

The Electricity Efficiency and Saving Plan

Horizon 2015





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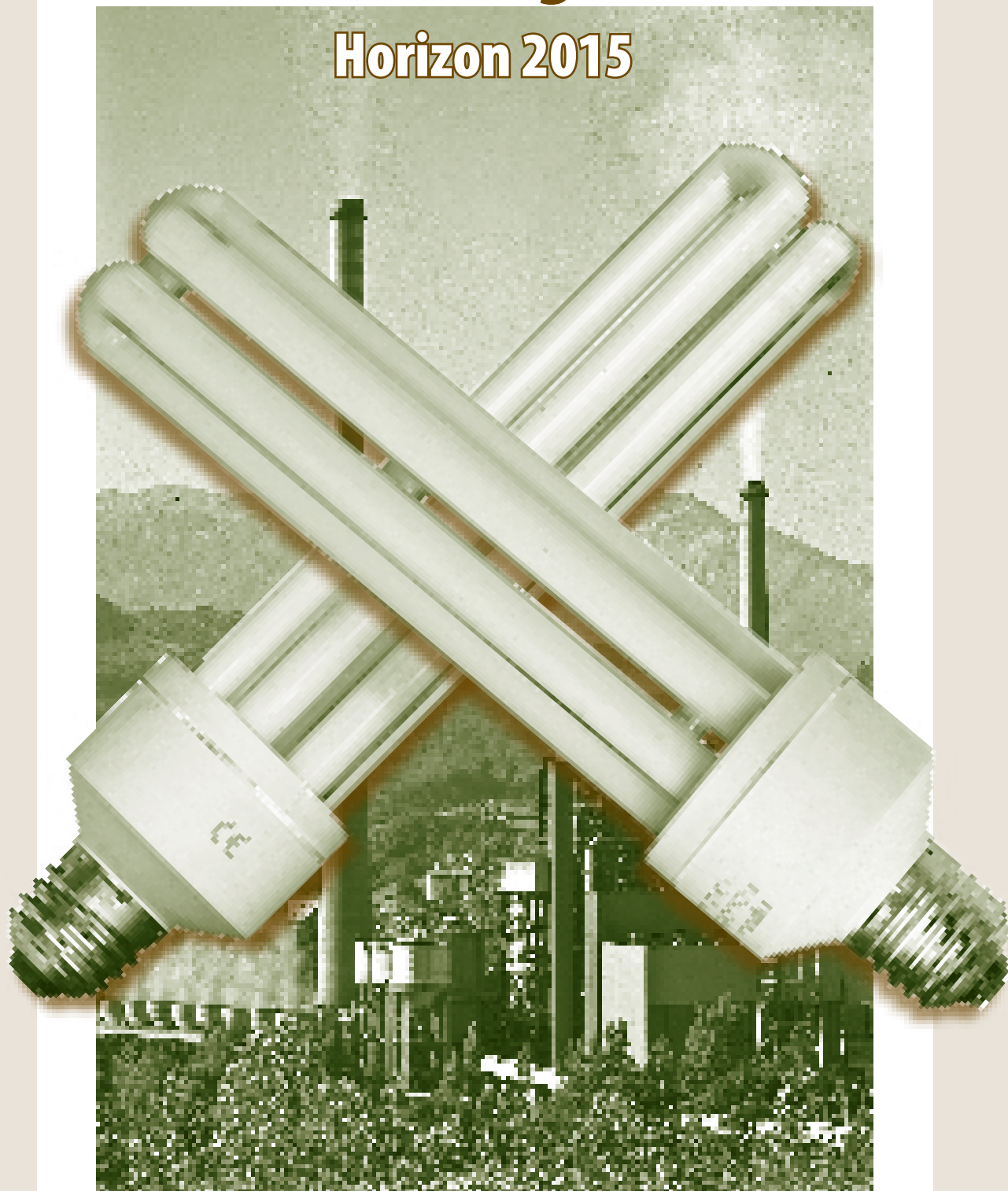
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ECOLOGISTAS
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Introduction

It is commonly believed by most people that saving energy is closely bound up with hardship or the idea of doing without. At Ecologistas en Acción, we are convinced that this belief is based on a confusion between energy and energy services. The distinction between these two terms is not just an academic one but has considerable practical repercussions. A single example may help to illustrate our point.

When we turn on a light bulb we are hoping to obtain an energy service, in other words a specific amount of light. This amount can be obtained by very different levels of energy consumption. If we use a traditional filament light bulb we consume three times as much energy as by using a fluorescent bulb and four to five times as much as if we use a compact bulb. The service provided by all these bulbs is identical but the energy consumption differs considerably.

It is in the interest of a rational society to consume as little energy as possible in order to obtain the best possible services. These services, within certain pa-

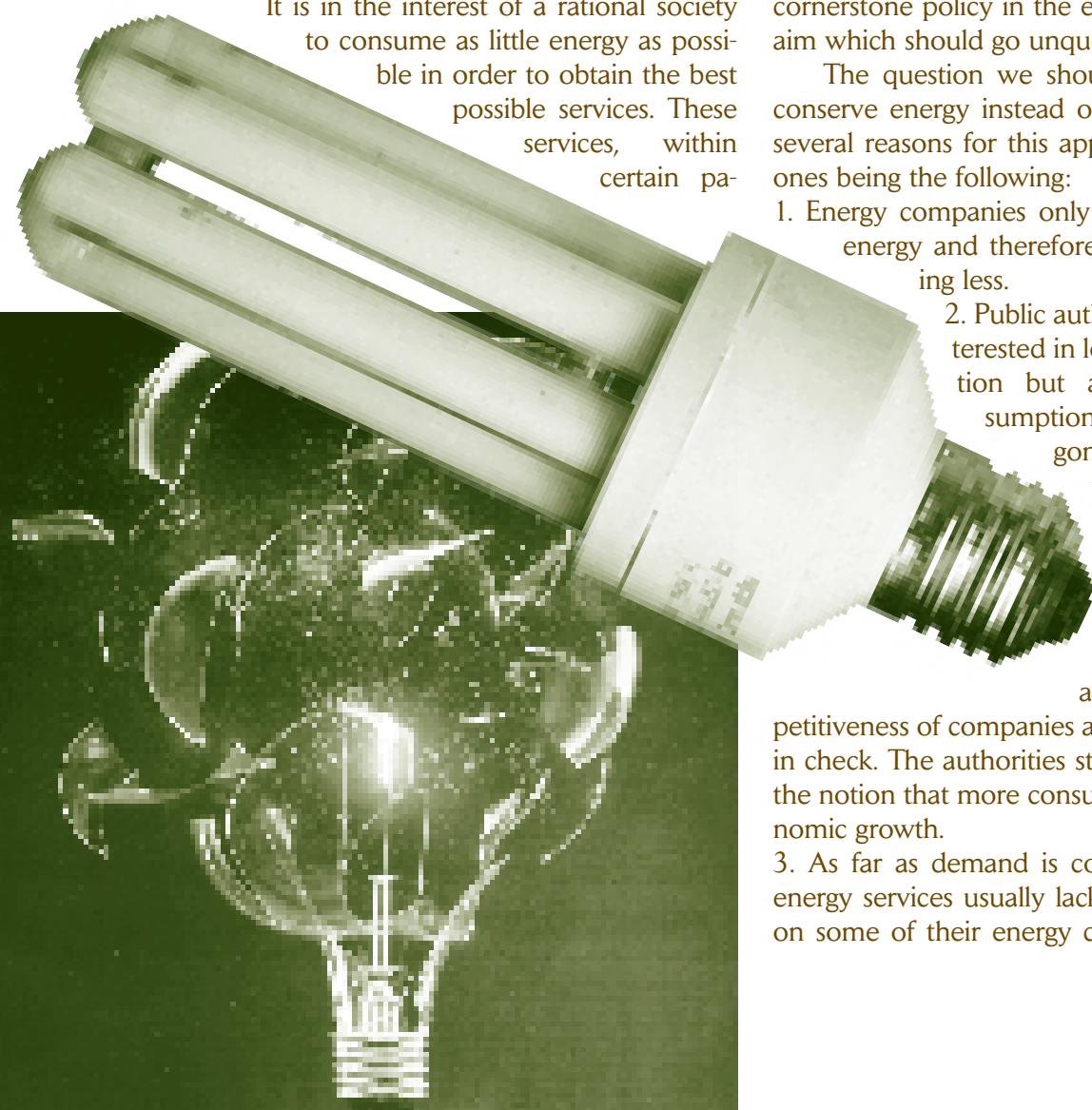
rameters, provide us with a material well-being to be set against the economic costs and environmental impact arising from energy consumption.

In general –and we could give hundreds of examples of the difference between energy and energy services– our need for services can be met by using very different amounts of energy, depending on the technology we employ. We are therefore committed to efficient technologies and ways of using energy.

Moreover, saving energy is, by and large, much cheaper than producing energy so the advantages of saving energy are economic as well as environmental. Another point worth emphasising is that what really interests consumers (individuals as well as industries) is the total amount they have to pay. If the unit price per kilowatt increases but enough energy is conserved, the final bill may be smaller. Reducing the per-unit price of a kilowatt as much as possible (a cornerstone policy in the electricity sector) is not an aim which should go unquestioned.

The question we should ask is why we don't conserve energy instead of producing it. There are several reasons for this apparent paradox, the main ones being the following:

1. Energy companies only make a profit by selling energy and therefore have no interest in selling less.
2. Public authorities are not only uninterested in lowering energy consumption but actively encourage consumption. To this end, they have gone as far as lowering electricity prices some years and have otherwise increased them so that they do not even keep pace with the annual rate of inflation; their aim is to increase the competitiveness of companies as well as keeping inflation in check. The authorities still steadfastly subscribe to the notion that more consumption means more economic growth.
3. As far as demand is concerned, those who use energy services usually lack the capital to cut down on some of their energy consumption by changing



over to more efficient systems. These systems are usually more expensive than the conventional more inefficient ones, even if the savings made in the long term easily cover the initial investment. However, improvements in efficiency demand substantial initial investments and, apart from the big industries, most industrial and service sector users need to be able to recoup their initial investment after five years at most; individuals usually find it hard to budget in this way.

4. Energy prices do not include external costs, particularly the huge environmental impact they cause; prices are therefore too low and don't encourage consumers to save. Fuel is directly or indirectly subsidised and research and development budgets are specifically directed at energy supplies.

5. Many consumers are unaware of the many ways of saving energy and frequently make poor decisions. This is particularly so in the case of home-owners because it is often the case that the apparent client is not the end user (this is the case in many rented homes), so that many simple savings are simply not made.

Because of all of the above, the price being paid by society (including the environmental price, of course) in order to meet our present need for energy services is far higher than the ideal price which would result from a well thought out combination of energy supply and saving. To achieve this one would have to abandon the idea that the end users' demand



for energy services could only be met by supplying them with enough energy; this approach could be replaced by the notion that this demand could be satisfied by offering not only energy but also devices which save energy or allow for a more efficient use of energy wherever it makes sense. To use an increasingly popular terminology, the idea is to offer not only kilowatts but 'negawatts' (energy saved through conservation measures).

Electricity is one of the basic pillars of our economic and social model and is fundamental to the development of our daily lives. However, we must bear in mind that the production of electricity is one of the main factors responsible for the destruction of the environment of our country and that this is something which most of our population is unaware of.

In fact, the generation of electricity implies releasing into the atmosphere the gases which are responsible for the greenhouse effect and for acid rain; the generation of radioactive waste, which is so difficult to get rid of; open-cast mining to obtain the coal which leads to the complete destruction of huge areas of our country; or it means the disappearance of valleys (including villages and woods) because of the construction of huge dams.

Our proposal just puts forward a way of saving electricity for two main reasons: the first is the complexity of trying to deal with all the different ways of creating energy and secondly, the fact that electricity is a very versatile product which can efficiently turn into a variety of different energy services. If one can conserve electricity, one can conserve nearly any kind of end-source energy.

In the last few years the Government, keen to promote greater economic development, has openly encouraged an increase in the consumption of elec-



Acid rain

tricity and has even encouraged wasting this resource without bearing in mind the serious environmental consequences involved. The days are now long gone since the television adverts which stated that 'even if you can afford it, Spain can't'.

Ecologistas en Acción believes that, in order to protect our environment, it is fundamental to reserve the present trend and to put a stop to this increase in the consumption of electricity.

We have therefore prepared the present plan to promote electricity efficiency and saving, called Horizon 2015: this plan proposes introducing a series of measures which aim to reduce the consumption of electricity in Spain, without affecting our quality or our way of life. In the plan we analyse each of the consumer sectors, and put forward perfectly viable energy-saving proposals for each one of these, thus confirming the fact that protecting the environment is perfectly compatible and indeed complementary with being able to have a quality of life.

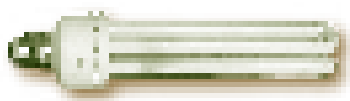
The savings which we have forecast for 2015 have been calculated on the basis of present consumption, without taking into account increases in consumption which may well arise between now and 2015 because of economic growth. Because of this, the figures we've projected regarding potential savings are conservative in that they do not take into account levels of consumption in 2015. However, there is another uncertainty - that of consumption trends over the next few years - which as well as depending on many factors, may even con-

siderably alter, especially if the measures proposed in this document are adopted. We have therefore preferred to base our calculations on present levels of consumption and believe that the consequent saving - if the measures were adopted - would be made by 2015.

We are very aware that the bulk of our proposals would involve modifying present laws (particularly the Electricity Sector Act 54/97 which was passed by the first government of the People's Party), particularly with respect to setting prices through supply-demand mechanisms. A similar reform is also necessary as regards the regulations dealing with high and medium-tension power lines, substations and electricity transformers.

Although it may be possible to achieve a certain amount of saving in the context of our present market (by using demand-focussed management programmes, by legally ensuring that more efficient electricity transformers are manufactured), we believe that a strong conservation policy which is able to bring down electricity consumption to a more reasonable level requires a greater level of commitment from the government. We also need to see a change in the way electricity is perceived: it cannot be thought of or used as just a product arising from an industrial activity but should be seen as a limited natural resource - rather like water, for example - given the direct, lineal relationship which exists between the production of electricity and the way this affects the environment.





The Present Situation

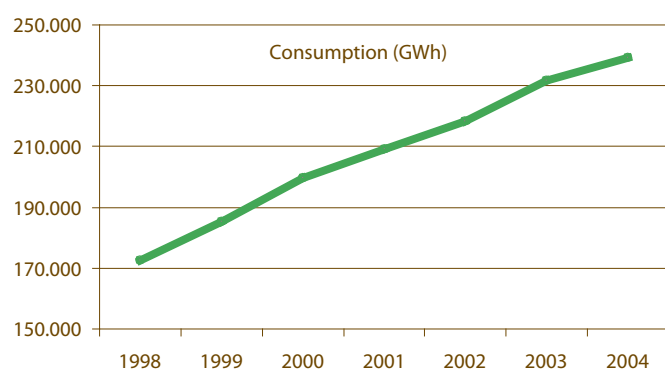
The development of electricity consumption in recent years

In recent years, electricity consumption in Spain has increased spectacularly. Between 1998 and 2005 total consumption (including mainland Spain and the Balearics and Canary Islands) has increased by 38.5%, and there has been no recent downturn in this trend (Graphic 1)

There are many reasons for this continuous increase in electricity consumption, but the following are the most important: the economic growth that we have seen in recent years; an increase in standards of living, which leads to a greater use of more white goods; and most particularly, the low electricity prices, which have not kept pace with inflation or increases in the Consumer Price Index, and which even fell between 1997 and 2002 (Graphic 2)

These low electricity prices affected all sectors but

Graphic 1: Annual Electricity Consumption in Spain



Year	Consumption (GWh)	Annual increase
1998	172.707	
1999	185.456	7%
2000	199.568	8%
2001	209.233	5%
2002	218.392	4%
2003	231.860	6%

Source: OMEL- the Spanish Electricity Market Operator

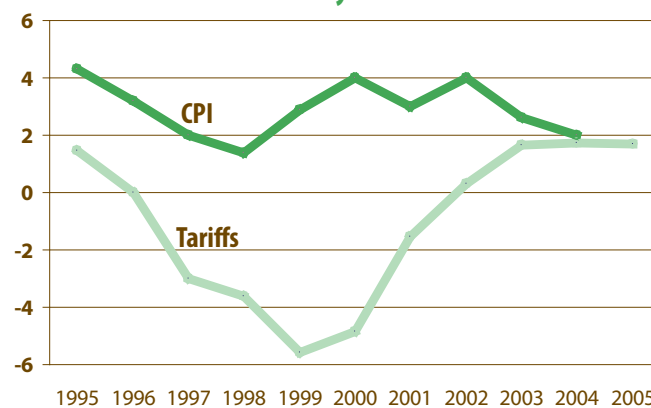
especially industry. They have encouraged consumerism, playing down the energy costs involved in production systems, and reducing the financial advantages of investing in more efficient production systems and, more generally, in saving on the electricity bill.

As can be seen in the following table, the end price of electricity in Spain is much lower than in neighbouring EU countries (Graphic 3)

As we can see, electricity prices in Spain are much lower than in other nearby countries and it is particularly significant that in Portugal, a country with less economic potential and a lower per capita income, electricity costs 29% more for industrial consumers and 38% more for domestic consumers.

As a result of these low prices, consumption in Spain has shot up in the last few years in all sectors. A

Graphic 2: Variation in the average price of electricity 1995-2005



Year	Variation in tariffs as regards the previous year (%)	Increase in the CPI (%)
1995	1,48	4,30
1996	0,00	3,20
1997	-3,00	2,00
1998	-3,63	1,40
1999	-5,57	2,90
2000	-4,85	4,00
2001	-1,52	3,00
2002	0,32	4,00
2003	1,65	2,60
2004	1,72	2,00
2005	1,70	

Source: Spanish Energy ministry

good indication of this is that per capita consumption in our country reached 5,834 kWh in 2003 in comparison with 5,576 for Italy (a country with a climate very similar to our own, with a higher per capita income and with a higher maximum demand for electricity). However, the situation only five years ago was quite the reverse. Portugal's per capita consumption of electricity is far lower than that of Spain and stands at 4,141 kWh. (Source: The Spanish Electricity System-2003 REE – The Spanish Electricity Network)

Primary energy intensity (the ratio between the consumption of primary energy and the GDP) grew by 5% in the 1990s whereas the average EU levels fell by 9.6%. In the year 2000, Spain's national indicator was 17% higher than the EU. This means that we need more energy than the average EU citizen for each GDP unit. Consequently, our development is held back by a marked inefficiency and our economic growth goes hand in hand with a significant increase in our per capita energy. This is why our CO₂ emissions per inhabitant increased by almost 27% in the 1990s.

Consumption distribution by sectors

According to the Ministry for Industry, electricity consumption in Spain is distributed as follows:

- The industrial sector: this consumes about 45%. Within this sector it is important to highlight some industries which consume a large amount of electricity or even a significant percentage of the country's total consumption. This applies to aluminium and electrolytic zinc plants as well as integrated steelworks which account for 4.3% of total energy consumption in mainland Spain.
- The domestic sector: this consumes about 30% (Graphic 4)
- Other sectors: 25%. This group includes services, small industries, public buildings and facilities (20%); street lighting (1%); irrigation (0.9%), transport etc.

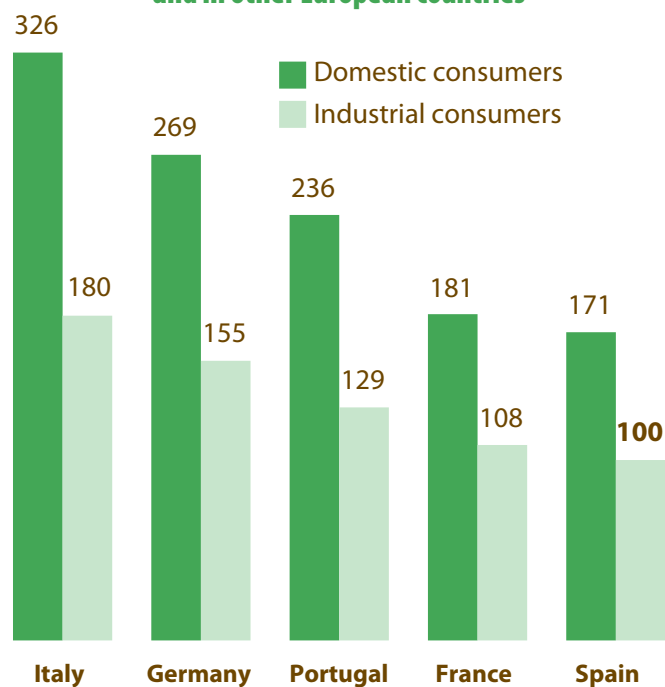
The environmental consequences of electricity consumption

Electricity appears to be 'clean': when used, it doesn't release smoke, it's silent and can be used for almost everything including lighting, heating, freezing, cooking, ventilation, helping us to communicate across the world and even brush our teeth. It is the most versatile energy form and by now essential to us.

Electricity is being increasingly used. Since 1990, consumption in Spain has increased by almost 80%, partly because of a general increase in energy consumption and partly because electricity is now used to provide services which were previously carried out by other means. However, in spite of its appearance, electricity is far from being a clean source of energy. For example, electricity production in Spain is now the major emitter of CO₂, the gas which is mainly responsible for climate change. The explanation for this is to be found in the way electricity is produced, i.e. mainly the burning of fossil fuels, mainly coal.

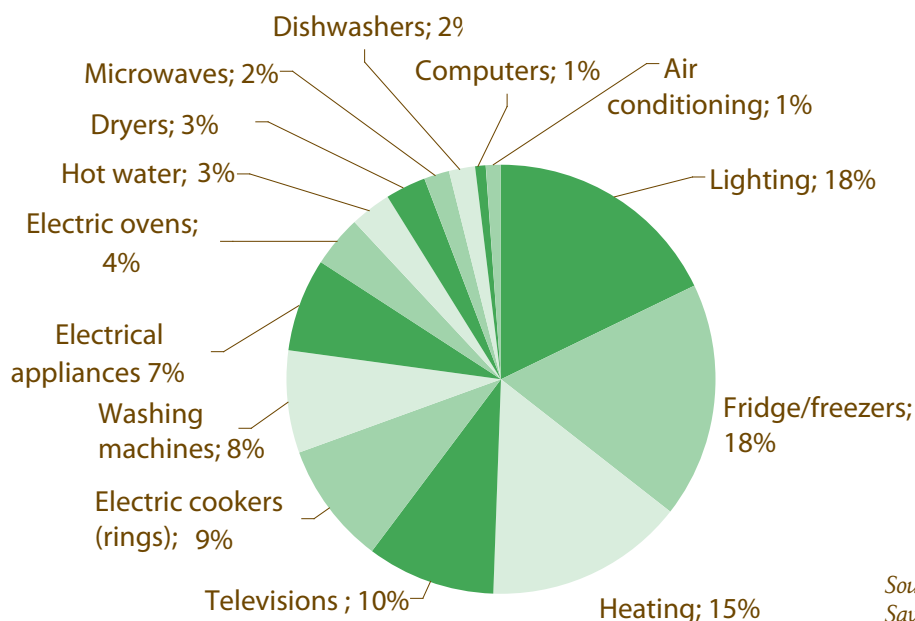
All fossil fuel power stations emit CO₂ and Nitrogen Oxide. Carbon dioxide, or CO₂, is the main cause of climate change and emissions of this gas should be reduced, at least to the levels undertaken by the Kyoto protocol. Spain is the EU country which is furthest from reaching the Kyoto objectives: our emissions of greenhouse gases are already 45% up on 1990 levels

Graphic 3: End price of electricity in Spain and in other European countries



	Italy	Germany	Portugal	France	Spain
Domestic cons.	326	269	236	181	171
Industrial cons.	180	155	129	108	100

Index 100: Spain Industrial Consumers. Source: Eurostat.

Graphic 4: **Distribution of electricity consumption in homes**

Source: IDEA (a Spanish Energy-Saving Institute)

and we should not be increasing any more than 15% in the next few years, between 2008 and 2012. This aim –an extremely modest one– will be impossible to achieve without bringing about huge changes in our way of producing electricity and without substantially reducing our levels of consumption.

Nitrogen Oxide (NOx) seriously damages our woods and trees as it causes acid rain. It directly affects our health, leads to coughs, nasal and throat irritation, aggravates respiratory allergies and chronic respiratory diseases.

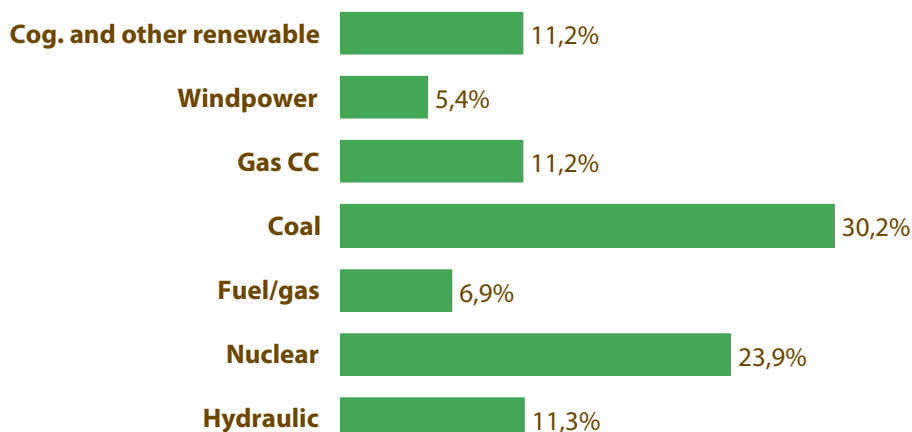
In 2000 and 2002 thermoelectric power stations, refineries and other major emitters exceeded the national legal limits of NOx without any repercussions.

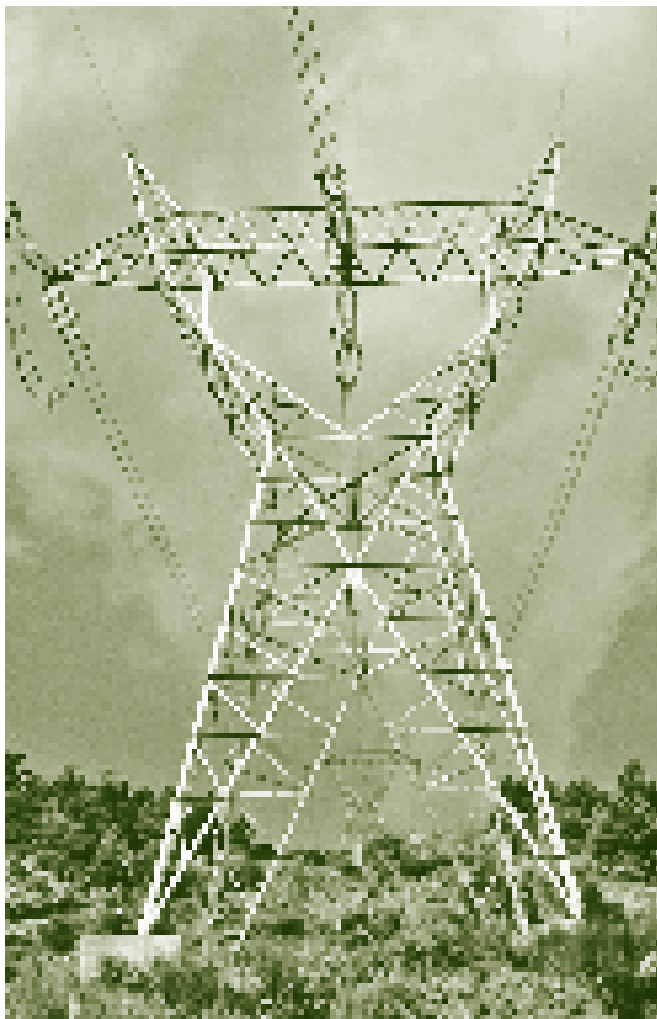
The presence of nitrogen oxide as well as volatile organic compounds (which come from thermal power stations, car traffic or plants) interacts with sunshine to produce tropospheric (or ground-level) ozone, a highly reactive substance which fiercely irritates internal and

external mucous membranes. It is thought that ozone can reduce our respiratory system's immunity.

All electricity generators need transmitters and if they are big stations the powerlines will be high-tension ones (220 kV, 400 kV). The most obvious impact these have are on the landscape and the countryside, and they are also a major contributor to the death of birds, and also an important factor when it comes to forest fires. They also have a negative impact on Spain's rivers and lakes, the drovers' roads, contribute to eroding our soil and hillsides and there are also accompanying problems such as the noise they emit, radio frequency interference, the generation of tropospheric ozone and the fact that they attract pollutant aerosols.

Other harmful effects arise because of exposure to low-frequency electro-magnetic fields and their impact on human health. The Spanish Federation of Provinces and Municipalities has recommended a re-

Graphic 5: **Electricity production in 2004 (Fossil fuels: 48,3%)**



definition – in other words, increasing the distance between electricity lines and buildings, houses, private and public facilities - of article 25 of the Regulation on high-tension power lines, adopting the precautionary principle and risk assessment.

There are other additional problems which are specific to the different fuels:

The environmental impact of coal-fuelled power stations

The presence of sulphur as one of the mineral matters in coal (between 1% and 7%) leads to the creation of sulphur oxide when the coal is burnt. Sulphur oxide behaves rather like Nitrogen oxide, also contributes to acid rain and irritates the respiratory system. It causes eye irritation, rhinitis, sinusitis, and sore throats. Long-term exposure can cause emphysema and bronchitis.

Mercury is also present in coal and, in fact, these kinds of power stations are the main man-made sources of mercury emission. Some of it comes out of the chimneys and some is left behind in the ash. In both cases a dangerous pollutant is released. Mercury is a highly volatile metal which can be transported over

huge distances after being released into the atmosphere. Once it reaches water it becomes methylmercury, a powerful neurotoxin which builds up in the trophic chain. When it is ingested by pregnant women methylmercury affects the cerebral development and nervous system of the foetus. Mother's milk is also a way of transmitting the toxin. Tiny amounts of mercury cause considerable impairment in the development of children. Because this substance builds up, it will become a serious problem in the future.

Particulates: these fine particles – smaller than or equal in size to a seventh of the width of a human hair in diameter - are a mixture of solid and liquid components which remain suspended in the air, mostly as an end result of combustion. They cause harm by getting into our respiratory tracts and lungs where they produce effects already mentioned such as irritation, asthma, bronchitis and emphysema.

Open-cast mining. This method of extracting coal involves digging up and moving enormous amounts of earth which causes a widespread destruction of the environment, including ruining local water sources.

The environmental impact of fuel-based thermal power stations

Emissions from thermal power stations are similar to the ones produced by coal-based stations with regard to CO₂, Nitrogen Oxide and Sulphur Oxide emissions, although the proportion of emission per calorie is lower.

The environmental problems associated with oil extraction and transportation are well known, and all too frequently lead to large-scale disasters such as the sinking of the oil tanker, the Prestige, off Galicia, on the north-west coast of Spain.



The environmental impact of gas-based thermal power stations

The latest generation of thermal power stations are the gas-fired combined cycle power stations. They burn natural gas or oil and use two turbines to optimise use of the heat generated by the combustion process. Their thermal efficiency is much better than other power stations (over 55%) and the natural gas produces less CO₂ per calorie than other fuels. However, it would be false to call these power stations clean: in one hour, a 1,200 MW station emits 435 tonnes of CO₂ and 375kg of nitrogen oxide. If it uses oil, the figures rise to 657kg per hour of nitrogen oxide and 760kg per hour of sulphur oxide.

Spain has no natural gas, and this is imported through gas pipes, of which there are two: one across the Straits of Gibraltar and the other one is from Northern Europe; there is also talk of building a third line from Algeria to Almería (eastern Andalusia). Otherwise, it is imported as liquid gas in tankers which then require port facilities for storing and converting the liquid gas back into natural gas. This requires very specialised facilities which means enlarging the ports and consequently this has a thermal and chemical impact on the marine environment of the area.

The environmental impact of nuclear power stations

Nuclear power stations use the heat arising from radioactive nuclear reactions to evaporate water which moves a turbine. The radioactive emissions are the main environmental problem here, and the big difference between this energy source and the others we have looked at so far is the high level of danger, even in small amounts, and the long-term nature of the problem. The impact of nuclear power stations will last for hundreds of thousands of years and will have inescapable consequences for future generations. Some of their by-products include:

Radioactive emissions which are produced in the course of normal operations and within permitted legal limits. It is generally thought that these legal limits protect public health but advances in our knowledge of biological mechanisms could well reveal that our limits should be set lower than the present ones are. This scenario is one we've seen before.

Low-level and intermediate-level waste which accumulate because these materials remain radioactive for periods of time which can even reach 300 years. In Spain we have accumulated almost 200,000 cubic metres of waste at the El Cabril site in Córdoba (Andalusia).



High-level waste generated by nuclear power stations up until 2003 amounted to more than 3,089 tonnes of uranium. Every year our nuclear stations continue to operate they generate more waste; unless we do not speed up the process of shutting these down we will be handling an approximate 6,750 tonnes of uranium. This waste will remain active for more than 200,000 years and we still haven't ascertained what is to be done with it to prevent it from polluting our waters or affecting life on this planet. The region or area that ends up being burdened with this waste will be marked for ever.

A nuclear accident, after events at Chernobyl and Harrisburg, is more than a mere improbable hypothesis. We are aware of the terrible consequences which cannot be compared to any other technology associated with the generation of electricity. In Spain we have witnessed very serious accidents such as the fire at the Vandellós nuclear power plant, and many other accidents or less important incidents. Nuclear technology cannot be said to be safe.

Water for cooling: any system that generates electricity by using steam to move turbines need to cool this steam with huge quantities of water. This is why thermal power stations need water and, to a greater or lesser extent, pollute it with chemical products used for cleaning the pipes and by increasing the temperature of the water. The most efficient stations, the combined-cycle power stations, evaporate on a daily basis a quantity of water which is the equivalent of 120,000 people's water consumption. It seems therefore probable that water's role as an electricity generator clashes substantially with its other function in meeting people's needs and demands, particularly during summer.

The environmental impact of major hydroelectric projects

Unlike the previous cases, this form of generating electricity does not produce any emissions; however, its negative impact arises from the dams which flood a whole swathe of land, bringing about the elimination of everything in that piece of land: woods, fields, ruins, villages, etc. In fact, the present dams in Spain have caused the disappearance of more than 500 villages which are buried beneath their waters. This kind of impact is permanent and cannot be reversed, even if no energy is generated.

A dam also means totally transforming the ecosystem of rivers, giving rise to an important barrier effect which alters the flow and the nutrient level of the water; this has negative consequences on river life and even on the river's ability to form stable deltas and the salt level of the coastal aquifers.

Other energy sources

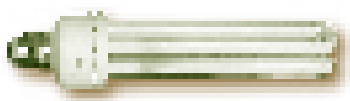
Other energy sources, which up until now only make a small contribution to our electricity production (as is the case with solar and wind power) are far less problematic than the previous ones we've examined; however, even the alternatives also have considerable environmental effects such as the impact on the landscape, in the case of wind power.

We would like to conclude by saying that although electricity is necessary for us to pursue our daily lives and ensure our present way of life, we must also be fully aware of the fact that, in Spain



at least, the production of electricity is inextricably linked with serious environmental damage. This is why we at Ecologistas en Acción believe that the conservation of electricity is one of the main priorities when it comes to protecting the environment.





Measures to reduce consumption

Reducing energy loss in the transmission and distribution of electricity

According to the National Energy Committee, about 10% of the electricity we produce is lost in our distribution networks. It is therefore particularly important to try to reduce these losses, and we therefore propose that the following action is taken:

- A plan to gradually rebuild and repair the present electricity network, substituting the oldest cables and lines by other more efficient ones. Whilst carrying out this work they should take appropriate action to avoid birds being electrocuted by substituting some of the support posts by other safer models, and by even burying certain lines and cables. They should also introduce ways of minimising the risk of collision by setting up bird-protection devices (birdsavers) all along the cables. Birds of prey are mainly killed by electrocution and by banging into power cables etc, and this also applies to other birds such as storks, cranes and great bustards.
- Ensure that the whole grid is managed properly, lightening the load on overburdened cables as it should not be forgotten that losses are directly in proportion to the amount of cable per square kilometre.
- The Ministry for Industry should encourage industrial parks to set up near existing electricity generation plants, by reducing the unitary price of the land, by providing financial help with establishing a well-planned industrial zone, etc. Clearly, these parks should comply with environmental requirements.
- Encourage 'distributed generation', particularly through cogeneration in small units and, whenever possible, by using renewable sources close the points of consumption, in order to minimise losses.
- Promote new generation centres to be built near big industrial centres. Wind and hydraulic power do not fall into this category as they are totally reliant on particular environmental conditions.

If the measures suggested were introduced it is thought that losses along the grid could be cut by half

by the year 2015, which would lead to a total reduction in consumption of 5%.

Industrial consumption

Industry is the greatest consumer of electricity, and this consumption has increased substantially in the last few years. This is due to the low price which industry is paying for electricity: it is only paying slightly more than cost price, and sometimes even less. This is the case with the big industrial consumers who are on the G-4 tariff (large aluminium, zinc and integrated steel works) and whose electricity prices in 2003 were only 2.31cents per kilowatt (source: National Energy Committee). The electricity companies can offset the-



se below production-cost prices by setting higher tariffs on, for example, households. In Spain, therefore, all households are partially subsidising the major aluminium, zinc and integrated steel industries, something which most people are probable unaware of.

On top of this, and as we have pointed out before, the price of electricity is far lower in Spain than in nearby countries such as Italy, where industry pays 80% more for its electricity than in Spain, or in Portugal, where they pay 29% more.

In order to reduce electricity consumption in the industrial sector there will need to be greater efficiency in our production systems, and electricity prices could have a decisive role to play in this regard. The following bullet points set out a series of measures which need to be introduced to reduce electricity consumption.

- A three year period should be established so that the government can determine the amount of electricity to be used per unit of standard product (for example, per kilo of aluminium, per kilo of clothing made out of a particular type of material), using electricity-efficient production techniques, with the available technology. This will henceforth be referred to as the energy-efficient 'best value price' per unit of product.
- An increase in electricity prices within a three year period on all tariffs until our prices are at least at the same levels as those in Portugal (29% higher than in Spain at present).
- The price of electricity for the industrial sector should be based on a sliding scale of rates. The basic rate would be based on a price increase of 29% on present levels, and this would be the price we would pay for the amount of electricity used to obtain a particular unit of manufactured product using efficient production techniques (the energy-efficient 'best value price' of the product). We would be charged at this rate by multiplying the 'best value price' per unit of the product by the number of units produced.
- Any remaining electricity used during production would be charged at least 50% more than the 'best value price' until it reached twice the best value price. At that point, it would move into the next price bracket. Any outstanding electricity would be charged at a rate that was twice that of the basic rate. These prices will have to be updated every year and keep in line with inflation and the Consumer Price Index. Given that this system of different tariffs could be difficult to implement in some industrial sectors, an alternative proposal would be setting up incentives and tax penalties for companies, depending on whether their consumption of electricity is above or below the 'best value price'. In other words, the scale of rates could be applied to some industrial sectors and the carrot and

stick approach could be applied to others.

- Over 10 years, the relevant public bodies will grant subsidies which will help to increase efficiency in production systems, the aim being to reduce electricity consumption and come closer to reaching the targets (energy-efficient best value) set by the government bodies for each product.
- The energy-efficient best values established for each product by the relevant government bodies will be revised every five years, and the values would be tightened up as and when technological advances made this possible.
- The relevant government bodies will pay special attention to companies who are big electricity consumers, and would establish for each of these companies a maximum level of consumption which will be progressively reduced so that by 2015 it will be down by half on present levels.
- Cogeneration will be promoted by granting direct economic aid, tax deductions, etc. This is because it has proved unprofitable so far to set up this system given the continual lowering of electricity prices which made investment in such projects (initially costly) unattractive.

Potential savings: by adopting the above measures we calculate savings by 2015 of 25-30% of our electricity consumption.



Household consumption

The price factor will have less influence on reducing household consumption than it will have on industrial consumption so other measures also need to be adopted. These will tackle home-related issues and the various electrically-powered goods we use.

We will now describe the different steps we can take to reduce our consumption of electricity in the home.

Electrical appliances

These are the main reason for the growth in electricity consumption within our homes in recent years. They are now responsible for more than 60% of household electricity consumption.

The efficiency of different appliances varies tremendously from one model to the next. There is now energy labelling for many white goods which classifies them from A to G (A for the most efficient, and G for the least efficient). The EU 2003/66/CE Directive about the labelling of fridges, freezers and fridge/freezers introduces two additional categories – A+ and A++ - which are more efficient than what is presently on sale.

White goods which carry an energy label at present include fridges, washing-machines, dish-washers, driers, air conditioning (R.D. 142/2003) and electric ovens (R.D. 210/2003), which account for about 35% of our consumption of electricity. The difference in electricity consumption between the different classifications is considerable, and on average 'A' class white goods use 2.27 times less electricity than those in the G category. In spite of this, the use of energy-efficient white goods is not very widespread, and we are still a long way from the EU average in this respect. IDAE's (Spanish Energy-Saving Institute) fourth bulletin states that in 1998 only 22.7% of fridges sold in our country were in the A or B category whilst the average figure for EU as a whole stood at 37% and in Germany at 63.8%. The same situation was true of washing machines: in Spain, 43.6% bought A or B category machines – mainly B, whereas the EU averaged out at 57.9% and Germany at 87.3%. Again according to IDAE, 23 million white goods were sold in Spain during 2002 and only 650,000 of these were A-class goods.

We therefore propose introducing a regulation which would set a three year limit by which white goods not falling into categories A or B would have to be removed from sale. This measure would not even be very innovative because in Australia they are at pre-



sent introducing a minimum standard regulation and Canada and the USA are looking at their minimum standards with a view to removing their least efficient white goods from the market.

Over a five year period our government bodies must introduce subsidies to help people buy class A white goods, at the same time establishing an additional financial incentive for handing in any inefficient white goods; this will guarantee the proper disposal of these goods and make it easier to obey the recently introduced Spanish Act relating to the waste management of electrical appliances.

By adopting these measures, by 2015 we would save between 10 and 15% of our household electricity.

Stand-by button

Televisions are increasingly common in our homes (accounting for 10% of household consumption), as are videos, DVD players, computers and hi-fi systems which have stand-by buttons: these mean that when we are not using these machines we are still consuming electricity. It is calculated that a machine on stand-by consumes about 15% of the electricity it uses when it is on properly. So, if the television is on for about six hours a day, on average, and if we keep it on stand-by the rest of the time, we are using an extra 45% of electricity by not turning it off completely.

In order to get rid of the stand-by mode on televisions, videos and DVD players, we propose that the government provides each home with a free extension lead with zapper, to which you can connect the TV, video, DVD player and hi-fi system; then, by zapping once you can disconnect all the machines. This system could also apply to the computer.

We also propose that the government offers a small subsidy to encourage people to buy equipment without a stand-by button. At the same time, all equipment with stand-by buttons should be withdrawn from the market within five years.

If all of these measures were adopted, we could reduce the consumption of household electricity by 2-3%.

Lighting

Lighting our homes accounts for 18% of our electricity consumption. It is well known and accepted that we need to improve energy efficiency when it comes to lighting. To this end, the Spanish 2002 Act (834/2002) concerning the efficiency requirements of the ballasts of fluorescent lamps, passed as a result of a EU Directive, establishes some minimum efficiency criteria.

There are now low-energy light bulbs on the market which provide just as much light but consume four to five times less electricity than traditional incandescent bulbs.

In order to promote the use of these low-energy bulbs, at Ecologistas en Acción we suggest that all incandescent bulbs be withdrawn from the market within five years. The government should also subsidise about 40% of the cost of these low-energy bulbs

during the first five years.

If these measures were adopted, our forecasts show that by the year 2010 we could save 12% on our household electricity consumption.

Electric cookers

These can run on gas or electricity. Electric hobs can work by conventional means, using induction or a ceramic top. Induction hobs heat the food by creating an electromagnetic field and are therefore much more efficient than other electric hobs, although they are still less efficient than gas hobs. It is calculated that electric hobs account for 9% of our household electricity consumption.

Ecologistas en Acción propose that the government establishes a five year limit for phasing out these conventional and ceramic hobs, and we also call for subsidies to help replace them. We also call for the government to partly subsidise taking natural gas into everyone's homes, as well as subsidising the purchase of a new gas hob.

If these measures were introduced, by the year 2015 we would achieve a 4% saving in our household electricity consumption.

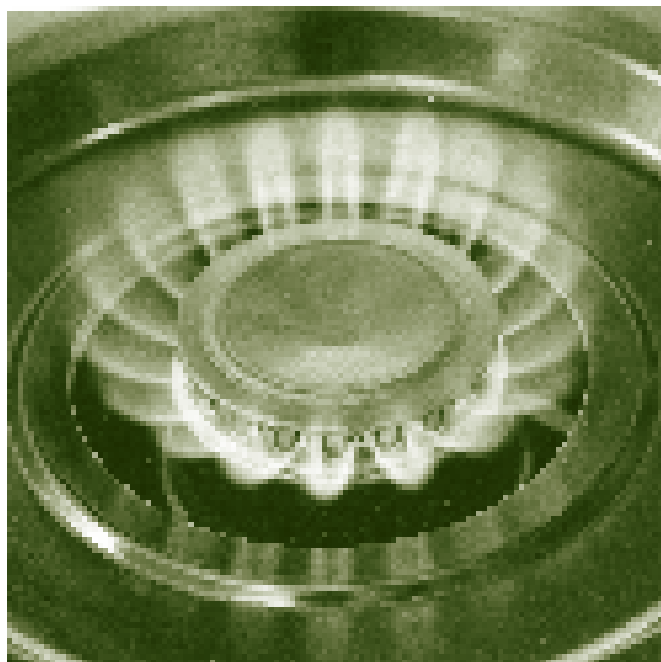
Electric heating

According to calculations, 15% of our household spending on electricity goes on heating. The level of energy efficiency varies from one system to another, and heat pumps and storage heaters are more efficient than direct electric heaters. However, an electric heating system is the least energy-efficient system there is.

We propose that the government sets out a timeframe of five years to withdraw any less efficient electric heating systems and that, at the same time, they subsidise the installation of natural gas into every home, and that they also help towards the set up costs of putting in a new heating system if it is being put in to replace an electric system.

Introducing an Energy Certificate for properties

This has already been taken in hand by EU regulation. The energy certificate of a building or home will form part of the official documentation on the home, to be used when the property is put on the market. Economic aid will be made available to purchase energy-efficient homes (with insulation, the right materials, making use of natural light, using renewable energy, etc.)



Official aid will also be stepped up to convert existing properties and improve their energy efficiency.

Modifying regulations to encourage the use of solar energy

Making use of the sun's heat would at least reduce our reliance on electricity to obtain hot water for our homes. It is therefore important to legislate for the introduction of solar cells in certain types of buildings. This measure has already been partially considered in the present modification of a Spanish regulation on heat installations on buildings (the RITE regulation). We should also be promoting solar cell energy. This has been very successful in countries such as Germany, which has far less sun than we do but where they've developed very successful projects to encourage the use of solar power — namely, the 100,000 Solar Roofs project. Because of the above, Germany has many more photovoltaic systems in place than Spain has.

The price of electricity

The average consumption of electricity per home in Spain is 3,300 kilowatts a year, and we are billed for this every two months. Just as in the industrial sector, price is a factor which can really help us to be more rational about our patterns of consumption. However, present low prices (which even dropped for five years running) mean that the electricity bill hardly dents our pockets, and people are becoming increasingly unaware of what they pay for their electricity. At the same time, we must not forget that we are dealing with a very essential product. We therefore propose that a tariff system is introduced, one that encourages saving and penalises waste.

We propose that the first 400 kilowatts consumed every two months (i.e. 2,400 per year) are charged at current prices; that the next 200-600 kilowatts (per two months) are charged at double the rate and that any kilowatts consumed over and above 600 should be charged at four times the basic rate. These prices should be updated every year, in line with the Consumer price index (and the rate of inflation).

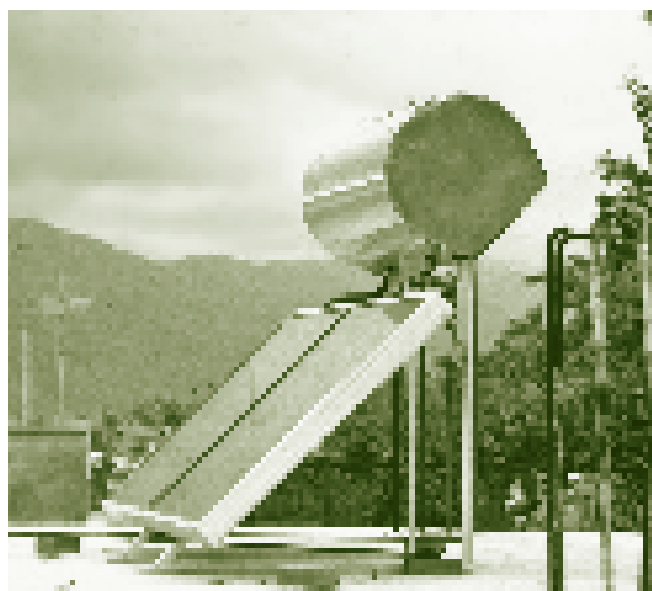
So that large families or the less well-off are not at a disadvantage, when there are several families sharing any one home, the electricity company will have to extend the total amount of consumption permitted within the basic bracket in those cases according to the number of people living in that home, and with a preliminary presentation of the corresponding registration certificate.



Public awareness

Unlike the industrial consumption of electricity, people's awareness can play an important role in the household consumption of electricity, especially if the measures proposed earlier are also applied. In this respect, we propose that, over the next 10 years, the relevant public authorities really campaign hard to increase public awareness on these issues, both directly and via the media, so that people at least really take on board the following two messages:

- The consumption of electricity brings with it extremely serious damage to the environment: emissions into the atmosphere cause global warming and acid rain, open-cast coal mining, high-level radioactive waste, huge dams flooding and destroying valleys, the reduction of biodiversity, etc.
- Although greater electricity consumption usually goes hand in hand with an improved quality of life, once people reach a certain level of consumption (clearly the case in Spain) any further increase brings no improvement whatsoever in their quality of life: people are not any happier because the lights or the TV are switched on even when no-one's there.





Potential savings: By adopting the above measures, we calculate savings of 30-35% in our electricity consumption by 2015.

Other sectors

This group includes all the remaining sectors which consume electricity and which make up approximately 25% of total consumption. These include the service sector, small industries, public buildings and facilities (20%); street lighting (1%); irrigation (0.9%), transport etc. The following paragraphs put forward some proposals aiming to achieve a reduction in the consumption of electricity in some of these sectors.

Service sector and small industries

Some of the measures put forward for the household sector can also be applied here, such as the proposal on lighting. Similarly, we also propose adopting the following measures:

- Within a period of three years, increase the price

of electricity in order to bring it in line with current prices in Portugal at the very least.

- Within a period of three years, relevant government bodies will have to establish a level of consumption deemed appropriate for each establishment and based on the size of the establishment and the kind of activities undertaken there. Once this is place, the establishment in question will receive a discount on their electricity bill when their consumption is lower than their allotted level, but will have to pay a surcharge if consumption levels exceed the permitted amount. Alternatively, one could use the sliding scale system (different rates for different brackets) in order to reduce electricity consumption in the industrial sector.

- Measures relating to buildings. Both large shopping centres and huge leisure centres typically operate continuously on electric lighting, even when closed. However, single level buildings (most of them more recently) could perfectly make use of the natural sunlight through windows in part of the ceiling or by installing large windows in the walls, considerably reducing the need for electric lighting. Moreover, opening hours

of shopping centres and therefore most electricity consumption should coincide with, for the most part, daylight hours so that natural light can be used to its maximum.

In order to achieve this, we propose that the government introduces a regulation calling for all newly-built shopping and leisure centres with one or two levels to include a minimum quota of windows permitting natural sunlight to enter, and adopting necessary measures to avoid a substantial increase in the use of air conditioning, through adequate insulation. For shopping centres with several levels, a set quota of walls with windows in them will be necessary. The proprietor of any existing buildings opting for this option will be entitled to tax deductions.

These measures should also be applied to specific industries, as well as a large part of public buildings and facilities.

- Legally limiting outdoor lighting of buildings based on their volume per unit. It is becoming increasingly commonplace for large shopping and leisure centres to establish large outdoor lighting displays with the sole objective of attracting customers and even causing light pollution. We feel that this kind of lighting is totally superfluous and unnecessary and we therefore call for a regulation which restricts the amount of outdoor lighting, depending on the size of the building in question. The permitted level of lighting should just be enough to light up the outside area of the building and provide a discrete light on the establishment's sign.
- To include electricity savings as one of the factors which will work in favour of employees when it comes to the annual round of wage negotiations.

Public buildings and facilities

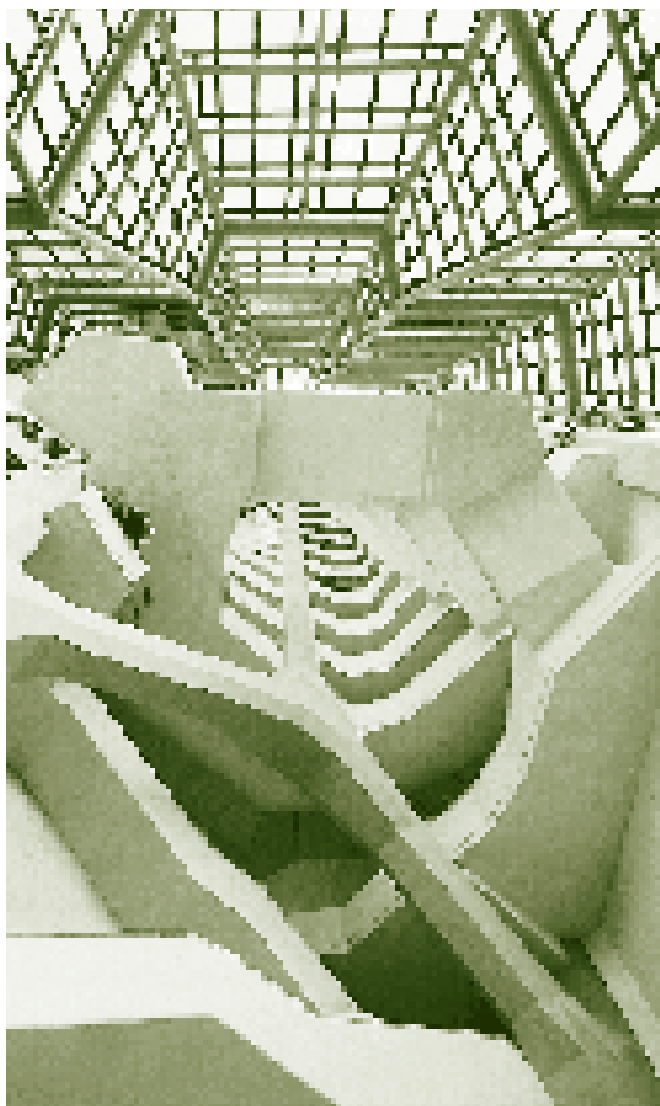
All government bodies should make a special effort to reduce electricity consumption, not only because of the environmental benefits this would bring, but also for the example that it sets for private consumers and entities since it would not seem appropriate to adopt a series of measures forcing the private sector to reduce its consumption when the public sector is not doing the same.

In this sense, government bodies, over the next five years, should carry out a series of projects in all public buildings and facilities of all kinds aimed at reducing electricity consumption. Many of the technical proposals established for other sectors earlier in this document are also appropriate in this area, such as that of making greater use of natural sunlight through a greater percentage of windows covering the roof as in the case of buildings of one or two levels. Similarly,

additional measures should be introduced such as, for example, the relocation of air conditioning apparatus and the improvement of insulation in public buildings, the gradual replacement of electric heating in all public buildings with other, more efficient forms of energy (natural gas, for example), installing sensors detecting movement in corridors to switch lights on and off automatically, centralized controls to switch off electrical appliances (for example, computers) when the working day is finished, etc.

Government bodies should also encourage solar cell panels to be installed in those public buildings meeting the necessary conditions to do so. Although this measure does not save electricity, it undoubtedly generates a form of electricity that contributes to the move away from electricity generated in huge thermal and nuclear power stations, which causes great damage to the environment.

Government bodies, on the whole, should set a target of reducing current levels of electricity consumption in public buildings and facilities by at least



40%, which is a perfectly attainable challenge given the amount of electricity wasted in most public buildings.

Street lighting

Public street lighting currently makes up 1% of electricity consumption.

We propose that outdoor lighting only uses low-energy light bulbs and in particular, low-pressure sodium vapour lamps. We also consider it necessary that the government bodies reject and prohibit streetlamps that waste half of their light because the light is reflected upwards instead of downwards onto the street and onto the objects that should be illuminated. The worst form of these are the ball-shaped streetlights which, as well as wasting excess energy due to the poor use of light, are also one of the causes of light pollution from the night sky which in recent years has increased considerably. Added to this is the growth of cities and irresponsible behaviour such as keeping the streetlights on in areas which are being developed and are, as yet, not inhabited.

We also propose that the various government bodies introduce a campaign to install streetlights containing a small solar power panel in the uppermost part to supply them with electricity, with the exception of those in the older areas of towns and cities for aes-

thetic reasons. They should also gradually replace all existing streetlights along the sides of motorways, dual carriageways and main roads in big cities with streetlights containing a solar panel.

Christmas lights also consume a large amount of electricity. The city of Madrid is a good example of this because Christmas lighting consumes at least 3.6 GWh every year. To deal with this, we feel that a limit should be put on the number of days, which increases year after year; we would also limit the number of hours permitted to leave lights on during the night.

Potential savings: By adopting the above measures, we estimate that savings of approximately 30% could be made by 2015.

Total estimated savings

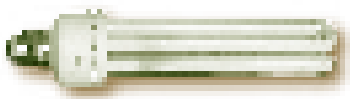
By adopting all of the measures put forward throughout this document for each of the different sectors, including the predicted reduction in losses in our distribution networks, a reduction in electricity consumption of at least 35% could be achieved, which is a greater amount than the electricity produced by all nuclear plants (23.9% of the total amount), or even greater than that produced by all coal-fuelled power stations (30.2% of the total amount).

As a consequence of this reduction in electricity consumption, CO₂ emissions in our country will be greatly reduced given that generating electricity is day after day the main source of the emission of gases causing the greenhouse effect. For example, it is true to say that if in 2004 the objective proposed had been reached, without changing any other factors in generating electricity in that year, the emission of 35 million tonnes of CO₂ into the atmosphere would have been prevented. Spain would be much closer to reaching the Kyoto objectives as we would have reduced our emissions level by 12 percentage points from the current 45% to 33%.

On the other hand, it would also mean that real economic savings would be made given that CO₂ of the electricity sector is costly from the moment when an emissions market exists and the value of the CO₂ that has not been emitted can be evaluated in terms of avoided costs in the sector to buy emission rights. This value equates to an estimated 175 million Euros which is a modest initial price of 5 per tonne (1 tonne of CO₂ equals 1 right of emission), a price with greater security of being much higher the further into the decade we go.







Managing the proposed measures

In order to develop the proposals outlined in this document, the Energy Saving Campaign (CAE) will be created. It will be based on the Energy Saving and Diversification Institute, IDAE, which will be in need of profound restructuring, as well as other relevant bodies to bring about the development of the proposed measures. The IDAE is currently part of the Ministry for Industry, although we consider that the CAE should be part of both the Ministry for Industry and the Ministry for the Environment, given the environmental objectives and components included in the actions that it aims to take.

At the same time, a cross-sectoral, energy saving consultation body, will be set up: this coordinating body will be made up of State and regional authorities for industry and the environment and will establish and implement the measures proposed for saving electricity and improving energy efficiency. The Spanish Federation of Provinces and Municipalities would also feed into this body.

In order to be able to adequately introduce all the proposed measures, the CAE should be introduced throughout most of Spain, having recourse to offices open to the public in all those municipalities with more than fifty thousand inhabitants, providing extensive information for all sectors that consume electricity, including household users.

A large part of the measures proposed in this document are quite costly and, by striving to guarantee the viability of this plan, we must determine where the funding to be able to carry out such development will come from.

Some of the different measures proposed include a net rise in current electricity prices as well as the introduction of higher electricity rates (according to the sliding scale system), which carry even higher prices. This will of course lead to an increased income for the electricity companies. We think that the increased revenue due to higher electricity prices should finance the development of the various measures aimed at encouraging energy saving.

In order to achieve this, at the beginning of the year, electricity companies will transfer to the CAE the increase in earnings obtained during the previous

year as a result of the introduction of the price system proposed by the plan. This amount should be fixed yearly by the Council of Ministers for each electricity company based on the turnover obtained.

With these funds, the CAE will finance and tackle all projects and measures proposed in this Plan. We are confident that the strategy of recovering any invested capital by means of making energy savings (financing from third parties) is an adequate mechanism for tackling savings programmes, especially in the industrial sector as well as the commercial and services sectors.

Furthermore, the CAE should offer technical advice, plans, the installation of equipment and maintenance, etc. We are by no means suggesting that it should have a monopoly on energy saving. In the event that other private companies emerge, specialising in these areas, the role of the CAE will be limited to contracting services out to them or simply to provide finance.

Un papel decisivo de la CAE sería el de proporcionar información a los usuarios de las posibilidades de ahorro y sus ventajas económicas, sociales y ambientales. One crucial role of the CAE would be that of providing information for users about the possibility to make savings and its economic, social and environmental advantages. Una buena parte de las posibilidades de ahorro eléctrico se centran en el sector doméstico, en pequeñas empresas y en establecimientos y locales del sector servicios, por lo que deberán considerarse como normales las campañas masivas de información utilizando para ello los medios de comunicación de masas. A large proportion of the electricity saving possibilities are focused on the domestic sector, on small businesses and establishments and premises from the service sector and it is therefore to be expected that huge propaganda, mass media campaigns will be put in place. Por supuesto que esto no excluye la realización de campañas de información más sectorizadas y específicas. Of course this does not exclude carrying out information campaigns that are specific and geared towards particular sectors. Asimismo, la CAE realizará actividades de promoción y demostración. The CAE will also carry out promotional and demonstrational activities.

The CAE will contribute, along with other public

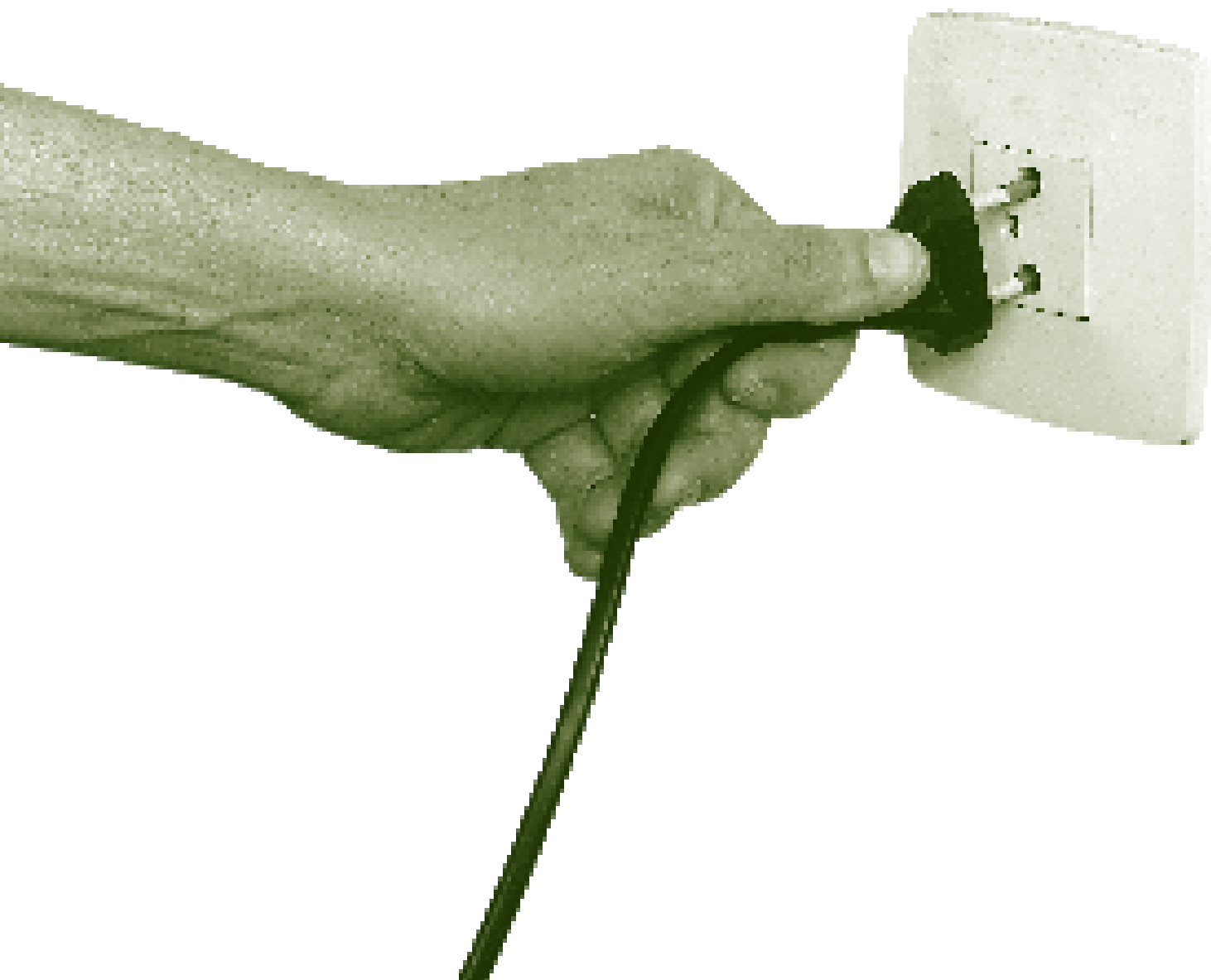
bodies, to determining the energy-efficient 'best value price' per unit of product in order to establish the basic prices of electricity for industry, or amounts of energy deemed appropriate for the service sector in accordance with the development of activity and the surface area per unit, to regulate standard amounts of electricity used by household appliances and utensils and conditions in the construction of houses and premises, etc.

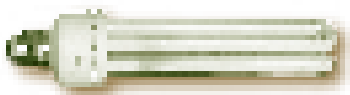
The CAE will have two very distinct management units. The first will tackle electricity-saving measures which allow for economic profits to be made in accordance with usual accounting criteria and which will include mainly clients such as the industrial sector, public authorities and large service companies. The other will be particularly responsible for electricity savings that have no economic profits. We are not only thinking about projects in which return periods on invest-

ments are quite long, but also about the savings achieved by small-scale users where the amounts saved are so small on their own that they can only be achieved by active collaboration on the part of the individual concerned or by using service networks that already exist for other means and in which the savings only make up a portion of its profits.

The CAE will legally have recourse to a special programme geared towards social sectors with lower income levels. The idea behind this is that these sectors are not adversely affected by a possible increase in electricity prices; because they will be using more efficient technology, they should be able to obtain the same services at an end price which should be the same or even less than their present price.

In this way, the financing and therefore the development and implementation of all the measures proposed in this Plan are fully guaranteed. ❧





Conclusion

As indicated throughout this document, electricity consumption is essential for the development of our daily life and maintaining our present life style. However, it is inextricably linked to harming the environment and is one of the principal causes of environmental deterioration in our country (emission of gases causing the greenhouse effect, acid rain, pollution, open-cast coal mining, valleys submersed by dams, etc).

In recent years, electricity consumption has dramatically increased in our country. This has been due to the increased quality of life and particularly due to the low price of electricity which, over the last ten years, has been much lower than the increasing rate of inflation.

At Ecologistas en Acción, we consider that it is vital that this trend is reversed in order to protect our environment. We propose a series of measures that, without affecting our quality of life or life style, would reduce current electricity consumption levels by an estimated 35% if approved and introduced. This would also prevent a large part of environmental damage cu-

rently caused by the generation of electricity.

Apart from the environmental damage that would be prevented, it would specifically mean that there would be a considerable reduction in the emission of CO₂ in our country which, by applying this reduction to the consumption levels in 2004, would have prevented the emission of some 35 million tonnes of CO₂ into our atmosphere. This would mean reducing our current level of emissions by 12 percentage points.

The Government should therefore draw up a new Energy Saving and Efficiency Strategy that includes all the measures proposed in this document; on the same lines, it should also draw up a National Energy Plan.

There is no doubt at all that adopting and implementing the measures proposed in this Plan would be the best way for us in Spain to protect the environment as it would help us to meet the objectives set in the Kyoto Protocol. Moreover, it would do so without having a negative impact on our quality of life or lifestyle which would, in fact, improve. X

