.11
b.1.2	248.84	222.11
b1 (P<5 kW)	-	-
b1 (P>5 kW)	-	-
b.2.1	94.90	68.17
b.2.2.	94.90	68.17
b.3	94.90	68.17
b.4	94.90	68.17
b.5 (10<P<25 MW)	94.90	68.17
b.5 (25<P<50 MW)	87.57	60.84
b.6	94.90	68.17
b.7	94.90	68.17
b.8	87.57	60.64
c.1 and c.2	80.24	53.51
c.3	80.24	38.85
d.1	80.24	53.51
d.2	80.24	53.51
d.3	72.91	46.18

**Key:**

- a.1: CHP plants.
- a.1.1: CHP plants that derive at least 95 per cent of their energy from natural gas.
- a.1.2: Other CHP plants.
- a.2: Energy -from-waste plants.
- b.1: Solar-energy plants.
- b.1.1: PV plants.
- b.1.2: Solar-power plants.
- b.2: Wind-power plants.
- b.2.1: On-shore wind plants.
- b.2.2: Off-shore wind plants.
- b.3: Plants that use geothermal or oceanic energy.
- b.4: Hydroelectric plants rated at not more than 10 MW<sub>e</sub>.
- b.5: Hydro-plants rated at more than 10 MW<sub>e</sub> but less than 50 MW<sub>e</sub>.
- b.6: Plants that use as a principal fuel biomass from energy -crops, or residues from agriculture, horticulture or forestry.
- b.7: Plants that use as a principal fuel biomass from dung, liquid biofuel or biogas.
- b.8: Plants that use biomass wastes from industrial facilities in the agricultural and forest sector, or a mixture of them with other kinds of biomass.
- c.1: Plants that use urban solid wastes as a principal fuel.
- c.2: Plants that use as their principal fuel other waste not already considered above.
- c.3: Plants that co-fire wastes with other fuels, when the wastes supply less than 50 per cent of the energy.
- d.1: Plants that treat and reduce wastes from pig-keeping.
- d.2: Plants that treat and reduce slurries.
- d.3: Plants that treat and reduce other wastes.

### **7.1.2 Action Plan for 2005 to 2007 of the Spanish Strategy for Energy-saving and Energy-efficiency**

The Action Plan for 2005 to 2007 arose from the need to summarise the requirements of the Strategy for Energy-saving and Energy-efficiency in Spain for 2004 to 2012 (E4), establishing the objectives, temporary terms, resources, and responsibilities of the central Government,

Autonomous Communities and Local Entities, and evaluating the final global impacts on energy-savings, costs and emissions of CO<sub>2</sub> avoided for each measure, and for the whole Plan.

The Plan will also be useful in fulfilling the environmental objective of the Assignment National Plan for 2005 to 2007 (PNA) of rights to emit CO<sub>2</sub>. The measures identified in the Plan are intended to reduce CO<sub>2</sub>-emissions of by 32.5 million tonnes.

The objective for energy-saving fixed in the Plan is to make a reduction of 12 million TOE during the three-year period (2005-07), which is 8.5 per cent of primary-energy consumption in 2004, and 20 per cent of the imports of petroleum in that year – see Table 7.2.

**Table 7.2. Savings of primary energy by sector - thousands of TOE.**

Sectors	2005	2006	2007	Totals
Construction (buildings)	34	437	1,033	1,505
Residential	33	222	650	905
Services	23	58	110	191
Industry	37	304	673	1,014
Transport	497	1,623	3,156	5,277
Agriculture and fishing	7	19	38	64
Energy transformation	407	1,125	1,519	3,051
<b>Total prim energy</b>	<b>1,039</b>	<b>3,788</b>	<b>7,179</b>	<b>12,006</b>

The investments required to develop the proposed measures are shown in Table 7.3.

**Table 7.3. Investments required to develop the proposed measures – millions of Euros.**

Sectors	2005	2006	2007	Totals
Construction (buildings)	137.92	1,578.96	1,579.6	3,296.5
Residential	68.85	384.37	880.1	1,333.3
Services	117.70	127.79	128.7	374.2
Industry	26.95	194.45	267.8	489.2
Transport	352.76	338.99	321.4	1,013.1
Agriculture and fishing	99.09	170.17	240.2	509.4
Energy transformation	105.91	432.77	365.7	904.4
<b>Total investments</b>	<b>909.18</b>	<b>3,227.51</b>	<b>3,783.51</b>	<b>7,920.2</b>

The expected levels of public support are shown in Table 7.4.

**Table 7.4. Levels of public funds expected in this programme - millions of Euros.**

Sectors	2005	2006	2007	Totals
Construction (buildings)	9.35	103.54	103.5	216.4
Residential	0.16	106.63	106.6	213.4
Services	7.70	8.36	8.4	24.5
Industry	5.96	43.91	61.3	111.2

Transport	7.76	53.99	66.4	128.1
Agriculture and fishing	6.16	7.75	9.5	23.4
Energy transformation	1.60	2.16	2.2	5.9
<b>Total cost</b>	<b>38.70</b>	<b>326.34</b>	<b>357.96</b>	<b>722.99</b>

6.13 million Euros should be added to the figures in Table 7.4 for dissemination and publicity campaigns to increase public awareness.

The distribution of public funds among administrations is shown in Table 7.5.

**Table 7.5. Distribution of public funds - millions of Euros.**

Sectors	2005	2006	2007	Totals
General administration of the State	38.595	311.12	336.27	685.98
Autonomous administration	0.1	9.05	12.49	21.64
Local administration		5.8	7.2	13.0
Fiscal allowances		3.5	5.0	8.5
<b>Totals</b>	<b>38.695</b>	<b>329.47</b>	<b>360.96</b>	<b>729.12</b>

Measures proposed by sectors include:

### 1. Industry.

- (a) Voluntary agreements for the attainment of energy objectives.
- (b) Energy Audits.
- (c) Programmes based on public subsidies.

### 2. Transport.

- (a) Modal changes.
- (b) More efficient use.
- (c) Improvement of energy-efficiency in vehicles.

### 3. Construction or refurbishment of buildings.

- (a) Standards for the implementation of Directive 2002/91.
- (b) Heat-recovery systems in existing buildings.
- (c) Improving the energy-efficiency of existing heating systems.
- (d) Improving the energy-efficiency of existing lighting systems.

### 4. Public services.

Improving the energy-efficiency of:

- (a) existing public lighting,
- (b) new public lighting,
- (c) existing facilities for the supply and purification of water, and
- (d) new facilities for the supply and purification of water.

### 5. Computer-equipment.

- (a) Planning renovation of appliances.
- (b) Training of salespersons and buyers.
- (c) Incorporating efficient equipment in new houses.
- (d) Planning of better equipment and energy-efficiency in the public sector.

## **6. Agriculture and fishing.**

- (a) Promoting the efficient use of energy in agriculture.
- (b) Incorporating energy-efficiency measures in the modernisation plan for the fleet of agricultural tractors.
- (c) Standardising more efficient irrigation systems.

## **7. Energy-transformation**

- (a) Taking various actions to support E4.
- (b) Mounting feasibility-studies.
- (c) Undertaking energy-audits.
- (d) Developing the potential for CHP.

### **7.1.3 The Spanish Plan for 2005 to 2010 for RES**

The European White Paper for a Community Strategy and Action Plan (COM 1997/599) set a target for RES to reach 12 per cent of total energy-consumption by 2010. More recently, the EU has adopted two new objectives for the year 2010: (a) renewable electricity (in Spain it should reach 29.4 per cent of the total) and (b) liquid biofuels for transport which, as mentioned above, should attain 5.75 per cent of European consumption.

It is also useful to mention the implementation of the Kyoto Protocol that was incorporated within the Spanish National Plan of Assignment of Rights to Emit for the period from 2005 to 2007, which will also influence the development of RUE and RES.

These points are relevant to the revision of the Plan for the Development of Renewable Energies in Spain in the period from 2000 to 2010 (PFER).

The Spanish Plan for Renewable Energies (PER) for 2005 to 2010 upgrades PFER and establishes some objectives, taking account of the level of energy-consumption in Spain, and its evolution - see Table 7.6 and Figure 7.1. PER proposes the following measures:

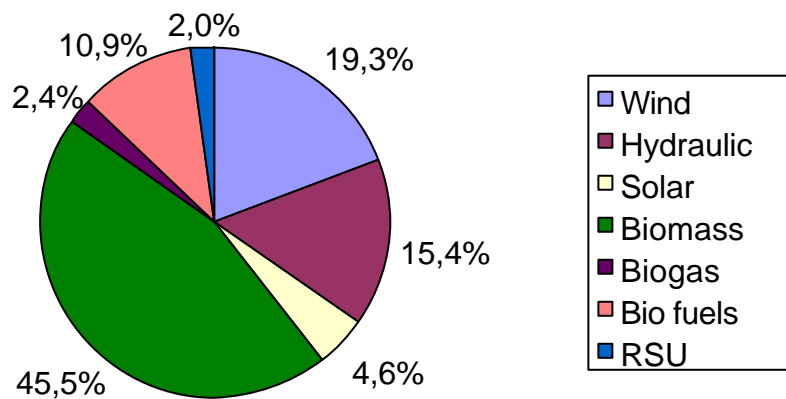
- (a) Maintenance of public support for investments in certain technologies;
- (b) Fiscal tax-reduction;
- (c) Modification of the Law 54/1997 of the Electric Sector to facilitate co-combustion of biomass with coal, and allowing higher prices for electricity generated from biomass;
- (d) Modification of Royal Decree 436/2004, setting the limit for wind-energy at 20,000 MW<sub>e</sub>, and that for thermo-solar electricity at 500 MW<sub>e</sub>;
- (e) Adapting legislation and Standards, for example the new Technical Code for Construction;
- (f) Conversion to the national legislation of the D-ERES;
- (g) Establishing within the Spanish Electricity Grid (REE) a unique operating centre for the Special Regime, equivalent to that of the Ordinary Regime;
- (h) Developing of innovative technologies: offshore wind-parks, systems for the gasification of biomass, solar power plants, integration of solar-thermal heating and photovoltaic installations, production of silicon for use in solar units, etc;

- (i) Improving of the administrative procedures of projects;
- (j) Subsidising the mechanisation of the collection and treatment of the biomass;
- (k) Developing the logistics of biomass, biofuels and used oils; and
- (l) Dissemination and training activities.

**Table 7.6 Energy objectives in PER for 2010.**

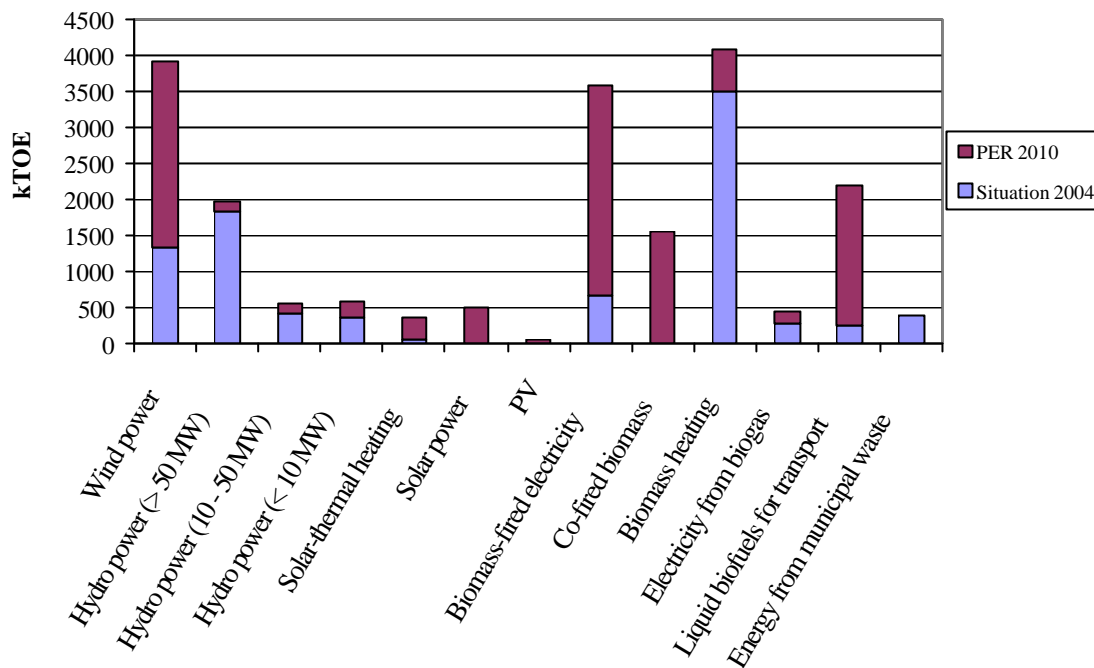
Type of E-RES	Unit	Quantity	Primary energy in kTOE	Percentages in terms term of primary energy
Wind-power	MW <sub>e</sub>	20,155	3,914	19.4
Hydro-power (> 50 MW <sub>e</sub> )	MW <sub>e</sub>	13,521	1,979	9.8
Hydro-power (10 - 50 MW <sub>e</sub> )	MW <sub>e</sub>	3,257	557	2.8
Hydro-power (< 10 MW <sub>e</sub> )	MW <sub>e</sub>	2,199	575	2.8
Solar-thermal heating	M <sup>2</sup>	4,900,805	376	1.9
Solar-thermal electricity	MW <sub>e</sub>	500	509	2.5
PV	MW <sub>p</sub>	400	52	0.3
Biomass-fired electricity (alone)	MW <sub>e</sub>	1,317	3,586	17.7
Co-fired biomass	MW <sub>e</sub>	722	1,552	7.7
Biomass heating	kTOE	4,070	4,070	20.1
Electricity from biogas	MW <sub>e</sub>	235	455	2.3
Liquid biofuels for transport	kTOE	2,200	2,200	10.9
Energy from municipal waste	MW <sub>e</sub>	189	395	2.0
<b>Total</b>			<b>20,220</b>	<b>100</b>

**Figure 7.1. Energy objectives PER 2010**



PER foresees for the year 2010 strong growth in most of the renewable technologies, as shown below.

Figure 7.2 Expected growth of the renewable technologies by 2010



The importance of biomass for reaching the targets set out by PER is highly significant for all forms of RES. PER foresees the use of 9,208 kTOE of biomass, which represents 48.6 per cent of the required total energy-target. At present, the consumption of biomass is estimated at 4,167 kTOE/year; that figure will have to be increased by at least 5,041 kTOE.

Wind-power is planned to contribute 19.4 per cent of the energy-target. This technology is mature and commercially exploitable.

Regulatory measures (local regulations and the Technical Code of Construction), coupled with subsidies to investments, are expected to give a strong boost to low-temperature solar-thermal heating installations.

It will be necessary to invest great effort in innovation and technology-development to move solar-thermoelectric power stations to a state of reliable maturity.

Although hydro-power will maintain its importance in electricity-production, it is not expected to increase greatly in output.

To achieve a strong contribution from PV, it will be necessary to resolve the problems of supply of the modules, and the adaptation of Standards for their connection to grid.



**Table 7.7 Summary of the objectives of PER for 2010.**

	<b>Primary energy</b>	<b>Renewable energy</b>	<b>Percentage of renewable energy</b>	<b>Percentages of reference</b>
	kTOE	kTOE	Per cent	Per cent
Primary energy	167,100	20,220	12.1	12.0
Electric power	44,799	13,574	30.30	29.4
Fuels transport	37,735	2,200	5.83	5.75

The development of the PER has obvious economic and environmental repercussions, which could include the creation of employment and new companies, agrarian activity and public subsidies - see Tables 7.8 and 7.9.

**Table 7.8 Repercussions of PER for the period of 2005 to 2010.**

<b>Topic</b>	<b>Value for effects of all actions related to RES</b>
Public support (investment subsidies, electricity-premiums and fiscal advantages)	8,492.24 million Euros
Associated investments	23,598.64 million Euros
Generated employment	94,925 new jobs
Millions of tonnes of avoided emissions of CO <sub>2</sub>	76.98

**Table 7.9 Distribution of public funds - millions of Euros.**

<b>Public funds</b>	<b>Value for the whole of the renewable areas</b>
Investment (non-repayable)	681
Rebates on tax imposed on bio fuels	2,855
Electricity-premiums	4,956

Table 7.10 summarises the proposed modification of the electricity premiums in reference to the situation outlined in **Royal Decree 436/2004**, and investment-subsidies and fiscal incentives for each of the technologies.

#### 7.1.4 The Technical Code for Construction

A new Technical Code for Construction was approved by Royal Decree 314/2006 in March of this year. It will guarantee that buildings will be safer, more habitable, more sustainable and be built with better quality.

This new Code will regulate the construction of every new building and the rehabilitation of existing ones, including houses and commercial buildings, schools, hospitals, sports-halls, industrial buildings and socio-cultural buildings. It introduces new elements covering both materials and construction-techniques to promote buildings that will be more energy-efficient.

The Code has two parts: (a) the “*Recognised Documents*” define a project’s content, objective and sphere of activity, and (b) the “*Basic Documents*” include the buildings’ requirements. By these

means, the basic requirements that are regulated are: (a) structural security, (b) security in case of fire, (c) health, hygiene and safety in use, (d) environmental protection and (e) energy-saving.

The Basic Document for energy-saving is one of the Government's new policy- tools; its objective is to promote RUE and RES. Thus, this Document introduces an obligation of adding criteria for energy-efficiency, and for the use of solar, PV or thermal RES in both new and refurbished buildings. It contains four basic requirements in that context:

- (a) Limits are imposed on the thermal properties of exterior components (walls, roofs, windows, etc.);
- (b) Requirements are set for the energy-efficiency of lighting; different requirements are fixed for the services-sector;
- (c) Requirements are set for a minimum contribution from solar energy for the heating of sanitary hot water; an obligation is imposed to produce sanitary hot water *via* solar thermal energy (varying between 30 and 70 per cent of the forecast daily demand for hot water); and
- (d) In new buildings of the services-sector of a given area surface, part of the electrical demand must be produced *via* PV.

According to the Institute for the Diversification and Saving of Energy (IDAE), the development of these requirements will produce from each building energy-saving of 30 to 40 per cent, and a reduction of CO<sub>2</sub>-emissions 40 to 55 per cent.

A period of six months is allowed for compliance with the requirements related to RUE and RES.

Together with the Technical Code for Construction, a new Board for Sustainability, Innovation and Quality in Building has been established which, with the participation of every public administration, representatives of the edification agents and associations representatives of citizens, will monitor the application of the new Code, and periodically update it, taking account of technical evolution and demands of the general public. Furthermore a General Register of the Technical Construction Code will make public the various relevant papers.

## **7.2 Plans and Policies in Andalusia**

Energy is at the centre of debates about (a) the ecological viability of land-systems, and (b) economic and social problems of the population. On the one hand, inequalities of access to energy increase differences between some territories and others, and the elimination of these differences should be considered as a test of sustainability and social cohesion. And, on the other hand, it is well known that the energy-sector plays a very important role in the emissions of GHG, and in other environmental damage caused by the large-scale burning of fossil fuels.

Andalusia, like other parts of Europe, is aware of these problems and has undertaken its share of responsibility, reflecting explicitly the will to overcome these problems in its energy-policy.

### **7.2.1 Andalusian Energy Plan (PLEAN)**

The Andalusian Energy Plan (*Plan Energético de Andalucía 2003-2006*) is set within Law 1 of the 11<sup>th</sup> January, 1994 of the Land Planning Laws of Andalusia (*El Plan de Ordenación del Territorio*

*de Andalucía*) and the Infrastructure Plan of Andalusia (*Plan Director de Infraestructuras de Andalucía 1997-2007(PDIA)*). It was the result of a complex technical process and co-operation between the regional administration, commercial associations, trade-unions and other social actors of the region. Its final approval by the Governing Board of the Andalusian Regional Government (Junta de Andalucía) was made through Decree 86/2003, of 1<sup>st</sup> April.

The Land Planning Law sets up various models of energy-management based on the grids and infrastructures of the urban systems, and the opportunities for RUE, diversification and use of energy sources of each place. The environmental and land-use obligations of PLEAN focus mainly on the following points:

- (a) Reduction of contamination, to be achieved from the promotion of RUE, RES and natural gas to replace coal and oil;
- (b) Decreasing the region's dependence on imported energy; and
- (c) Broader extension of the distribution-networks for electricity and gas, so as to provide equal access, in quantity and quality, to the different forms of energy throughout Andalusia.

PLEAN has become the strategic and coordination instrument for policies in the area of energy infrastructures, including the promotion of RES and RUE. The objective is to reach, by 2010, a contribution of 15 per cent from RES to primary energy, contributing to a rapid growth in electricity from RES – see Table 7.10.

**Table 7.10 PLEAN's objectives for growth in electricity or heat from RES - installed capacities (MW) of various technologies.**

Technology	2003	2006	2010
Wind-power	234	2,700	4,000
Power from biomass and biogas	110	164	250
Small hydro-power < 10 MW <sub>e</sub>	226	240	270
High-temperature solar power	0	100	230
PV connected to the grid	0.9	4.4	16.4

According to PLEAN, consumption of primary energy in Andalusia during the year 2000 was 15,425.2 kTOE (see Figure 7.3,) and the primary energy generated in Andalusia was 1,920.4 kTOE, 1,517.1 kTOE of which was consumed within the Autonomous Community and the rest was exported. Therefore the primary energy that was both produced and consumed in Andalusia reached only 9.8 per cent of the total consumption– see Figure 7.4.

**Figure 7.3 Evolution of the primary energy consumption by sources in Andalusia.**

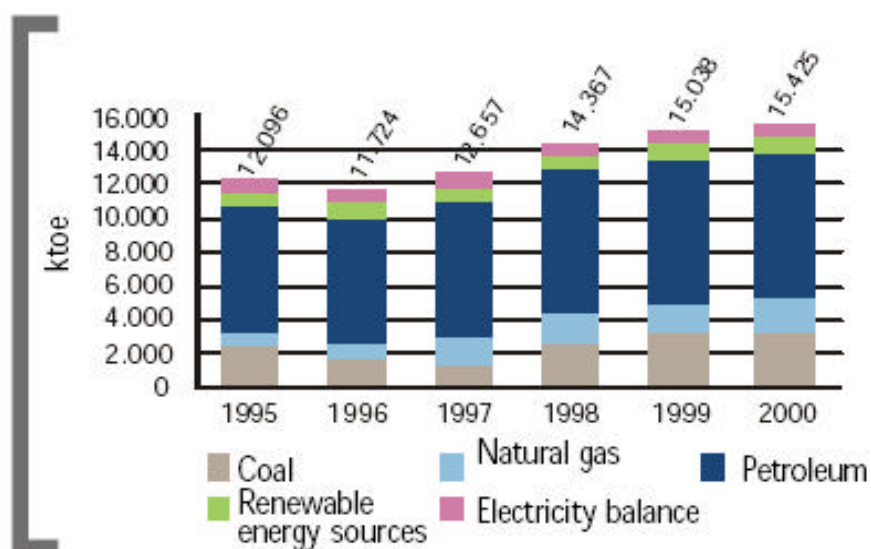
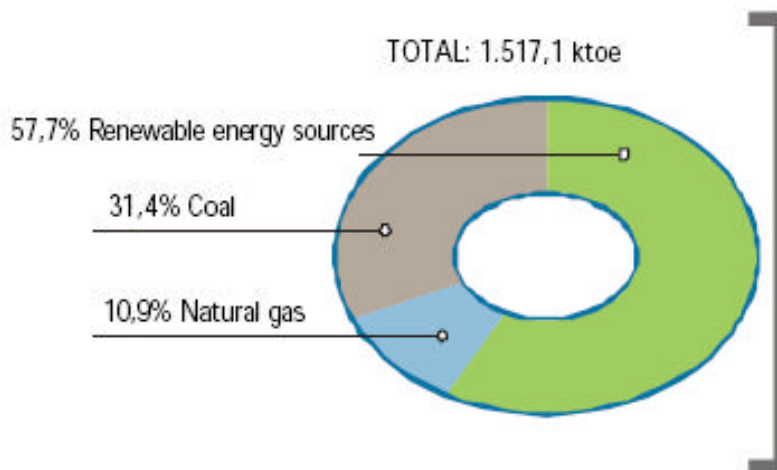


Figure 7.4 Energy self-consumed in Andalusia in 2000.



An important fact to take into account is that, in 2000, 69.7 per cent of electricity consumed in Andalusia was also produced there, which indicates that the main lack in this region is **primary** energy (the raw materials) and not the capacity of transforming raw materials to electricity.

Primary-energy consumption per capita in Andalusia has increased in recent years, growing from 1.65 TOE/person in 1995 to 2.1 TOE/person in 2000 - an average annual increase of 5.45 per cent.

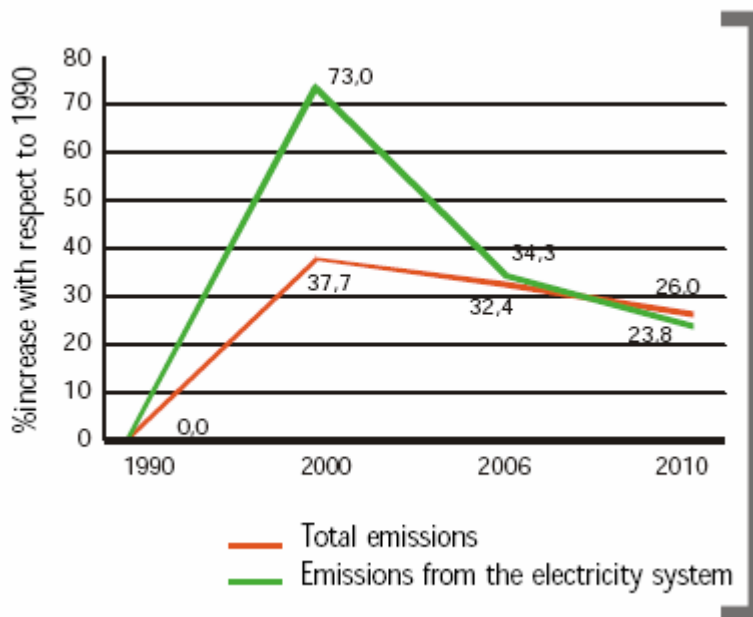
Also, there are several relevant specific Andalusian Orders:

- (a) The Order of the 30<sup>th</sup> September, 2002, which regulates the procedure to prioritise access and connection to the electricity-grid for distribution of energy (Areas of Electric Evacuation = ZEDE) from the installations contemplated in the Royal Decree 2818/1998 (which deals with electric-power production for installations supplied by RES and wastes, and with CHP);
- (b) The Order of the 22<sup>nd</sup> June, 2001 for the concession of subsidies to electricity-generation plants using RES;
- (c) The Order of the 24<sup>th</sup> January, 2003 (and a modification of it in the Order of the 31<sup>st</sup> July, 2003), which define the PROSOL Programme for the promotion of RES installations in Andalusia for 2003; and
- (d) The Order of the 18<sup>th</sup> July, 2005, which establishes an Incentive Programme for the Sustainable Energy Development of Andalusia for 2005 and 2006.

### 7.2.1.1 Emissions of GHG

The energy-models proposed in PLEAN for the immediate future project considerable reductions in emissions of GHG, so that Andalusia will meet its share of the obligations acquired in this area by the EU. From an analysis of past data, it can be seen that the emissions of GHG increased by about 69 per cent in the decade from 1990 to 2000. PLEAN proposes a decrease of 22.4 per cent in the decade from 2001 to 2010 – see Figure 7.5.

Emissions derived from the generation of electricity constitute around 90 per cent of those attributed to the energy sector, and approximately 30 per cent of the total.

**Figure 7.5. Percentage increases in emissions with respect to 1990 proposed by PLEAN**

In 2000, the electricity generated Andalusia, plus that produced outside the region to cover its deficit in electricity, reached 30,814 GWh. In 2006, up to 44,316 GWh could be generated within Andalusia, which represents an increase since 2000 of 43.8 per cent. The increase is expected to be 72.7 per cent by 2010.

Of the gross electricity to be generated within Andalusia in 2006, 37.346 GWh is planned to cover demand in the region; the rest will be exported to other Autonomous Communities.

Under Law 54 of the 27th November, 1997, the authorisation of large combustion plants for electricity-generation is the responsibility of the Spanish Government. For this reason, and in parallel with these authorisations, it is the Central Government that is responsible for a coherent regional allocation of reductions in emissions of GHG.

The use of nuclear energy is sometimes offered as a means of increasing the probability of successfully reaching the objectives set in the Kyoto Protocol as it does not generate emissions of GHG. Nevertheless, as the Andalusian Regional Government has rejected nuclear power because of (a) the dangers of nuclear wastes, (b) the potential risk to the population in case of a nuclear accident and (c) the high cost of the management of radioactive wastes, has led to an intensification of effort necessary for the fulfilment of the Protocol.

PLEAN proposes an electricity-system in which, in spite of a strong increase in generation-capacity, emissions in absolute values of SO<sub>2</sub>, NO<sub>x</sub> and CO<sub>2</sub> derived from Andalusian demand will decrease in 2006 with respect to the year 2000 by 70.6, 12.9 and 22.6 per cent, respectively, as a consequence of the use of natural gas in the generation of electricity and the use of RES. The planned percentages for 2010 are 76.0, 14.5 and 28.4, respectively.

### 7.2.1.2 Promotion of RES

In Andalusia, RES offer important potential in the context of increasing security of supply and reducing the emissions from the combustion of fossil sources, as well as other social benefits such

as the creation of employment and the development of depressed areas. Implementation of RES, however, requires important political and economic efforts that should be combined with a policy of control of the demand for energy, to rationalise and stabilise consumption.

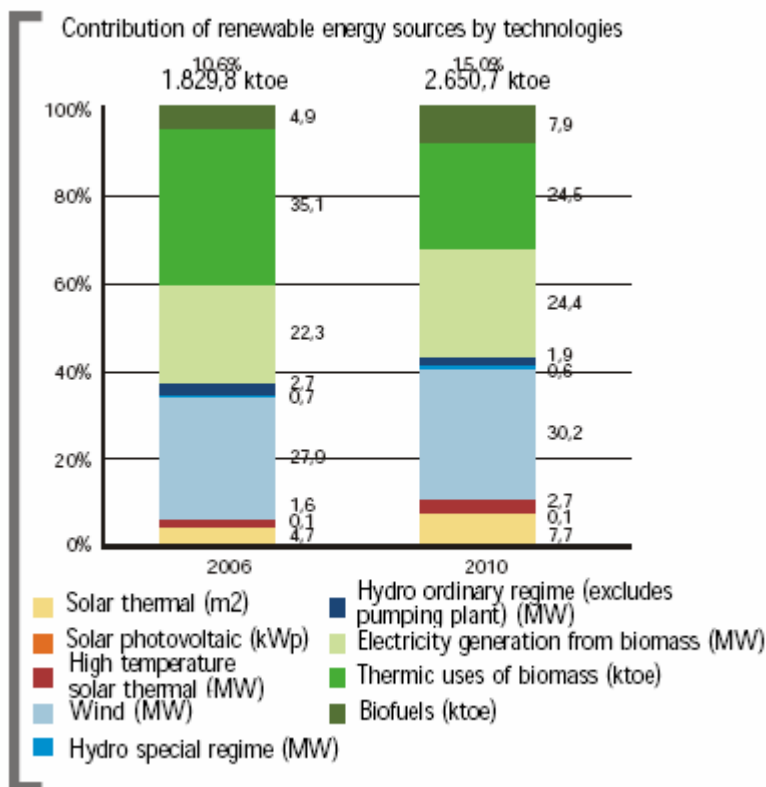
These are the reasons why the Andalusian Regional Government, in the framework of PLEAN, has opted for very ambitious targets for the promotion of RES, and has assumed an obligation to secure that, by 2010, 15 per cent of the total energy demand in Andalusia will be met from RES. 10.6 per cent should be achieved in 2006, and will show the way to meeting future objectives.

The scale of each of the renewable technologies targeted at meeting this objective is shown in Table 7.11 and Figure 7.6:

**Table 7.11 Outputs (in various units) from the different RES**

	Situation in Andalusia at 31/12/2000 (parametric)	Situation in Andalusia in 2006 (parametric)	Situation in Andalusia in 2010 (parametric)
Solar Thermal (m <sup>2</sup> )	130,552	411,552	1,046,552
Solar photovoltaic (kWp)	3,618	10,500	23,801
High temperature solar thermal (MW)	0	100	230
Wind (MW)	146.2	2,700	4,000
Hydro special regime (MW)	78	102	128
Hydro ordinary regime (exclude pumping plant) (MW)	475	476	476
Electricity generation from biomass (MW)	51	164	250
Thermic uses of biomass (ktoe)	638	643	649
Biofuels (ktoe)	0	90	210

Figure 7.6 Contributions of RES.



7.2.1.3 Employment derived from the use of RES

One of the benefits associated with the promotion and development of RES is the creation of new employment, mainly because the labour-element associated with some RES is more intensive than that of conventional fuels. In many circumstances, the employment generated is local and within rural areas that have high unemployment levels, and can contribute to social cohesion and to a balanced growth of the Region.

According to the predictions established by PLEAN for 2006, the increased use of RES could generate 14,288 new jobs (not including those related to high-temperature solar-thermal power), 12,421 in construction and installation, and 1,867 in operation and maintenance.

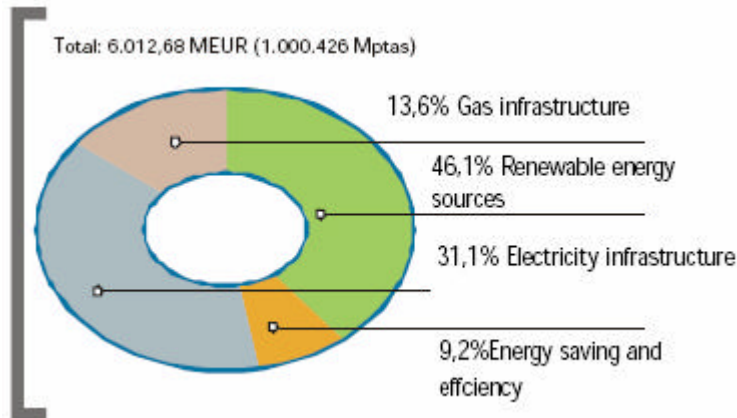
New jobs in construction and installation are predicted to reach 9,428 in the period from 2007 to 2010, with a further 1,884 jobs in operation and maintenance in the same period. Between 2001 and 2010, a total of 25,600 new jobs are planned. Adding an estimate of the staff necessary for the development of high-temperature solar-thermal plants in Andalusia, produces a sub-total 26,244 of new jobs. But, taking account of the potential employment associated with energy-crops and recovering agricultural and forestry wastes, the number could be elevated to 66,244 new jobs in the period from 2001 to 2010.



#### 7.2.1.4 The financial framework

The fulfilment of the objectives established in PLEAN is subject to the mobilisation of important resources, both public and private – see Figure 7.7.

**Figure 7.7. Overall investments foreseen in the Andalusian Energy Plan.**

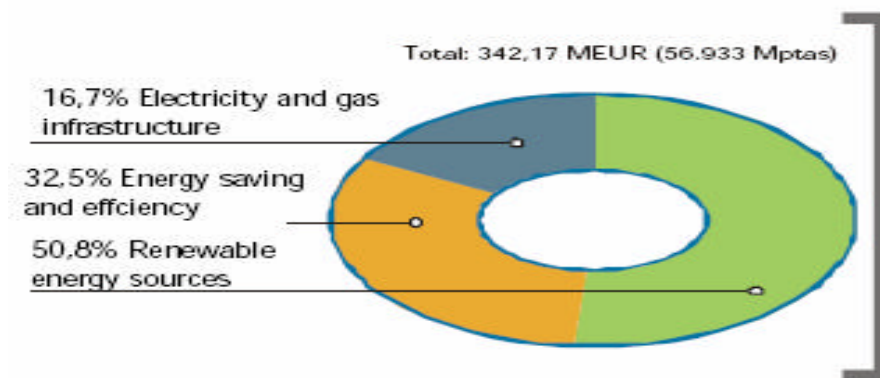


The investments foreseen for the private sector are fundamental to the fulfilment of the objectives that define the energy-infrastructure of PLEAN. Thus PLEAN has been fully discussed with the private sector and finalised as a result of a broad consensus. The private sector will be essential at the time of undertaking many of the activities foreseen in the Energy Plan, and in some of them, for example for improvements of the infrastructures for electricity and gas, the private sector is, in many cases, the only source of finance.

The public sector will have a stronger presence in the programmes for the development of RUE and RES, and will also help to support some aspects of the general infrastructure when such support is required to complete an objective. This is the case, for example, in the amplification of the transmission- and distribution-grids for electricity gas in areas in which, for social reasons or for promoting the development of the particular zone, public support is necessary because the private sector cannot justify investments therein.

Of the 342.17 million Euros of public support needed to achieve the goals set out in PLEAN, the Andalusian Regional Government will provide 74.5 per cent (254.85 million Euros), and the remainder will come from other public administrations at various levels – see Figure 7.8.

**Figure 7.8. Public funds allocated in the Andalusian Energy Plan.**



### 7.2.2. The programme for 2005 and 2006 of incentives for the sustainable development of energy in Andalusia

To encourage the general public in Andalusia to adopt the proposed changes in the production and use of energy, a programme for 2005 and 2006 of incentives for the sustainable development of energy was created in July, 2005. The Andalusian Energy Agency (*Agencia Andaluza de la Energía*), a part of the Regional Ministry for Innovation, Sciences and Enterprise, will stimulate new projects for RUE and RES.

The objective of this programme is to motivate those projects and performances of the energy sector that are set out in the Andalusian Plan for Innovation and Modernisation, which seeks to give a new and more ambitious impulse to the development and optimisation of the energy-system in the Region. The budget dedicated to this programme for 2006 is 46 MEuros.

The beneficiaries of the programme are:

- (a) companies operating establishments in Andalusia, preferably SMEs,
- (b) trade-associations, etc,
- (c) local administrations, and
- (d) local citizens and their representative organisations.

The levels of financial incentives are:

- (a) in general, up to 40 per cent;
- (b) for SMEs, citizens and public administrations, up to 50 per cent; and
- (c) if the project is dedicated to the promotion of certain RES up to 10 per cent, and if it also provides energy to a community, an additional 10 per cent may be provided.

The types of incentives include both (a) direct, non-refundable incentives, and (b) rebated interest-rates.

Works that can be stimulated include:

- (a) RUE;
- (b) Installations for the production of energy under the special regime (CHP, biomass, hydro, thermo-solar etc);
- (c) Other RES installations (thermal solar systems, PV stand-alone, thermal production from biomass, biogas and bio fuels, wind stand-alone, mini hydro-power, mixed installations);
- (d) Production of liquid biofuels and preparation of solid fuels;
- (e) Logistics for biomass and bio fuels projects;
- (f) Transport and energy-distribution; and
- (g) Energy-studies, audits and dissemination actions.

Projects and actions will receive special consideration if they:

- (a) are innovative;
- (b) set up cooperation with other companies, foundations or local administrations;
- (c) are located in protected spaces; and/or
- (d) influence the creation of economic initiatives.

The innovative aspects of the programme are:

- (a) It unifies the four previous Orders.
- (b) It allows on-line application procedures.
- (c) The Agency undertakes all of the tasks of procedure, management, resolution, distribution and control of the energy-incentives.
- (d) The programme shows greater agility.
- (e) The range of possible beneficiaries, and the scope of projects, are both extended.

### **7.3 Plans and Policies in Doñana**

The Law 2/1989, by which the Inventory of Natural Protected Spaces of Andalusia is approved and additional measures are established for its protection, emphasises the diversity and magnitude of the ecological wealth of Andalusia and the evidence of the human imprint on natural spaces. Therefore this Law affirms the necessity to apply nature-conservation to the economic sectors, and promotes a policy conservation that is compatible with economic development.

Article 20.4 of the Law establishes that Government's Council will approve the Plan of Integral Development for the municipalities that are in the Natural Park and its area of socio-economic influence. It is an object of that Plan that such socio-economic structures adequately safeguard ecological stability, and conform to the Plan of Ordination of Natural Resources and in the Plan for Use and Management.

Doñana is one of the natural spaces that has international relevance; and it is a pioneer in sustainable development, for example through the foundation of the National Park and Natural Park. Their natural value is reflected in their ecosystems, such as the swamps, sandbanks and complexes of coastal dunes and beaches, and the estuary of the river Guadalquivir, which numerous species of flora and fauna inhabit.

Sustainable development is a dynamic process; as the first Plan has been concluded, the second Plan should be conceived as a process within which will strengthen the social and productive

culture of local development. This will require the reinforcement of the active participation of the managerial and social actors of Doñana in strategic decisions.

The second Plan for Sustainable Development of the National Park and Natural Park of Doñana will cover:

- (a) Analysis of the Natural Park and of the National Park;
- (b) Setting the objectives of the Plan and checking coherence with the Land Planning Laws;
- (c) Plan of Territorial Ordination;
- (d) Measures to be included in the Plan;
- (e) A model for management; and
- (f) Evaluation and follow-up.

The process of developing the Plan will be developed in three phases:

1. Arranging participation – a phase in which the concept of the Plan will be shared with institutions, managerial main actors, associations and local interested communities. The Regional Ministry of Environment, through the Foundation Doñana 21, will arrange the participation of these parties.
2. Determination of contents - the design of the Plan will take account of programmes and actions that have arisen from the proposals made, and discussions held, in the first phase.
3. A follow-up and evaluating phase of the Plan will be undertaken by the Regional Ministry of Environment with the collaboration of the Commission of Coordination. Every three years the condition of the area, the degree of execution of the planned objectives and all critical factors will be evaluated, and a report will be written, including pertinent correction proposals.

## **8. CONCLUSIONS**

In accordance with the required outputs of Work-package 2 of WISE-Plans, this report reviews energy policies that are in place, or are being developed, internationally, at the European level and within the Member States of the European Union, to take account of the twin perils of (a) the depletion of low-cost fossil fuels and (b) climate-change.

It then goes on to examine the status of specific plans being developed for the four communities that are being studied in this project.

It is clear that policies and plans are more advanced in some of the partners' countries than in others. Part of the reason for the project is to allow partners to learn from each other. Sharing of information is part of the foundation for securing Sustainable Energy Action Plans.

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**APPENDIX 1. An extract from the EC's Biomass Action Plan – “Annex 2: summary of measures”*****“Biomass for heating and electricity.***

*The Commission will:*

*work towards a proposal for Community legislation in 2006 to encourage the use of renewable energy, including biomass, for heating and cooling;*

*examine how the Directive on energy performance of buildings could be amended to increase incentives for the use of renewable energy;*

*study how to improve the performance of household biomass boilers and reduce pollution, with a view to setting requirements in the framework of the eco-design Directive;*

*encourage district heating scheme owners to modernise them and convert them to biomassfuel;*

*encourage Member States that apply a reduced VAT rate to gas and electricity to apply such a rate to district heating too;*

*pay close attention to the implementation of the Directive on electricity from renewable energy sources;*

*encourage Member States to harness the potential of all cost-effective forms of biomass electricity generation;*

*encourage Member States to take into account, in their support systems, the fact that, in combined heat and power plants, biomass can provide heat and electricity at the same time.*

***Transport biofuels.***

*The Commission will:*

*Bring forward a report in 2006 in view of a possible revision of the biofuels Directive. This report will address the issues of:*

*setting national targets for the share of biofuels;*

*using biofuels obligations on fuel suppliers;*

*ensuring, through certification schemes, that the biofuels used to meet the targets satisfy minimum sustainability requirements.*

*Encourage Member States to give favourable treatment to second-generation biofuels in biofuels obligations.*

*Bring forward a legislative proposal promoting public procurement of clean and efficient vehicles, including those using high blends of biofuels.*

*Examine how biofuel use can count towards the CO<sub>2</sub> emission reduction targets for car fleets.*

*Pursue a balanced approach in ongoing free trade agreement negotiations with ethanol-producing countries/regions. The EU must respect the interests of domestic producers and EU trading partners, within the context of rising demand for biofuels.*

*Propose amendments to the biodiesel Standard to facilitate the use of a wider range of oils, including imported oils, to produce biodiesel, and allow ethanol to replace methanol in biodiesel production.*

*Assess the impact of options to address the issues of limits on the content of ethanol, ether and other oxygenates in petrol; limits on the vapour content of petrol; and limits on the biodiesel content of diesel.*

*Ask the relevant industries to explain the technical justification for practices that act as barriers to the introduction of biofuels and monitor the behaviour of these industries to ensure that there is no discrimination against biofuels.*

*Support developing countries by helping them to produce biofuels and by maintaining market access conditions that are no less favourable than those provided by the trade agreements currently in force.*

*Bring forward a communication dealing specifically with biofuels early in 2006.*

### ***Cross-cutting issues.***

*The Commission will:*

*Assess the implementation of the energy crop scheme.*

*Finance a campaign to inform farmers and forest holders about the properties of energy crops and the opportunities they offer.*

*Bring forward a forestry action plan in which energy use of forest material will play an important part.*

*Review the impact of the energy use of wood and wood residues on forest based industries.*

*Consider how the waste framework legislation could be amended to facilitate the use of clean wastes as fuel.*

*Review how the animal by-products legislation could be amended in order to facilitate the authorisation and approval of alternative processes for the production of biogas and other biofuels*

*Encourage the European Committee for Standardisation to speed up work on standards for the quality of biomass fuels.*

*Explore how to develop a European spot market in pellets and chips.*

*Encourage Member States to establish national biomass action plans.*

*Encourage Member States and regions to ensure that the benefits of biomass are taken into account when preparing their national reference frameworks and operational plans under the cohesion policy and the rural development policy.*

**Research.**

*The Commission will:*

*Continue to encourage the development of an industry-led biofuel technology platform.*

*Consider how best to take forward research into the optimisation of agricultural and woody crops for energy purposes, and biomass to energy conversion processes.*

*Give a high priority to research into the bio-refinery concept, finding valuable uses for all parts of the plant.*

*Give a high priority to research into second-generation biofuels, with an aim of improving their efficiency and cost-effectiveness; a substantial increase in Community funding is expected.”*

**APPENDIX 2. A summary of UK transport policy, taken from the White paper of 2004**

*“The strategy charts a course over the next 30 years, founded on the following.*

***Road networks enhanced by:***

- *new capacity where it is needed, assuming that any environmental and social costs are justified;*
- *locking in the benefits of new capacity through various measures including some tolling and carpool lanes where appropriate;*
- *Government leading the debate on road pricing and its capacity to lead to better choices for motorists;*
- *better management, exploiting the potential of new technology to avoid problems and deal with them rapidly if they occur; and*
- *using new technology to keep people informed both before and during their journey.*

***Railways where:***

- *Government sets the strategy, working with the industry to get the costs under control and with the Office of Rail Regulation ensuring that it pays the proper price for what it is buying;*
- *the structure of the industry is improved, with clear lines of responsibility that focus the industry on delivering for its customers;*
- *there is a single point of accountability for performance to improve standards across the industry; and*
- *local and regional stakeholders are involved in decisions on the balance between rail and other forms of transport.*

***Local travel enhanced through:***

- *freer flowing local roads delivered through measures such as congestion charging;*
- *more, and more reliable buses enjoying more road space;*
- *demand responsive bus services that provide accessibility in areas that cannot support conventional services;*
- *looking at ways to make services more accessible so that people have a real choice about when and how they travel;*
- *promoting the use of school travel plans, workplace travel plans and personalised journey planning to encourage people to consider alternatives to using their cars; and*
- *creating a culture and improved quality of local environment so that cycling and walking are seen as an attractive alternative to car travel for short journeys, particularly for children.*

***A balanced approach to aviation:***

- *working with all those involved to implement the conclusions of the Air Transport White Paper;*
- *ensuring that, over time, aviation meets its external costs; and*

- *ensuring that the impact on environment and communities is minimised, with appropriate mitigation and compensation measures put in place.*

**Reflected in our shipping policy:**

- *reviewing the policy framework for ports development by late 2005; and*
- *working with the European Union and global bodies to maintain high quality in the shipping industry.*

**Sustainable freight transport that:**

- *focuses on approaches which offer the best outcomes for our economy, society and the environment.*

**Supported by effective decision making that:**

- *gives local and regional stakeholders more influence over transport investment in their area, including the rail network;*
- *ensures that choices on transport are made alongside other decisions that have an impact on transport, particularly housing and regeneration, at the national, regional and local level; and*
- *ensures the social, economic and environmental costs and benefits are fully recognized when decisions are taken using the New Approach to Appraisal and our developing value for money analysis.*

**While improving safety and security though:**

- *new technologies that can reduce the risk of an accident;*
- *promoting safer vehicles that protect both passengers and pedestrians;*
- *informing drivers about the risks of dangerous driving and the legal penalties; and*
- *co-ordinating security measures at the international level, including making the most of new security technologies.*

**And respecting the environment:**

- *there will continue to be a strong presumption against schemes that would significantly affect environmentally sensitive sites or important species habitats or landscapes;*
- *by keeping the environmental impacts of new and existing transport infrastructure to a minimum, ensuring that mitigation measures are implemented to a high standard;*
- *working across government to ensure that we can deliver carbon savings in line with our domestic and international commitments and reduce the impact of other emissions which pollute the environment;*
- *reducing the impact of all forms of transport, including encouraging the development, introduction and take-up of new vehicle technologies and fuels;*
- *ensuring that the noise impacts of transport are reduced and mitigated;*
- *making progress towards the inclusion of aviation in the European Union emissions trading scheme a priority during our presidency in 2005; and by investing in public transport to provide alternatives to the car.”*

**APPENDIX 3. An extract from *Planning Policy Wales (2002)*.****“12.8 Sustainable energy.**

*12.8.1 It is now widely accepted that climate change is occurring and that the burning of fossil fuels, which generate greenhouse gas emissions, is a major contributor. Unless such emissions, particularly carbon dioxide, are brought under control, there will be severe and unpredictable global impacts which in turn will lead to significant effects at local level.*

*12.8.2 At Kyoto in December 1997 the European Union agreed jointly to reduce emissions of a basket of GHG to 8 per cent below 1990 levels by 2008-12. The UK government agreed to a 12.5 per cent reduction and set a domestic goal of reducing emissions by 20 per cent of 1990 levels by 2010. In an effort to deliver these targets, the Government has launched its Climate Change Programme. The Assembly Government is committed to playing its part in developing and delivering a climate change programme which meets these targets.*

*12.8.3 The objective of the UK Government's energy policy is to ensure a secure, diverse and sustainable supply of energy at competitive prices consistent with wider economic policies, the promotion of energy efficiency and health and safety and the full and proper protection of the local and global environment. This includes increasing the UK contribution of electricity supplied from renewable energy sources to 5 per cent by the end of 2003, rising to 10 per cent by 2010. The Government has also implemented a review of energy supply and use with a long-term view towards 2050 in order to provide strategic planning for diverse, secure, sustainable and environmentally acceptable energy supplies for the UK.*

*12.8.4 The Assembly Government's aim is to secure the strongest economic development policies to underpin growth and prosperity in Wales and recognise in this the importance of clean energy, both as an economic driver and to take forward the Assembly's commitment to sustainable development. As part of this the Assembly Government intends to encourage the development of the renewables sector and promote energy efficiency and conservation in an economic, environmentally sound and socially acceptable way.*

*12.8.5 The Assembly's Economic Development Committee is undertaking a review of energy in Wales. The review will explore the long-term scenarios for (non-transport) energy production and use in Wales and make recommendations to the Assembly Government on a strategic framework for achieving the optimum sustainable use and generation of energy in Wales up to 2020. The targets which emerge from this review will form part of the Assembly Government's commitment to the delivery of the climate change obligations and inform future planning policy.*

*12.8.6 Renewable energy currently accounts for some 3 per cent of Wales's electricity generation. The Assembly Government wishes to see the planning system play its part in contributing to the UK Climate Change Programme and the objectives outlined in 12.8.3, enabling Wales to work towards an agreed target of its electricity and heat requirements from renewable sources by 2010.*

*12.8.7 For the purposes of this policy, renewable energy is the term used to cover those sources of energy, other than fossil fuel or nuclear fuel, which are continuously and sustainably available in our environment. This includes wind, water, solar, geothermal energy and plant material often referred to as biomass. Biomass is generally regarded as fuel (other than fossil fuel), at least 98 per cent of the energy content of which is derived from plant or animal matter or substances derived therefrom (whether or not such matter or substances are waste). This includes agricultural, forestry, or wood wastes or residues, sewage and energy crops.*

12.8.8 It should be noted that consents and environmental assessments for offshore wind energy developments are required under UK legislation, namely the Electricity Act 1989, the Coast Protection Act 1949 and the Food and Environmental Protection Act 1985.

**12.8.9 Local planning authorities should therefore facilitate the development of all forms of renewable energy and energy efficiency and conservation measures where they are environmentally and socially acceptable. They should make positive provision for such development to meet society's needs now and in the future by: considering the contribution that their authority area can make towards developing and facilitating renewable energy and energy efficiency and conservation through their UDPs; ensuring that development-control decisions are consistent with national and international climate-change obligations, including a contribution to renewable-energy targets, having regard to emerging national and international policy on the levels of renewable energy required and on appropriate technologies; and recognising the environmental, economic and social opportunities that the use of renewable energy resources can make to wider planning goals and objectives and the delivery of renewable energy targets.**

12.8.10 At the same time, local planning authorities should ensure that (a) international and national statutory obligations to protect designated areas, species and habitats and the historic environment are protected from inappropriate development; and (b) environmental effects on local communities are minimised.

## **12.9 UDPs and sustainable energy.**

**12.9.1 Local planning authorities should undertake an assessment of the potential of all renewable-energy resources and the potential of renewable-energy technologies and energy-efficiency and conservation measures and include detailed policies in their UDPs.**

12.9.2 In undertaking such assessments local planning authorities should: (a) take into account the contribution that can be made by the area towards climate change and renewable energy targets; and (b) recognise that different approaches will be appropriate for the deployment of the different renewable technologies and energy-efficiency and conservation measures.

12.9.3 Local planning authorities should seek opportunities to integrate energy efficiency and conservation objectives into the planning and design of new development in their areas. For example solar gain can be maximised through appropriate development design. The layout, orientation, mix of uses, density of development, including scope for light penetration, planting of shelter vegetation and optimal use of local topography can all influence energy requirements.

12.9.4 In terms of wind-energy technologies, UDPs may, where possible and practicable, indicate broad locations or specific areas where wind-energy developments are likely to be permitted. In defining such areas it will be appropriate to balance the scale and contribution of such developments to certain levels of renewable energy against the sensitivity of the receiving environment. Small scale or domestic scale schemes may be appropriate in most locations provided they are sensitively sited and designed. In nationally designated areas, large-scale deployment of renewable energy may not be appropriate.

## **12.10 Development control and sustainable energy.**

12.10.1 Local planning authorities should consider the effects of any scheme and its associated infrastructure on the local environment. Where a development is likely to cause demonstrable

*harm to a designated area by virtue of having a significant adverse impact on the qualities for which the site was designated, consideration should be given to refusing the development if such effects cannot be overcome by planning conditions or agreements.*

*12.10.2 Whilst having regard to the contribution of renewable-energy use to wider planning goals such as the diversification of the rural economy, local planning authorities should ensure that any environmental effects on local communities are minimised, to safeguard quality of life for existing and future generations.*

*12.10.3 In determining applications for any form of development, local planning authorities should encourage developers to integrate energy efficiency and conservation measures as part of the design of new development.”*



## APPENDIX 4. Taxation of energy in Sweden\*.

*Note: \*this information was correct at January, 2006, but is subject to revision.*

### A.4.1 VAT.

Value added tax (VAT) is levied on all kinds of energy-consumption with the exception of fuels used for aircraft; the tax rate is 25 per cent.

### A.4.2 Excise Duties on fuels.

The Swedish taxation of energy is regulated by the Act on Excise Duties on Energy (SFS 1994:1776), which brought Sweden into line with European taxation of energy-products (fossil fuels like petrol, diesel, heating oils, coal and natural gas) and electricity. From the 1st January, 2004 the Energy Tax Directive, 2003/96/EC, has repealed the older Directives 92/81/EEC and 92/82/EEC, which covered only mineral oils. The administration of harmonised Excise Duties is regulated in Directive 92/12/EEC.

There are three different kinds of Excise Duties, which are levied on fuels – Energy Tax, Carbon-dioxide Tax and Sulphur Tax. Petrol, gas oil, heavy fuel oil, kerosene, LPG, methane, natural gas, coal and petroleum-coke are directly subjected to all three of these taxes. The Sulphur Tax is also levied on peat. Crude oil has, from 1999, been subject to energy tax. The general principle is that Excise Duties are only to be paid if the fuel is used as motor-fuel or for heating purposes. It is also possible to use the fuels duty-free for certain other purposes, which are specified in the Act.

Apart from these directly Excisable fuels, Duties are also levied on certain other fuels when sold or used as motor-fuels or for heating purposes. This applies to mineral oils, to any product used as motor-fuel and to any liquid or gaseous hydrocarbon that is sold or used for heating purposes. However, aviation-spirit and jet-fuel are not subject to Duty when used for aircraft.

Petrol has been taxed since 1924, and diesel since 1937. Energy Tax on oil and coal used for heating purposes and electricity has been collected since the nineteen-fifties; later both LPG and natural gas were taxed too. The Carbon-dioxide and Sulphur Taxes were introduced in 1991. The Carbon-dioxide Tax-rates correspond at present to approximately 0.92 Swedish Crowns (SEK), (equivalent to 0.099 Euros\*) *per* kg of CO<sub>2</sub>. The Sulphur Tax is levied on the sulphur content in the fuel and is based on a tax-rate of 30 SEK (3.22 Euros) *per* kg of SO<sub>2</sub>.

*Note: \*Tax-rates in Euro in this survey are calculated with an exchange-rate of 9.3086 SEK per Euro (which was the official rate on the 3rd October, 2005).*

#### A.4.2.1 Sulphur Tax.

The Sulphur Tax on peat, coal, petroleum coke and other solid or gaseous products is set at 30 SEK (3.22 Euro) *per* kg of SO<sub>2</sub> in the fuel. The Sulphur Tax on liquid fuels – such as diesel oils and heating oils – is 27 SEK (2.90 Euros) *per* m<sup>3</sup> of oil for each tenth of a per cent by weight of the sulphur-content. However, oil products with a sulphur-content of a maximum of 0.05 per cent by weight are exempted from Tax. Oils with a sulphur-content above 0.05 per cent but below 0.2 per cent are taxed on the same basis as oils with a sulphur-content of 0.2 per cent.

### **A.4.2.2 Energy Tax and Carbon-dioxide Tax.**

The Duty-rates on mineral oils and other directly excisable fuels in Sweden are listed in Table A.4.1\* below with the rates expressed in SEK and Euros.

*Note: \*in the following tables the fuels are described by their CN code, a code number of the combined nomenclature established by Council Regulation (EEC) No. 2658/87 (and following amendments) on the tariff and statistical nomenclature and on the Common Customs Tariff.*

#### **A.4.2.2.1 Environmental classifications for unleaded petrol and for diesel.**

In 1994, Sweden introduced two different rates of Excise Duty on unleaded petrol. The aim of this measure was to encourage a changeover to more environmentally-friendly petrol. The best quality (Environmental Class 1) received the lowest Tax-rate; the classification was based on technical characteristics, including contents of sulphur, benzene, aromatic hydrocarbons, olefins and phosphorus, and vapour pressure. From the 15th November, 2002, alkylate-based petrol, a special quality aimed at two-stroke engines, was included in Class 1, and given a lower Tax-rate than other Class-1 petrol. Unleaded petrol, which does not comply with the characteristics of Class 1, is charged with a higher rate of Tax (in Class 2). The specific technical characteristics for Environmental Classes 1 and 2 are listed in Table A.4.2, below. All petrol sold in Sweden belongs to Class 1.

Unmarked diesel of Class 1 is taxed somewhat more than green-marked heating gas-oil. Unmarked diesel is for use as a fuel for private pleasure-boats and in all kinds of motor-driven vehicles (cars, buses and lorries, as well as tractors, excavators, trucks and other off-road vehicles). Differentiation of the Tax-rate in terms of three Environmental Classes has, since 1991, been applied to the energy-taxation of diesel. The different Tax-rates are related to precise technical characteristics such as the contents of sulphur, polycyclic aromatic hydrocarbons and other aromatics in the fuel, and have proved to be an effective way of encouraging the use of more environmentally-friendly fuels. These characteristics are described in detail in Table A.4.3, below. Almost all diesel (99 per cent) sold in Sweden belongs to Class 1.

**Table A.4.1 Excise-Duty rates in SEK and Euros on mineral oils and other fuels in Sweden, on the 1st January, 2006.**

CN code (from 2002)	Type of product unit	Excise duty rate		CO <sub>2</sub> Tax		Total tax	
		SEK	Euros	SEK	Euros	SEK	Euros
<b>Mineral oils</b>							
1. 2710 11 31, 2710 11 41, 2710 11 45 or 2710 11 49	Petrol Environmental Class 1 – motor petrol – alkylate-based petrol Environmental Class 2 2.89 per litre	2.86 1.28 0.31	0.31 0.14 2.13	2.13 2.13 0.23	0.23 0.23 5.02	4.99 3.41 0.54	0.54 0.37
2. 2710 11 31, 2710 11 51 or 2710 11 59	Other petrol, per litre 3.56	0.38	2.13	0.23	5.69	0.61	
3. 2710 19 21, 2710 19 25, 2710 19 41, 2710 19 45, 2710 19 49 or 2710 19 61– 2710 19 69	Gas oil, kerosene, heavy fuel oil, per m <sup>3</sup> a) marked oil <sup>a</sup> b) unmarked oil <sup>b</sup> Environmental Class 1 1,042 Environmental Class 2 1,286 Environmental Class 3 1,609	739 111.94 138.15 172.85	79.39 2,623 2,623 2,623	2,623 281.78 281.78 281.78	281.78 3,665 3,909 4,232	3,362 393.72 419.93 454.63	361.17
4. within 2711 12 11– 2711 19 00	Liquefied petroleum gas (LPG), per 1,000 kg a) used for the propulsion of motor driven vehicles, vessels or aircrafts b) other purposes	0 145	0 15.58	1,357 2,759	145.78 296.39	1,357 2,904	145.78 311.97
5. within 2711 29 00	Methane, per 1,000 m <sup>3</sup> a) used for the propulsion of motor driven vehicles, vessels or aircrafts b) other purposes	0 239	0 25.68	1,116 1,965	119.89 211.10	1,116 2,204	119.89 236.77
<b>Other fuels</b>							
6. 2711 11 00, 2711 21 00	Natural gas, per 1,000 m <sup>3</sup> a) used for the propulsion of motor driven vehicles, vessels or aircrafts b) other purposes	0 239	0 25.68	1,116 1,965	119.89 211.10	1,116 2,204	119.89 236.77
7. 2701, 2702 or 2704	Coal, per 1,000 kg	315	33.84	2,282	245.15	2,597	280.76
8. 2713 11 00–2713 12 00	Petroleum coke, per 1,000 kg	315	33.84	2,282	245.15	2,597	280.76
9. 3803 00 10	Crude tall oil, per m <sup>3</sup> 3,362	361.17	–	–	3,362	361.17	

Note: <sup>a</sup> Marked oil is used in stationary motors and ships and for heating purposes. As for marked oil used in either the manufacturing industry or in agriculture including commercial horticulture tax rates are lower: no energy tax is paid for such consumption and only 21 per cent of the carbon dioxide rates listed in the table.

<sup>b</sup> Unmarked oil is used for the propulsion of motor driven vehicles and private pleasure boats.

Table A.4.2 Technical requirements for environmental classification of petrol.

Requirements	Environmental class 1		Environm. class 2
	motor petrol	alkylate-based petrol	
Research octane number, minimum	95	–	95
Motor octane number, minimum	85	–	85
Vapour pressure by Reid, maximum kilopascal	70 <sup>a</sup> /95 <sup>b</sup>	65	70 <sup>a</sup> /95 <sup>b</sup>
Vapour pressure by Reid, minimum kilopascal	45 <sup>a</sup> /65 <sup>b</sup>	50	–
Distillation:			
– Evaporated at 70 °C, per cent by volume	–	15–42	–
– Evaporated at 100 °C, minimum per cent by volume	47 <sup>a</sup> /50 <sup>b</sup>	46 <sup>c</sup>	46
– Evaporated at 100 °C, maximum per cent by volume	–	72 <sup>c</sup>	–
– Evaporated at 150 °C, minimum per cent by volume	75	–	75
– Evaporated at 180 °C, minimum per cent by volume	75	–	75
Final boiling point, maximum °C	205	200	–
Olefins, maximum per cent by volume	13.0	0.5	18.0 <sup>d</sup>
Aromatic hydrocarbons, maximum per cent by volume	35.0	0.5	35.0
Benzene, maximum per cent by volume	1.0	0.1	1.0
Cycloalkanes, maximum per cent by volume	–	0.5	–
n-Hexane, maximum per cent by volume	–	0.5	–
Oxygen, maximum per cent by mass	2.7	–	2.7
Oxygenates:			
– Methanol, maximum per cent by volume, stabilising agents must be added	3	–	3
– Ethanol, maximum per cent by volume, stabilising agents can be necessary	5	–	5
– Isopropyl alcohol, maximum per cent by volume	10	–	10
– tert-Butyl alcohol, maximum per cent by volume	7	–	7
– Isobutyl alcohol, maximum per cent by volume	10	–	10
– Ethers containing five or more carbon atoms per molecule, maximum per cent by volume	15	–	15
Other oxygenates <sup>e</sup> , maximum per cent by volume	10	–	10
Sulphur, maximum milligram per kilogram	10	10 <sup>f</sup>	10 <sup>f</sup>
Lead, maximum gram per litre	0.005	0.002	0.005
Phosphorus	non-measurable	–	–
Density at 15 °C, kilogram per cubic metre	–	680–720	–

<sup>a</sup> Is valid from 16<sup>th</sup> May to 31<sup>st</sup> August in the northern part of Sweden and from 1<sup>st</sup> May to 15<sup>th</sup> September in the southern part. During other seasons than said here or under note b the following requirements are allowed: Vapour pressure at 37.8 °C maximum 95 and minimum 45 kilopascal and Evaporated at 100 °C, minimum 47 per cent by volume. The EC requirements (directive 98/70/EEC) for the quality of petrol are in line with class 2.

<sup>b</sup> Is valid from 16<sup>th</sup> October to 31<sup>st</sup> March in the northern part of Sweden and from 1<sup>st</sup> November to 15<sup>th</sup> March in the southern part. During other seasons than said here or under note <sup>a</sup> the following requirements are allowed: Vapour pressure at 37.8 °C maximum 95 and minimum 45 kilopascal and Evaporated at 100 °C, minimum 47 per cent by volume.

<sup>c</sup> If the increase in temperature in the interval 45–72 per cent evaporated is less than ten Celsius degrees then instead the T<sub>50</sub>-value (the temperature at 50 per cent evaporated) should be between 90 and 105 °C.

<sup>d</sup> With the exception of regular petrol (a minimum motor octane number of 81 and a minimum research octane number of 91) for which the olefin content should be maximum 21 per cent by volume. Those requirements do not hinder petrol with a lower octane number to be sold.

<sup>e</sup> Other primary alcohols and ethers, whose final distillation boiling point do not exceed the corresponding boiling point given in national standards, or, if they do not exist, in industrial specifications for motor fuels.

<sup>f</sup> Till the end of 2008 however the sulphur content is allowed to be maximum 50 milligram per kilogram.

**Table A.4.3 Technical requirements for environmental classification of diesel.**

Requirements	Environmental class 1	Environmental class 2	Environmental class 3
Cetane index (ignitability), minimum	50	47	–
Cetane number, minimum	51 <sup>a</sup>	51 <sup>a</sup>	51
Density, minimum kg/m <sup>3</sup> at 15 °C	800	800	–
Density, maximum kg/m <sup>3</sup> at 15 °C	820	820	845
Distillation			
– starting boiling point, minimum °C	180	180	–
– at 95 % distillate, maximum °C	285	295	360
Aromatic hydrocarbons, maximum per cent by volume	5	20	–
Polycyclic aromatic hydrocarbons, maximum per cent by volume	non-measurable	0.1 <sup>b</sup>	–
Polycyclic aromatic hydrocarbons, maximum per cent by mass	–	–	11 <sup>c</sup>
Sulphur, maximum milligram per kilogram	10	10 <sup>d</sup>	10 <sup>d</sup>

<sup>a</sup> Is valid for diesel which belongs to CN code 2710 19 41 in the Combined Nomenclature according to (EEG) 2658/87. The EC requirements (directive 98/70/EEC) for the quality of diesel are in line with environmental class 3.

<sup>b</sup> According to Swedish Standard 15 51 16.

<sup>c</sup> According to EN 12916.

<sup>d</sup> Till the end of 2008 however the sulphur content is allowed to be maximum 50 milligram per kilogram.

#### **A.4.2.2.2 Fuels used in industrial manufacturing, agriculture incl. green house cultivation, forestry and pisciculture works.**

Sweden employs lower rates of excise duty on energy products used for heating purposes and in stationary motors by the manufacturing industry, in agriculture including commercial green house cultivation, forestry and pisciculture works. Since 1<sup>st</sup> January, 2005 there is also a special, reduced rate for diesel used as propellant in tractors, farming machines etc.

The special regulations concerning the taxation of the manufacturing industry was introduced in 1993 and replaced a former reduction system for the industrial sector. Green house cultivation has like the industry been benefiting from tax reductions since long. Other forms of agriculture, forestry and pisciculture works did get their reduction from 1<sup>st</sup> July, 2000.

No energy tax is paid for fuels consumed by the manufacturing industry and these enterprises pay 21 per cent of the general rates of carbon dioxide tax. For industry use an application for refund must normally be made quarterly and the tax amount must be at least 1,000 SEK from administrative reasons. For use in agriculture, forestry and pisciculture works the refund is only given if the amount exceeds 1,000 SEK per calendar year. The rates for fuels used for heating purposes are listed in Table A.4.4 below. For diesel the refund is limited to the carbon dioxide tax. Of that tax 23 per cent is paid, corresponding to a refund of 2.02 SEK per litre.

A special refund of tax is given for diesel used in forestry in the southern parts of Sweden during the period 8<sup>th</sup> January, 2005 – 31<sup>st</sup> December, 2006. The background is a storm that felled millions of trees and the refund was introduced to promote the efforts to quickly take care of the fallen timber. The refund is given for the remaining tax on diesel.

**Table A.4.4 Rates of excise duty on fuels consumed for heating purposes and in stationary motors in manufacturing industry, agriculture and forestry, 1<sup>st</sup> January, 2006.**

Fuel	Excise duty rate (21 per cent of the general CO <sub>2</sub> tax rate)	
	SEK	Euro
1. Heating gas oil, heavy fuel oil, kerosene (not for vehicles) (CN codes 2710 19 21, 2710 19 25, 2710 19 41, 2710 19 45, 2710 19 49 or 2710 19 61– 69) per m <sup>3</sup>	550.83	59.17
2. Liquid petroleum gas (not for vehicles) (within CN codes 2711 12 11–2711 19 00) per 1,000 kg	579.39	62.24
3. Methane (not for vehicles) (within CN code 2711 29 00) per 1,000 m <sup>3</sup>	412.65	44.33
4. Natural gas (not for vehicles) (within CN codes 2711 11 00 and 2711 21 00) per 1,000 m <sup>3</sup>	412.65	44.33
5. Coal (within CN codes 2701, 2702 or 2704) per 1,000 kg	479.22	51.48
6. Petroleum coke (within CN codes 2713 11 00–2713 12 00) per 1,000 kg	479.22	51.48
7. Crude tall oil (CN code 3803 00 10) per m <sup>3</sup>	550.83	59.17

Further tax reductions can be applicable to enterprises with a very high consumption of energy. If the paid reduced carbon dioxide tax exceeds 0.8 per cent of the sales value of the products being sold by the enterprise, it is possible for the enterprise to apply for a further reduction of the excess tax amount so that only 24 per cent of this amount is paid. The tax rates that the remaining tax amount corresponds to must on the average respect the EC's minimum tax rates for the consumed heating fuels.

Until the end of 2008 another reduction of the carbon dioxide tax is also possible, in order to make the carbon dioxide tax paid not to exceed 1.2 per cent of the sales value of the produced products. Only companies manufacturing products out of other mineral compounds than metals can make a claim for reduction and it is only consumption of other fuels than mineral oils (e.g. coal and natural gas) that is accounted for. The EC's minimum tax rates for the consumed fuels must be respected.

#### **A.4.2.3 Relief from excise duty for fuels used for certain purposes.**

According to the Act on Excise Duties on Energy relief from energy tax and carbon dioxide tax is granted for certain purposes, namely for:

1. fuels used for purposes other than as motor fuels or as heating fuels,
2. coal and petroleum coke used in metallurgical processes,
3. other fuels than petrol used for transportation by rail,
4. fuels used for the purposes of navigation, other than in private pleasure craft,
5. jet fuel and aviation spirit used for the purpose of air navigation (commercial as well as for private pleasure),
6. fuels used for the production of mineral oils, coal, petroleum coke and other fuels for which excise duty is paid by the manufacturer, and

7. fuels used for the production of electricity (note that energy tax is levied on electricity, see A.4.3.1 below).

Relief from sulphur tax is granted for the purposes set out in paragraphs 1–6 above. Some other purposes also qualify for relief from sulphur tax. One purpose is the production of goods from other mineral compounds than metals. Sulphur tax is exempted if the sulphur is not emitted to the atmosphere through binding in the process in products or in ashes.

Further, a 100 per cent reduction of the energy tax and 79 per cent of the carbon dioxide tax is granted for fuels used for the production of heat in a combined heat and power plant (CHP). When the tax reduction is calculated the fuel consumption shall be allocated to the production of heat and electricity through proportioning.

Biologically produced methane is exempt from excise duties.

#### **A.4.2.3 Tax-relief and tax-reductions for certain pilot projects.**

The government has a right to apply exemptions or reductions in the rates of duty to fuels used in the field of pilot projects for the technological development of more environmentally-friendly products and in particular in relation to fuels from renewable resources. With reference to this regulation the Government has given complete relief from excise duties for e.g. ethyl alcohol (ethanol) and rapeseed methyl ester (RME) used as motor fuels.

### **A.4.3 Excise duties on electricity.**

#### **A.4.3.1 Energy tax.**

Energy tax is levied on the consumption of electricity in Sweden. The rate is differentiated according to the type of activity (industrial or not) and where in the country the consumption takes place. The rates are listed in Table A.4.5 below.

**Table A.4.5 Energy tax rates on electricity, 1<sup>st</sup> January, 2006.**

Type of consumption	Energy tax SEK per kWh	Euro per kWh
1. Manufacturing industry and agriculture including commercial greenhouse cultivation	0.005	0.0005
2. Other consumption than specified under 1, in the northern parts of Sweden	0.201	0.0216
3. Other consumption than specified under 1, in the southern parts of Sweden	0.261	0.0280

Relief from energy tax is granted if the electricity is produced in a certain manner or used for certain specific purposes, namely:

1. produced in a wind power station during 2006 (deduction is allowed with 0.65 SEK/kWh for stations on land and with 0.15 SEK/kWh for stations at sea and in lake Vänern),
2. produced and consumed on board a craft or other means of transportation,

3. used in connection with the production of electricity,
4. produced in a reserve power station, and
5. used in an industrial enterprise that takes part in a five year programme to increase the energy efficiency. The energy savings must at least correspond to the tax relief.

Energy and carbon dioxide taxes on fuels are exempted when the fuels are used for the production of electricity.

#### A.4.3.2 Other taxes on electricity.

Apart from the energy tax, which is levied on the consumption of energy, there is an additional tax on electricity, which is applied on the production of electricity in a nuclear plant. This tax is regulated in the Act on Excise Duties on Thermal Capacity on Nuclear Power Reactors (SFS 2000:466). The tax is based on the thermal production capacity in the nuclear reactor. The duty rate applicable is 10,200 SEK (1095.76 Euro) per megawatt of the permitted thermal capacity and calendar month. Before 1<sup>st</sup> July, 2000 the tax was related to the produced quantity of electricity. The tax rate was then 0.027 SEK (0.0029 Euro) per kWh.

Electricity produced in Sweden during 2005 originated to 45 per cent from nuclear power plants and to 47 per cent from hydroelectric power stations. Only about 8 per cent was produced by means of biofuels and fossil fuels in CHP plants.

#### A.4.4 Revenues from excise duties on fuels and electricity.

**Table A.4.6 Revenues 2005 in million Swedish Crowns and Euro.**

Energy source	Energy tax	CO <sub>2</sub> tax	Sulphur tax	Nuclear power tax	Total	Total (in million Euro)
Petrol	14,833	11,140			25,972	2,790
Other oil products	4,596	13,702			18,298	1,966
Coal, LPG and natural gas	84	969			1,053	113
Crude tall oil	21				21	2
Sulphur in fuels			74		74	8
Electricity	18,151			1,804	19,955	2,144
<b>Sum</b>	<b>37,685</b>	<b>25,810</b>	<b>74</b>	<b>1,804</b>	<b>65,373</b>	<b>7,642</b>

Gross domestic product 2005, GDP	2,673 billion SEK	285 billion Euro
Tax revenues in relation to GDP	2.4 per cent	2.4 per cent



**APPENDIX 5. Extracts from “Environmental goals for all of us living and working in Skellefteå.”*****Introduction***

*The Swedish parliament has passed an act containing 15 national environmental goals, setting out the direction for Swedish environmental work. These goals concern companies, associations, county councils, municipalities and individual persons. It is a voluntary undertaking, but it is necessary and important for us all.*

*In Skellefteå we have set up a number of local environmental goals. With explanations about the state of the environment today in the municipality of Skellefteå and how we can continue to work together to protect our environment.*

*It is our bounden duty to ensure that our environment is preserved and protected so that all living environments and species are given a chance to survive. So that we can pass on our natural resources to coming generations with a good conscience.*

***Goals for a quality environment***

- *A good residential environment*
- *A non-toxic environment*
- *Living coast and islands*
- *Protection from radiation*
  
- *Fresh air*
- *Reduced impact on the climate*
- *A protective ozone layer*
  
- *Thriving wetlands*
- *Living forests*
- *A rich arable landscape*
- *Non-toxic soil*
  
- *Good quality ground water*
- *Living lakes and watercourses*
- *The sea in balance*
- *Only natural acidification*
- *No over-fertilisation*
  
- *A magnificent mountain environment*
- *A rich variety of plant and animal life*

*Goals are a bit more than we know we can achieve, yet still something that can reasonably be achieved if we really try.*

**Living**

*It should be pleasant and healthy to live in Skellefteå.*

*The food we eat should be healthy and we should not be exposed to noise, pollution and injurious chemicals in our homes or in our living environment otherwise. The effect of our way of living on the external environment should be minimised. We should protect the unique values of our coast and islands. Local, renewable assets, such as the forest for building and biofuel should be utilised. We must be economical with natural gravel. We will create green jobs and develop new technologies for the benefit of others.*

- *A good dwelling environment*
- *A non-toxic environment*
- *Living coast and islands*
- *Protection from radiation*

**Overarching goals**

*People should be able to live and work at the coast and on the islands as well as inland, and it should be possible to live an environmentally friendly outdoor life throughout the municipality.*

*Social planning should make good communications easier, for example, the railway, public transport, cycling, shipping, etc.*

*Conditions for people to meet spontaneously should be created in residential areas and in the public realm.*

*We will build a society which does not generate so much noise, and use increasing knowledge to create an environment safe from radiation.*

*We will build houses fit to live in - and use materials which do not cause allergies or oversensitivity.*

*Knowledge and assets known to promote wood as a building material should be utilised.*

*We will place more stress on preserving and developing natural and cultural environmental values in the town, in residential zones and their surrounding areas.*

*The forest in the vicinity of built-up areas should be easily accessible and be preserved so that it invites to outdoor life.*

*We should be able to eat fish, mushrooms, berries, game, etc from our waters and lands without risk to our health.*

*We will save on natural gravel and follow the intentions of the "Materials Economy Plan for Skellefteå Municipality 2003".*

*Skellefteå's schools will be pioneers and introduce environmental knowledge and sustainable development on the timetable.*

**Environmental goals for 2012**

### ***Planning***

*Valuable, cultural-historical buildings have been identified in a programme for a cultural environment.*

*There are plans for how green and aqueous areas in built-up areas and their surroundings should be protected and developed.*

*A care plan has been developed for the Vitberg area near the densely populated zone, setting out how the area is to be developed, managed and cared for from a sustainable and long-term perspective.*

*For Skellefteå town there is at least one architectural programme which shows how housing can be developed whilst at the same time protecting its distinctive character.*

*A overview of nationally interesting cultural environments for the coasts and islands has been produced.*

### ***Dwellings***

*Half of all buildings where people reside often or for long periods have ventilation which is documented as well functioning.*

*All those changing their mode of heating to district or geothermal heating, etc know that this often requires improved ventilation.*

*All schools and preschools must have a lower radon figure than 200 bq/m<sup>3</sup> of air.*

*All blocks of flats and a half of all other dwellings have a documented radon figure of under 200 bq/m<sup>3</sup> of air.*

### ***A quiet environment***

*The sound level in places of entertainment and leisure should be below critical values so as to avoid damage to hearing.*

*Through appropriate measures in built-up areas, the percentage of people disturbed by noise (> 65 dBA) is 5% lower than in 1993.*

*Outside built-up areas, no-one is exposed to traffic noise above the national value in force of 65 dBA.*

### ***Consumption***

*Regular monitoring of the caesium content after the Chernobyl disaster has been carried out on mushrooms, fish, meat, etc.*

*The range of ecological foods on offer is 15% higher than in 2002.*

*Those responsible for buying in the public domain and large companies have been trained in environmentally orientated purchasing.*

### *Gravel pits*

*Natural gravel constitutes not more than 20% of the total amount of ballast used. New gravel pits are only allowed when equivalent materials are unavailable.*

*Ballast consists of at least 25% of recycled material, for example low-sulphur rock waste and blast stone.*

*Gravel pits for neither household nor other purposes are permitted in areas with a high natural or cultural value or where they might impact on the quality of the groundwater. 11*

### **FRESH AIR - OUTDOORS**

*The air should be just as clean in Skellefteå's built-up areas as in the country. The air must not be forced to accept GHG, ozone-destructive substances or pollutants which can be injurious to humans, animals, buildings, land or water. We must reduce total energy consumption.*

- *Fresh air*
- *Reduced impact on the climate*
- *The protective ozone layer*

### **Overarching goals**

*The use of fossil fuels should be reduced on a broad front (petrol, diesel, heating oil, etc). Dependence on oil should be overcome by 2020.*

*Oil should be replaced by renewable energy for heating and transport.*

*The municipality should promote the production of biofuels, public transport, and the reuse and recycling industries.*

*We should look after natural resources such as the forest, agricultural land and expanded waterpower, etc as sources of production for renewable energy. All production should be carried out in an environmentally correct fashion.*

*We should be self-sufficient in renewable, environmentally adapted fuel.*

*Planning and building should be for the benefit of a society where air pollution and the carbon dioxide content are reduced.*

*Skellefteå and its built-up areas should be supplied with a considerably extended district heating network. Heating should be produced in environmentally acceptable manner, for example using biofuels and preserved waste heat.*

*We should be active in energy matters and follow the intentions of the "Energy Plan for the Municipality of Skellefteå".*

### **FRESH AIR - OUTDOORS**

#### *Environmental goals 2012*

#### *General*

*The release of carbon dioxide from fossil fuels has been reduced by 8% compared with 1990.*

*We sort out our waste so that at least 6,000 tonnes of organic waste is dealt with by decomposition. All biogas formed will be used to drive vehicles and to replace oil consumption in industry.*

#### *Heating*

*The consumption of heating oil has been reduced by 80% compared with the year 2000.*

*The number of detached houses heated by electric radiators has been reduced by 5% compared with the year 2000.*

*All municipal premises have been converted to use renewable fuels.*

#### *Traffic*

*Due to good solutions in Skellefteå we are achieving Parliament's goals for fresh air by a wide margin.*

*Every tenth car bought by the inhabitants of the municipality can be driven using renewable fuel.*

*Renewable fuel is available at all petrol stations selling more than 1000 m<sup>3</sup> of fuel per year.*

*Of municipal motor vehicles 30 % are run on renewable fuels.*

*An environmental zone has been introduced in central parts of Skellefteå. All work vehicles and lorries within this zone are run on fuel of the best environmental class.*

*When purchasing, the municipality imposes conditions on transport with the aim of reducing the amount of carbon dioxide released.*

*The sale of alkylate petrol for two stroke engines has doubled compared with 2005.*

#### *Energy*

*All companies which can influence their energy consumption have measurable energy objectives.*

*Housing in built-up areas is being planned for renewable energy with priority being given to district heating, solar panels, geothermal heat, heating from surface water, etc.*

*Access to waste heat from industry and municipal activity has been surveyed and a plan drawn up for how it can be preserved.*

*Total energy consumption has been rendered more effective and is lower than in 1995.*

*A plan has been established showing where expansion of wind power stations can take place.*

#### *Release of pollutant substances*

*The release of ozone-destructive substances has ceased.*

*The discharge of solvents from industry has been reduced by 50% since the year 2000.*

*20 % more companies have introduced an environmental management system than in 2005.*

### *NATURE IN BALANCE*

*We will use, protect and preserve nature so that the unique benefits of Skellefteå are developed and managed in the best possible manner. We will protect the open landscape. Agriculture and forestry will survive and develop in a sustainable fashion. The soil will be free of pollutants and its water-retentive function will be preserved. The conditions for a rich outdoor life will be present. Environments with cultural and ancient monuments will be preserved to the greatest possible extent.*

- Flourishing wetlands*
- Living forests*
- A rich agricultural landscape*
- Non-toxic soil*

### *OVERARCHING GOALS*

*The municipality will set an example in its management of its own forest lands both as regards production and conservation. The natural and cultural environments and fresh air assets will enjoy high priority as will the forests, which are especially important for reindeer husbandry.*

*We will look after the forests, agricultural land and extended waterpower, etc as sources of production for renewable energy. All production will take place based on preserving the environment.*

*Forests, wetlands, etc, which are worthy of protection will be set aside for purposes of nature conservation. Priority will be given according to regional environmental objectives.*

*The open landscape will be preserved and protected.*

*Agriculture will be orientated towards ecologically correct methods. Cultural historical traditions and methods, pastures, and summer grazing should be encouraged.*

*Good soil, i.e. agricultural soil allowing good conditions for food production should be regarded as a finite resource.*

*Arable land no longer in use should be used as a resource for the production of biofuel.*

*Hunting and game preservation should be included as an integral and essential part of nature conservation.*

*Endangered or delicate species and biotopes found in other geographical areas but which are found to a considerable extent within the municipality of Skellefteå should be given long-term protection.*

*Ecotourism should be promoted and e.g. form part of the marketing of the municipality's natural and cultural assets.*

*Polluted areas should be surveyed, investigated and decontaminated if necessary.*

*Sewage sludge and urine should be returned to agriculture to the greatest possible extent.*

*Environmental goals 2012*

*NATURE IN BALANCE*

*General*

*Skellefteå municipality has taken up the fifty percent finance offered by the Swedish National Environment Protection Agency for the purchase and creation of at least one municipal nature reserve.*

*At least one cultural reserve with a feature of arable land has been created in Skellefteå municipality*

*A private nature reserve/eco park has been created in Skellefteå.*

*Agriculture and arable land*

*The agricultural area has stayed at the same level as in the year 2000.*

*Through its purchasing of food, the municipality is striving to achieve local, active, sustainable agriculture. At least 10% of food purchases is ecological.*

*10 percent animal husbandry and 30% of arable land in the municipality is run on ecological lines.*

*Since the year 2000, 75 hectares of wetlands and small lakes have been provided or recreated in the arable land.*

*Arable land near lakes with waterfowl, wetlands, etc have been surveyed. Instructions for maintenance have been established in action plans.*

*The traditional meadowland is twice as large and the traditional grazing land has been expanded by 50% as compared with the county council's survey in 2001.*

*Wetlands*

*Wetlands found in areas of national interest and wetlands in the two highest classes in the county's wetland inventory have been exempted from exploitation.*

*Smaller wetlands have been surveyed for their natural and cultural worth.*

*Stormyran (marsh) (Vithatten), Övre Kågedalen and the Jättungsmyran (marsh) have been surveyed for their natural and cultural worth and have been granted long-term protection.*

*An action plan has been set up to avoid the impact on and exploitation of untouched wetlands and those with high value in the natural and cultural environment.*

*The forest*

*The area of forest set aside for purposes of natural conservancy has increased compared with 1998.*

*Forests more than 120 years old are spared to a greater extent. The proportion of old forests and older deciduous forests is five percent greater than in 1998.*

*Dead and fallen trees are allowed to decay to a greater extent on site. 30% more dead wood is left in the forest compared with the national forest survey in 1998. The increase has been mainly in the coastal region.*

*The amount of deciduous forest has increased by five percent compared with the national forest survey in 1998. Rejuvenation of deciduous forests is taking place to a greater extent and old deciduous trees and forest are being spared in the forest stock.*

*Nature conservancy and timber burning on forest land has increased.*

*A third of forest land has been surveyed for ancient and cultural remains which have been of significance to Man.*

*Of the unique forests on raised land which are part of the municipality's survey of coast and island areas, nine forests with classification 1 are protected.*

#### *Polluted land*

*Half of the fifteen or so polluted areas which the county council has assigned to risk classes 1 and 2 have had their soil investigated. Decontamination has been started in 50% of areas requiring such treatment.*

#### *Living water*

*Water should be life-giving. On its way from inland to the sea, it should not convey pollutants which change the living conditions of plants, animals and people. The water along the municipal coast should be pure and create the conditions for a vigorous population of plants and animals. The water in the soil should be protected, and where available should be fit for consumption by people and animals. Affected water should wherever possible be restored to its original state.*

- *Groundwater of good quality*
- *Living lakes and watercourses*
- *Seas in balance*
- *Only natural acidification*
- *No over-fertilisation*

#### **Overarching goals**

*We should protect important and richly varied living environments in lakes, watercourses and the sea. Living environments for plant and animal life which have been adversely affected by Man in one way or another should wherever possible be restored or recreated.*

*Drained lakes and wetlands should regain their original level if draining no longer fulfils any function and if restoration would raise the area's natural, cultural or leisure benefits.*

*Man-made obstacles blocking walking paths in smaller watercourses should be removed and cleansed water from the floated timber era should be restored.*



*The natural stocks of salmonidae within the municipality should be allowed to develop a vigorous population.*

*Fertiliser and chemical control should be carried out in such a way that lakes, watercourses and the ground water are not polluted.*

*Future areas should be protected which can be interesting from the point of view of the water supply, not just from a local perspective but also from a wider regional perspective.*

*We want cleaner waste water which does not pollute either surface or ground water.*

*The impact of industry on surface and ground water should be minimal.*

*Living water*

*Environmental goals 2012*

*General*

*At least one marine nature reserve has been created.*

*The impact on aqueous environments*

*Drained lakes and wetlands have been surveyed. A selection for restoration work is taking place having regard for cultural-historical assets and the on-going use of land.*

*The smaller watercourses which are to be restored after the floated timber era have been surveyed. Restoration work should take place taking into account cultural-historical assets.*

*Lakes and watercourses which have been affected by mining have been surveyed.*

*Instructions have been issued for how dredging and erection of piers is to be carried out along the coast.*

*Fish*

*The catch from natural waters should not be greater than what the water can produce.*

*Fish should be released so that fish stocks worthy of protection and other water-borne creatures are not threatened.*

*There has been a survey of spawning grounds along the coast and watercourses that run out into the sea for fish needing satisfactory protection.*

*Marine salmon trout and coastal grayling should have such good living conditions that they develop a vigorous population.*

*Acidification*

*Waters where there is a high content of inorganic aluminium have been surveyed and the content kept below the level where fish and other waterborne organisms are adversely affected.*

*There is an action programme to avoid acidification from naturally occurring sulphide clay.*

### *Over-fertilisation*

*A monitoring programme is in progress showing waters where the nutritive salt content is too high and what the effects are.*

*An information campaign is in progress in areas of intense agriculture and animal husbandry in order to reduce leakage of nutrients into lakes and watercourses.*

*No unpurified drainage from households should flow directly into lakes, watercourses or the sea.*

*The release of phosphorus and nitrogenous compounds should be reduced in waters with a demonstrated tendency to over-fertilisation.*

*Routines have been produced for how reeds should be harvested.*

### *Drinking water*

*The major sources of groundwater in the municipality have been surveyed and analysed.*

*Plans for a water supply with established protection areas exist for general and major individual surface and groundwater sources.*

*The quality of the groundwater should not be measurably affected by quarrying, fertiliser management, biocides, etc.*

*40 percent of all private water sources have been analysed from a chemical point of view.*

### *Waste water*

*A waste water policy has been drawn up establishing the division of responsibility and how the water should be managed.*

*Local management of waste water has been developed so as to look after and purify surface water before it reaches the surface and ground water.*

### *Working towards environmental goals in Skellefteå*

## **POLITICAL PRIORITIES**

*On the basis of all background material, proposals for objectives and measures available, we have decided on four main themes for environmental work in Skellefteå.*

*We have chosen to prioritise future environmental work within the areas where we believe we are in the best position to affect the environment in a clearly positive direction.*

*We have great possibilities to develop production of biofuel.*

*We will allow nature to produce, but we must also protect it.*

*Protected nature will benefit the local population and the tourist trade.*

*In the course of environmental change we must also make use of the available facilities to develop*

*trade and industry in an environmental direction.*

*Here environmental requirements can be a driving force which the municipality imposes when purchasing.*

*Investment in biofuels*

*The climate is a global matter, but we have a great opportunity to make a major investment also at local level.*

*The purpose of our investment in biofuels is that dependence on fossil fuels should be overcome by 2020. Then no dwelling should need oil for heating. No motorist will be restricted to only petrol. There should always been a better alternative to oil.*

*Experiencing nature and culture*

*We should invest in experiences of nature which make Skellefteå more attractive. This is because the experience industry - the tourist trade - will be in all probability a future growth area. Interest in ecological solutions for building and town planning will hopefully increase. Here green zones near built-up areas and the cultural landscape are important factors which can increase growth in the municipality.*

*Environmentally propelled business development*

*Major opportunities for growth exist in a global market. The municipality should prepare the way and develop satisfactory opportunities for companies seeking to develop environmentally propelled trade.*

*Environmentally adapted purchasing*

*The municipality's purchasing of goods and services should be environmentally defined and stimulate "greener" demand.*

*This is also a good way of reducing the impact of our own organisation on the environment.*