

Green Taxes for Trade and
Industry
description and evaluation

June 2000

Title:

Green Taxes for Trade and Industry - description and evaluation

Published by:

The Danish Energy Agency
44 Amaliegade
DK-1256 Copenhagen K

DENMARK

Tel: (+45) 33 92 67 00
Fax: (+45) 33 11 47 43
E-mail: ens@ens.dk
Internet: www.ens.dk

This report is available from:

EnergiOplysningen
Teknikerbyen 45
DK-2830 Virum
Tel: (+45) 70 21 80 10
Fax: (+45) 70 21 80 11
E-mail: energioplysningen@ens.dk

Published in June 2000

Edition: 200

Editor: Henrik Lawaetz

Paper: cyklus

ISBN 87-7844-178-1

CONTENTS

1. Introduction.....	2
1.1 Background	2
1.2 Organization of the report.....	2
2. Summary	3
2.1 Introduction.....	3
2.2 The Energy Package	3
2.3 Evaluation.....	5
2.4 The recommendations of the Committee	10
3. The Energy Package.....	12
3.1 Introduction.....	12
3.2 Taxes	12
3.3 Reductions in labour market contributions	15
3.4 Subsidies for energy efficiency.....	16
3.5 The agreement scheme.....	19
4. Evaluation of the Energy Package	24
4.1 Introduction.....	24
4.2 Environmental effects of the Energy Package	24
4.3 Economic effects of the Energy Package	28
4.4 Balance sheet for tax revenues and retransferring.....	29
4.5 Competitiveness.....	31
4.6 Government subsidies in the Energy Package	36
4.7 Administrative effects	37
4.8 Projection of CO ₂ emissions to 2005	43

1 INTRODUCTION

1.1 Background

Since 1995, an number of green taxes have been introduced for trades and industries as follow-up to the 1993 tax reforms and the 1994 report, *Green Taxes and Trades and Industries*.

In connection with the so-called Energy Package in 1995 which changes the taxation of energy use in trades and industries, it was also determined that the package should be evaluated in 1998.

This evaluation has been carried out by an interministerial committee and published in the report, *Evaluering af grønne afgifter og erhvervene* (in Danish only).

This report described the Energy Package and summarizes experience hitherto with the taxes, their effects on the environment and economy, as well as the administrative burdens for companies.

1.2 Organization of the report

The evaluation of the Energy Package and green taxes as instruments of environmental policy is summarized in Chapter 2.

Chapter 3 describes the Energy Package introducing higher CO₂ taxes, energy taxes on space heating and SO₂ taxes on emissions, agreements on energy efficiency in exchange for tax rebates and possibilities for subsidies to energy savings in trades and industries

Chapter 4 presents analyses of the effects of the Energy Package on the environment and the economy. Accounts are presented for taxes and retransferring. The significance of the Energy Package for competitive ability and the administrative effects for companies and authorities are illustrated. In addition, national CO₂ emissions are projected to 2005.

The report is edited by M.sc. Henrik Lawaetz, Danish Energy Agency.

2 SUMMARY

2.1 Introduction

In 1990, the Danish Parliament - Folketinget - passed legislation establishing a target for reduction of CO₂ emissions, stating that in 2005, emissions are to be reduced by 20% in relation to 1988 emission levels. In 1994, the government appointed an inter-ministerial committee which found that the CO₂ target would not be met without additional measures being taken, and that the most effective way of achieving further reductions would be to increase taxes on energy consumption in trades and industries. Against this background, the parliament passed the current Energy Package in 1995, effective from 1 January 1996.

The result was more stringent CO₂ taxes for trades and industries, the objective being that trades and industries should contribute to reductions in CO₂ emissions with 4% of total emissions.

2.2 The Energy Package

The 1995 Energy Package introduced higher CO₂ taxes, energy taxes on space heating and SO₂ taxes on emissions for trades and industries. On the other hand it became possible for energy-intensive enterprises to enter agreements on energy efficiency in exchange for tax rebates, as well as increased possibilities for subsidies to energy savings in trades and industries. The package was designed so that the additional taxes on trades and industries were transferred back through tax reductions, subsidies etc. Thus the costs for trades and industries should be unchanged.

Fuel consumption for electricity production at power plants or combined heat and power plants are exempted from taxes, since taxes here are collected on electricity consumption.

In 1998, energy taxes were increased by the agreement on tax adjustment of 01.07.98, the so-called Whitsun Package. This rise is taken into account in the Energy Package and included in the evaluation which has been carried out.

Fully effectuated, the additional taxes entailed by the Energy Package are estimated to be DKK 2.5 billion annually. In passing the package, attempts were made to recycle these additional taxes by means of easing taxation on labour, subsidies to energy-saving measures, and special subventions to small enterprises with few employees or no employees at all.

CO₂ taxes

There are CO₂ taxes on the entire trade and industry sector. However, enterprises pay differentiated taxes according to use, so that consideration is taken for energy-intensive enterprises, as well as to enterprises with heavy competition.

From 2000, energy-intensive production will pay a tax of DKK 25 per ton CO₂. A list of energy-intensive processes defines energy-intensive production. There is a tax of DKK 90 per ton of CO₂ for other energy consumption for production purposes. Fuel consumption for space heating is taxed with the full CO₂ tax of DKK 100 per ton CO₂ – the same being the case for households. However, energy-intensive enterprises pay lower taxes if they enter into an agreement on energy efficiency with the Danish Energy Agency. The average CO₂ tax is thus lower for industry than it is, e.g., for the service sector.

The distribution of fuel consumption as heavy process, light process and space heating is determined by means of meters. It is the responsibility of the enterprises themselves to install and maintain the meters, as well as to ensure the necessary measuring accuracy.

In order for enterprises to adjust to the new conditions, the taxes are being introduced gradually in the period between 1996 and 2000. See table 2.1.

Year	1996	1997	1998	1999	2000
Heavy process no agreement	5	10	15	20	25
Heavy process with agreement	3	3	3	3	3
Light process no agreement	50	60	70	80	90
Light process with agreement	50	50	50	58	68
Space heating	100	100	100	100	100

The taxes in the Green Package are applied so that both the environment and competitive ability are taken into consideration. The CO₂ taxes are differentiated so that, in practice, the more energy intensive an enterprise is, the less it pays.

Energy and SO₂ taxes

As something new, the package put an energy tax on enterprises for space heating, as well as a general sulphur tax. The energy tax was introduced gradually between 1996 and 1998, while the sulphur tax is being phased in until 2000.

The energy taxes will be increased gradually until 2002 from a level of about DKK 41 per GJ at the beginning of 1998, to about DKK 51 per GJ in 2002. There are no energy taxes on biofuels and renewable energy.

Space heating in enterprises is highly comparable with household energy consumption, and no enterprises have excessive energy needs for ordinary space heating. In energy-intensive industry, the percentage is very low. Therefore, the high tax rate on space heating is not significant for competitive ability in energy-intensive enterprises.

The sulphur tax is DKK 10 per kilo of emitted SO₂, or DKK 20 per kilo sulphur in the fuel. Fuels with a sulphur content under 0.05% are exempted from the tax.

Retransfer

All additional proceeds from the taxes on energy consumption are retransferred to the trade and industry sector by easing the wage-related costs of enterprises, as well as by subsidies for energy savings and a pool of special funds for small enterprises.

Retransferring by easing taxes on labour is done by reducing employers' labour market contributions which are dependent upon total wages, and by reducing payments to the Supplementary Labour-market Pension (ATP) per employee. These reductions are being introduced gradually and partially in time with the rising taxes. It is estimated that the reductions will amount to some DKK 2.2 billion in 2000.

A pool totalling DKK 1.8 billion has been set aside for subsidies to investments. This amount is paid out as enterprises effectuate energy-efficiency measures, and it is expected that the entire pool will be used by the end of year 2000.

Finally, a special pool has been established for small enterprises with limited wage costs. The annual amount from 2000 will be approximately DKK 0.3 billion, and are used primarily to reduce a number of fees, and to compensate a number of administrative expenses.

2.3 Evaluation

An interministerial committee of government officials has evaluated the Energy Package. The Committee began its work during the latter part of 1997, and presented its activities in a report during early 1999. The full report is available in Danish only and can be downloaded from <http://www.fm.dk/>

Environmental effects of taxes, subsidies and agreements

The effects of the CO₂ taxes have been evaluated on the basis of calculations with new models based on statistics of the connection between energy prices and energy consumption in trade and industry during the last 20 years. The environmental effect of the taxes is uncertain, since the effects depend upon the use of technology and the production considerations in the trade and industry.

Energy consumption is very unevenly distributed in Danish trades and industries, with those which account for 70 per cent of total energy consumption producing only 20 per cent of the increase in value in the private sector.

The tax burden is more evenly distributed on companies than on energy consumption. This is due to the fact that energy-intensive companies generally pay a lower tax rate as a result of the differentiated tax rates stipulated by the Energy Package. However, the most energy-intensive companies still pay the highest taxes per product unit.

The evaluation of the effect of subsidies and agreements is based on studies of the investments which have already been effectuated in energy-saving measures and agreements. The evaluation of the total CO₂ effect is based on assumptions regarding the influence on CO₂ of the subsidies which will be given during the rest of the period in which the Energy Package is in force, as well as on assumptions on the effect of future agreements. As such, there is an element of uncertainty regarding this part of the evaluation.

Calculations of the total effects of the evaluation show that that the package will result in the CO₂ reductions in 2005 as originally expected. See table 2.2. All in all, the taxes, subsidies and agreements on energy savings will result in effects that are close to those anticipated.

Table 2.2 Reduction of CO₂ and SO₂ emissions in 2005						
	CO ₂ pct		CO ₂ mill. tons		SO ₂ 1000 tons	
	Before	Now	Before	Now	Before	Now
Total:	3.9	3.8	2.4	2.3	32	34

Before is the estimated effect of the Energy Package in 1995.
Now is the most recent estimate of its effect.

If a greater CO₂ effect is desired, it is possible to obtain additional reductions by giving more priority to investment subsidies for energy savings than hitherto, e.g., by more differentiated subsidy rates and other adjustments for the remaining funds for subsidies. This would require a decision to extend the period for the subsidy scheme beyond 2000. As a result, the CO₂ effect would be increased, and longer-term priorities could be taken into consideration for the funds for subsidies, e.g. priority for development and use of totally new technology.

It is believed that the Energy Package will fully contribute the expected reductions in SO₂ emissions. SO₂ emissions have been reduced by the increased use of flue gas purification, the use of fuels with lower sulphur contents, and by means of reductions in energy consumption.

By the beginning of 2000, it is believed that targets for SO₂ reductions resulting from the SO₂ tax in the non-electricity sector will also have been reached. The electricity sector is regulated with quotas, and taxes are not based on actual emissions. From 2000 a tax will also be levied on SO₂ emissions, increasing the incentive for electricity plants to reduce SO₂ emissions.

Economic effects of the package

An Energy Package which retransfer the additional tax to the trades and industries will not have noticeable macroeconomic consequences. The total production of the private sector is influenced only to a lesser degree, thus having but insignificant influence on employment, private consumption and the balance of payments. See table 2.3.

Table 2.3 Effects of the Energy Package

	1996	1998	2000	2003	2005
Employment, 1000 persons	-0.3	-0.3	0.9	1.6	2.6
GVA in fixed prices in priv. urban trades, pct	-0.05	-0.02	0.04	0.02	0.12
Priv.consumption in amounts, pct	-0.03	0.00	0.05	-0.04	0.00
Balance of payments, pct of GNP	0.04	0.02	-0.01	0.04	0.01
Public balance, pct of GNP	-0.02	-0.02	-0.04	-0.04	-0.04

Retransfer

The main part of the additional tax is transferred back by reducing employers' labour market contributions and ATP (supplementary labour market pension) payments. The value of this is dependent upon developments in wages and employment in trades and industries. At the same time, subsidies for investments in energy-saving equipment are granted for a period. Finally, a limited special portion of wages in relation to production has been set aside for self-employed.

During the period from 1996 to 2005, the amount transferred back more than compensates for increased expenses, including the space heating tax contained in the Whitsun Package. See table 2.4.

Table 2.4 Accounts of additional taxes and retransfers incl. the Whitsun Package

DKK mill.	1999 1997	1998	1999	2000	2001	2002	2003	2004	2005	Total 1996- 2005
Retransfers minus additional taxes	-205	-15	-25	335	175	250	355	460	570	1900

Note: Rounded off to the nearest DKK 5 mill.

Until 2000, the total amount transferred back is expected to balance with the additional taxes. After 2000, it is expected that amounts retransferred will somewhat exceed increased expenses. This is due only to the reduction of employers' labour market contributions which will be of increasing value. This general tax reduction will be given to all companies in Denmark.

Calculations show that manufacturing companies will be burdened somewhat more than originally intended. On the other hand, the other sectors will be burdened somewhat less than previously expected, especially after 2000.

Under the current taxation system, companies with high space heating consumption are burdened by the taxation system. For most companies, the expenses for space heating comprise only a small part of total expenses. However, there are a number of companies which, for varying reasons, have a high consumption of energy for space heating in relation to the size of the rooms heated, including companies where ventilation is required in order to provide reasonable working environment. These companies pay a relatively

high tax. No common denominator has been determined regarding the organisation of these companies, nor their use of technology, etc. It is therefore not possible to suggest changes in the law for taxation, which would reduce the burden for these companies without making the taxation system even more complicated.

Competitive ability

The expenses of companies are influenced by the energy taxes. However, the influence of the taxes on company expenses is of less importance than fluctuations in, e.g., wages, interest rates or inflation.

As additional taxes in companies are retransferred, their total expenses are not at all affected. However, there are significant differences at the sector level. The energy consumption of the trade and industry sector is very unevenly distributed among the various sectors, causing differences in the tax burdens. In addition, there are differences in the sales of the different sectors, e.g. the sales of the trades and services, and the building and construction sectors are not as subject to foreign competition as are the sales of other sectors. Nevertheless, the taxation system does take considerable and necessary consideration to companies with high-energy consumption, as well as to companies subject to foreign competition.

Heavy processing industries – and therefore with reduced taxes – have not received a net financial advantage from the Energy Package, since the total amount transferred back to these industries does not exceed the total energy tax.

Subsidies and agreements

Since 1 January 1996, 6000 to 7000 companies have received one or more subsidies for energy savings. Subsidy for energy savings makes it more attractive for companies to invest in cleaner technology. This lowers CO₂ emissions while also reducing the amounts which companies have to pay in taxes.

Up to 1 October 1998, DKK 900 million had been paid in investment subsidies. It is estimated that total investment subsidies will reach the projected DKK 1.8 billion in 2000 with unchanged administrative practice.

Heretofore, the investment subsidies have primarily been given to energy-intensive sectors, i.e., the primary industries and production industries which have received some 80 per cent of the funds for subsidies. The subsidy scheme therefore helps to equalize the actual burden of the Energy Package among the various sectors in relation to the distribution of energy consumption.

Another element of the Energy Package is the fact that rebates are granted on CO₂ taxes if an agreement is entered with the Danish Energy Agency to carry out a number of energy-saving measures and introduce energy management. This agreement rebate can be obtained if production processes require large amounts of energy for heavy processes, or if production processes are very energy-intensive.

To this end, 101 individual agreements and three group agreements have been made. The agreements include 20 per cent of the total energy consumption of VAT-registered companies. It is expected that rebate amounting to some DKK 70 million in 1998. Nearly

all companies with high-energy consumption which were expected to enter into agreements have done so.

Administrative effects

Green-tax systems are complicated because they must take competitive ability into account. Therefore, green-tax systems result in higher company and government administrative costs than other taxes.

The organisation of the tax system with differentiated rates means that companies must categorize their energy consumption according to use. For a large number of Danish companies, this categorization is simple, since only electricity is process utilisation, whereas other energy consumption is space heating. It is estimated that some 100,000 companies can be included in this group.

For some 5000 companies, however, categorizing fuel consumption is much more complicated, as their fuel consumption is used in their production processes and also for space heating. In this case, it is necessary to define which machines, etc., are used for production processes, and which are used for space heating. It is also necessary for these companies to install meters which can record the energy consumed by production processes and space heating.

Of these 5000 companies, four to five hundred manufacturers and about 1000 greenhouses must, in addition, categorize their process energy consumption as light process and heavy process, which requires yet more administrative work. The installation of meters and categorizing of energy consumption as process and space heating is, however, in most cases, a one-time investment.

It is estimated that the administrative costs for companies are 1 to 2 per cent of the tax itself.

The administration of the subsidies and agreement scheme is organised in accordance with the regulations of the Ministry of Finance and recommendations from the Office of the Auditor General of Denmark regarding administration of subsidies, etc. This engenders certain requirements for documentation by companies receiving subsidies, as well as for verification of this documentation by the Danish Energy Agency.

It is estimated that the administrative costs for companies applying for subsidies are limited to an average of 3 to 9 per cent of the amounts of subsidies. This corresponds to 1 to 3 per cent of the total investments, since subsidies are given for up to 30 per cent of investment costs.

The agreement scheme requires compilation of a base agreement including energy audit, proposals for energy administration, etc. Energy audit must be verified, and an annual report must be submitted to the Energy Agency on the realisation of the energy saving which have been agreed upon. It is estimated that administrative costs will comprise an average of 5 to 12 per cent of the expected rebate for the CO₂ tax when fully implemented.

Projected CO₂ emissions

Total CO₂ emissions in Denmark have been projected to 2005. This shows that CO₂ emissions will be reduced by about 15 per cent in relation to 1988 emissions under the current measures. A CO₂ reduction of 5 per cent is lacking if the national CO₂ target of a 20 per cent CO₂ reduction in 2005 is to be fulfilled. It is primarily the increase in CO₂ emissions in the transport sector which causes the deficiency.

In projecting, it has been a general prerequisite that the policies described in the Danish energy action plan, *Energy 21*, will be implemented.

Household taxes will increase, as determined in the tax reform and the Whitsun Package. It is a prerequisite in the traffic sector that petrol taxes keep pace with the tax increases contained in the Whitsun Package up to 2002. After 2002, the tax level will be maintained.

It is a prerequisite that there will be an expansion in combined heat and power productions and a change of fuel consumption in the direction of increased use of renewable energy and natural gas.

2.4 The recommendations of the Committee

On the basis of the computations, special reviews and evaluations which have been carried out, the Evaluation Committee makes the recommendations which follow.

The committee assesses that green taxation systems for trade and industry are an appropriate instrument for regulating environmental strain. The taxation system, which has been evaluated, ensures an environmental effect which is economically effective, and which also takes international competitiveness into consideration. Although the taxation system for the energy sector was fundamentally restructured by means of the Energy Package in 1995, there can, however, in some small sectors, be a need for adjustments, e.g., adjustments in the agreement system or the tax rates.

The environmental effects of the Energy Package generally live up to the expectations held when the package was introduced. Thus, the Energy Package will contribute some 4 per cent to the reduction of CO₂ emissions in 2005, and will therefore play an important role in the efforts being made to reduce CO₂ emissions in Denmark. With regards to sulphur, the environmental effects of the tax are better than expected.

On the whole, it is recommended that the general organisation of the structure of the current taxation system and factual rate level for the energy sector be retained. However, the taxation system should be taken up for renewed consideration when the international community has clarified which measures are internationally relevant in climate policy. In addition to this, there will also be decisions at the EU level, which may necessitate adjustments in the Danish taxes.

Although the general structure in the energy tax system ought to be kept, it is recommended that adjustments be made in the Energy Package. It should thus be considered if the planned environmental improvements can be achieved in a manner which would result in fewer administrative burdens for companies.

The macroeconomic effects of the Energy Package are limited. Amongst other things, this is due to the fact, that the increase in proceeds from the changes in taxation are transferred back to trade and industry, and that the taxation system takes competitiveness into consideration. By virtue of the Energy Package, an extra DKK 2 billion are collected annually in CO₂ taxes, SO₂ taxes, and energy taxes from trade and industry. A corresponding DKK 2 billion are transferred back through investment subsidies, reduction of labour market contributions and reduction of fees, etc.

It is expected that the tax increases for trade and industry will exceed amounts transferred back up to, and including, 1999. During the period from 2000 to 2005 (2005 is the year in which the CO₂ targets are to be fulfilled), it is expected that the amounts transferred will exceed the amounts collected in taxes.

The tax system is organised so that the amounts transferred back rise faster than taxes. Transferring rises primarily with the wages paid by trades and industries, while amounts paid in taxes rise with increases in CO₂ emissions. Estimates indicate that wages will rise faster than CO₂ emissions between 1996 and 2005. However, there are significant differences among the various sectors.

Calculations done by the committee show that production industries are more heavily burdened than expected. Conversely, the other sectors are burdened somewhat less than originally expected.

The Energy Package is relatively complicated for companies to administrate, as wide-ranging and necessary consideration is taken to competitiveness in the composition of the taxation system. Some of the costs are, however, one-time expenses, which have already been levied.

The committee recommends that the administrative simplification of the Energy Package be considered, especially in areas, which include heavy on-going administrative burdens for companies. For example, the agreement concept of the Energy Package could be adjusted so that administrative costs involved in entering agreements would be limited. However, simplification of administrative procedures should not tamper with the basic principles of the Energy Package.

3

THE ENERGY PACKAGE

3.1 Introduction

Environmental protection has high priority in Denmark. The passage by the Danish Parliament of a number of environmental targets underline this fact. The environmental targets also include fulfilment of a number of international agreements and conventions.

The national energy target is that CO₂ emissions in 2005 should be reduced by 20 per cent in relation to 1988 emissions. The target is to be reached by national measures.

In 1995, the government passed collective legislation for trades and industries, the so-called Energy Package, as an instrument for reducing CO₂ emissions, and for contributing to fulfilment of the national CO₂ targets. The package includes energy, CO₂ and SO₂ taxes on energy consumption, subsidies for energy-efficiency measures, entry into agreements for energy-intensive companies, reduction in taxation of labour, and subsidies to the self-employed.

3.2 Taxes

The taxes will gradually be phased in up to 2000, and when the legislation was passed, attempts were made to ensure that tax increases would be transferred back to companies at a corresponding tempo in the form of subsidies and reductions in wage costs.

The energy and CO₂ taxes are dependent upon energy use, while the SO₂ tax is independent of energy use. In the private sector, energy use is categorized as heavy process, light process and space heating.

CO₂ taxes depend upon CO₂ emissions on combustion, as the total tax for all fuels corresponds to DKK 100 per ton of CO₂ emission. See Table 3.1. However, the CO₂ tax calculation rate on electricity is fixed and does not fluctuate as a result of changes in fuel consumption in the production of electricity.

It is possible for energy-intensive companies to enter agreements on energy efficiency and thereby reduce their CO₂ taxes. CO₂ taxes will therefore vary significantly, depending upon whether or not an agreement has been entered. See Table 3.2.

The green package introduced energy taxes on fuel consumption for space heating in trade and industry. The taxes were gradually introduced between 1996 and 1998 with payment of 30, 65 and 100 per cent of the full tax respectively. The energy taxes were later increased by the agreement on tax adjustment of 01.07.98, the so-called Whitsun Package, so that by 2002, the amount will gradually have risen to DKK 51 /GJ. See Table 3.3.

Table 3.1 CO₂ taxes DKK/GJ	
Coal	9.6
Brown coal and briquettes	9.7
Cokes and foundry furnace cokes	9.6
Petroleum	7.8
Gas oil	7.5
Fuel oil	7.9
LPG	6.5
Electricity	27.8
Natural gas	5.6
Wood and waste wood	0
Straw	0
Waste	0
Biological gas	0

Table 3.2 Resulting CO₂ taxes DKK/ton CO₂					
Year	1996	1997	1998	1999	2000
Heavy process, no agreement	5	10	15	20	25
Heavy process with agreement	3	3	3	3	3
Light process, no agreement	50	60	70	80	90
Light process with agreement	50	50	50	58	68
Space heating	100	100	100	100	100

Table 3.3 Trade and Industry energy taxes on space heating DKK/GJ							
Year	1996	1997	1998	1999	2000	2001	2002
Coal	10	25	41	45	47	49	51
Brown coal and briquettes	10	25	45	45	47	49	51
Cokes and foundry furnace cokes	10	25	41	45	47	49	51
Petroleum	13	28	46	49	50	51	53
Gas oil	12	27	44	47	48	50	51
Fuel oil	12	27	44	47	48	50	51
LPG	13	28	45	47	48	50	51
Electricity	30	72	128	132	136	140	144
Natural gas	12	27	44	47	48	49	51
Wood and waste wood	0	0	0	0	0	0	0
Straw	0	0	0	0	0	0	0
Waste	0	0	0	4	6	8	10
Biological gas	0	0	0	0	0	0	0

There is a sulphur tax on all fuel consumption. The tax is DKK 10/kg SO₂, and will be introduced gradually between 1996 and 2000 in order to reduce a tax-free basic deduction for sulphur content in the various fuels little-by-little. See Table 3.4. Fuels with a sulphur content of less than 0.05% are tax-exempt.

Table 3.4 Sulphur taxes							
	SO ₂ %	Unit	1996	1997	1998	1999	2000
Fuel oil	0,5	DKK/t	20	40	60	80	100
Gas oil	0,1	DKK/m ³	8	8	8	8	17
Coal	0,6	DKK/t	58	70	83	95	108
Electricity		DKK/MWh	9	9	9	13	13

Administration of the taxes

All taxes are collected and settled with the Central Customs and Tax Administration by the suppliers of fuels. Following this, private companies' taxes are reimbursed to the extent to which they are entitled in connection with the periodic VAT statements. In practice, reimbursement is effected by means of a deduction in company VAT reports, or for individual companies, by means of large reimbursements on request for advance repayment.

The categorization of fuel consumption as process and space heating is done by meter or other method of categorization. The main stipulation is that if the same fuel is used for both space heating and processing, the energy consumed is to be considered as space heating unless there is specific metering or distribution of the energy for processing.

Likewise, if the same fuel is used for both light and heavy processing, energy consumption will be considered as having been used for light processing, unless there is specific metering of the energy consumed for heating processing.

Space heating is understood as being energy used for the heating of space such as:

- production halls
- ware houses
- sales rooms
- offices
- hotel rooms and dining areas.

Space heating also includes hot water used for:

- cleaning
- bathing
- dishwashing
- washing hands.

All other energy consumption other than space heating is regarded as having been used for process purposes. In addition, in certain cases, heat used in the production of goods is considered as having been used for process purposes, regardless of the fact that processing also contributes to space heating. This is the case in connection with heat which is used in stalls, greenhouses, special halls for drying, storage, etc.

Light process usually includes energy consumption which is not space heating or heavy process.

Heavy process is defined in the process list in the CO₂ tax law. Examples of heavy process energy consumption are:

- greenhouse heating
- production of foodstuffs, sugar, yeast, etc.
- production of paper, glass, mineral wool, plaster, cement etc.

Reimbursement of taxes on light and heavy process is dependent upon metering or distribution of energy consumption. A number of simple methods based on the area heated, the installation effect, operation time, etc. have been made for determine space heating consumption.

It is the responsibility of a company to ensure that installed meters are properly installed, that the meters function and measure correctly, and to maintain them.

Heating energy stipulations are regulated by the Ministry of Trade and Industry, and must be approved or in some other manner ensure satisfactory accuracy.

Stipulations and norms for electricity meters are regulated by the electricity sector while gas and oil meters must be approved in accordance with rules laid down by the Ministry of Trade and Industry.

Fuel consumption for the production of electricity by power plants and by combined heat and power plants are exempted for tax, as the taxes are collected by taxation of electricity consumption. Special rules apply for the distribution of fuel consumption between electricity production and heat production in central power and in combined heat and power plants, as well as in industrial combined heat and power plants.

3.3 Reductions in labour market contributions

The green package placed higher taxes on VAT-registered private companies. However, on its passage, efforts were made to ensure that the increased revenues should be fully transferred back to trades and industries as a whole.

Retransferring takes place partly in the form of reductions in the taxation of labour, and partly in the form of subsidies for energy-efficiency measures and special subsidies for small companies.

The largest portion of transferring of the increased tax revenues is effectuated by means of a reduction in employers' labour market contributions. Labour market contributions are determined as a percentage of wages, and the reduction will take place gradually until 2000. See Table 3.5.

Table 3.5 Reductions in labour market contributions

Year	1996	1997	1998	1999	2000
Reduction %	0.0	0.11	0.27	0.32	0.53

Transferring by means of reductions in labour market contributions is dependent upon wage developments. Expectations based on estimates indicate that reductions will rise to some DKK 2 billion in 2000.

In addition, there will also be a reduction in employer payment of supplementary labour market pension (in Danish ATP) of DKK 159 annually per full-time employee. This will result in a total reduction of some DKK 200 mill. annually.

DKK 1.8 billion have been set aside for investment subsidies. It is expected that these funds will be pledged between 1996 and 2000, i.e., that the subsidies will not cease, but be transferred to the following years, in the event that they are not used during the year in which they are appropriated.

Finally, a special fund has been established for small businesses with limited payrolls. This so-called independents' fund is used primarily for reduction of a number of fees and for reimbursement of administration costs. The fund will be increased up to 2000 (see Table 3.6), and is administrated by the Ministry of Trade and Industry, and the Ministry for Food, Agriculture and Fisheries, as the funds are divided more or less equally between the two ministries.

Table 3.6 Fund for small businesses					
Year	1996	1997	1998	1999	2000
Fund in mill. DKK	180	210	255	255	295

3.4 Subsidies for energy efficiency

In connection with an earlier reorganisation of energy taxes in 1993, it became possible for trades and industries to obtain subsidies for energy-efficiency projects.

With the passage of the Energy Package in 1995, the original scheme was changed, in that an additional DKK 1.8 billion were appropriated for the period from 1996 to 1999.

The Danish Energy Agency administers subsidies for energy efficiency. As a rule, up to 30% is given in subsidies. However, the amount is up to 40% in small and medium-sized companies in particular sectors, including industrial combined heat and power plants. There is no upper limit for the size of subsidies, although there is a minimum of DKK 2000.

Possibilities for obtaining subsidies

The subsidy scheme is to encourage more effective utilization of energy in trades and industries. Subsidies are granted for changing to more effective energy technologies and methods of production, for projects, which can limit CO₂ and SO₂ pollution from the energy consumption, as well as for activities of developmental character. Attempts are made to give funds to investments and other activities, which would not be implement without subsidies.

The subsidy scheme has been approved by the EU, and is administrated in accordance with the rules for government grants.

Only companies, which are operated for business objectives and are VAT-registered, can obtain subsidies. Publicly owned companies, which operate on ordinary market terms, can obtain subsidies.

Subsidies are not granted to institutions, which are operated by the national, municipal or county governments, private foundations, or schools and educational institutions, or other organizations, which are included in the laws for appropriations, or otherwise receive public funds.

The percentage of subsidy depends upon the type of project and the on the size of companies, since it is possible for small and medium-sized companies to obtain larger amounts in subsidies according to general EU regulations. Small and medium-sized companies may not have more than 250 employees, and have either a turnover not exceeding ECU 40 million, or a total balance sheet which does not exceed ECU 27 mill.

Projects which are eligible for subsidies can be categorized as follows:

- individual projects
- standard solutions
- combined heat and power plants
- development, trial and demonstration projects
- other projects

Individual projects are investments which result in more effective energy utilization or a change to cleaner fuels. The extent of a project is described by the applicant, and up to 30 per cent of costs may be given in subsidies. Under these criteria, subsidies are not given to projects which, in themselves, would be very profitable, projects with but little energy-saving potential, or projects in which the environmental gains would be insignificant. The simple payback time must therefore be between two and nine years and CO₂ savings must be greater than 0.15 kg per DKK invested.

Applications are evaluated individually. General stipulations may be departed from in the case of special circumstances, e.g., in the case of improvements in working environments or the use of renewable energy.

Standard solutions are energy-saving projects which are pre-described. Standard solutions are primarily included to make it easier for small companies in particular to obtain subsidies for energy- efficiency projects. The standard solutions – of which there are 40 – cover areas in which there is large potential for energy savings through the intersectoral use of uniform technology. This is true of, e.g., areas such as lighting, cooling, ventilation, pneumatics and motors.

With but few exceptions, a maximum of 26 per cent is granted in subsidies, amounts also being limited for some solutions by a maximum amount per initiative, e.g., in the form of an amount per m².

The technical requirements for drawing up standard solutions have been compiled on the basis of the same energy and financial criteria as are enforced for individual projects.

Industrial combined heat and power plants are supported like individual projects. The application procedure also ensures that their dimensions are the best possible in relation to

the heat requirement. In order to encourage expansion, it has been possible for small and medium-sized companies to obtain subsidies for up to 40 per cent of their investments since 1998.

Development and demonstration projects are projects which can contribute to maturing new principles and methods for energy and environmentally friendly production for actual demonstration systems or projects, and which have the objective of distributing information and knowledge by means of fully developed technologies which have not yet penetrated the market. The Danish Energy Agency determines the amount in subsidies after evaluation of the individual applications, and with reference to EU directives.

Other projects include general information activities, reports, sector-related projects, energy inspection, use of energy advisers, etc. It is possible to obtain up to 100 per cent in subsidies for certain types of projects, e.g., general information activities, while for others, e.g., sector energy analyses, it is only possible to obtain up to 30 per cent in subsidies.

Subsidies

In compiling the Energy Package, it was assumed that the extra fund of DKK 1,800 million would be given as subsidies during the period between 1996 and 1999 with DKK 300, 500, 500 and 500 million respectively. At the same time it was made possible to transfer appropriations for subsidies from one year to another.

Since 1995 there has been an increasing number of applications for subsidies. This is presumably due to the fact that the scheme has been strengthened by the gradual introduction of the new taxes and that it has become better known, combined with greater environmental awareness. This increase has continued in spite of the fact that the expansion of industrial combined heat and power has decreased significantly.

Also during coming years it is expected that there will be an increase in the number of applications for subsidies. Based upon the actual growth up to mid-October, 1998, it must be expected that funds for subsidies will have been used by the middle of 2000 if there are no changes in the scheme. See Table 3.7. The original fund, which has gradually been reduced during recent years will be discontinued after 1999.

Table 3.7 Subsidies for energy savings 1996-2000					
DKK mill.	1996	1997	1998 ¹⁾	1999 ¹⁾	2000 ¹⁾
Total subsidies	366	451	550	575	232
Original fund	165	106	103	0	0
Extra subsidies	201	345	447	575	232
Accumulated extra subsidies	201	546	993	1,568	1,800

1) Estimate based on actual figures up to mid-October, 1998.

The rise in applications has kept pace with the rise in amounts of subsidies. From 1996 to 1998, the amounts of subsidies have risen with some 50 per cent, while the number of applications is approximately 2.5 times higher. See Table 3.8. The average subsidy application has thus been nearly halved during this period.

Table 3.8 Number of investment subsidy applications			
No. of (rounded off)	1996	1997	1998 ¹⁾
Standard solutions	1900	2800	4000
Individual projects	600	1500	2500
Other	300	400	500
Total	2800	4700	7000

1) Estimate based on actual figures up to mid-October, 1998.

Extensive information activities have been implemented during the entire period. These activities must be considered a significant factor in the sharp rise in the number of applications for subsidies between 1996 and 1998.

3.5 The agreement scheme

Agreements on energy efficiency are made between companies and the Danish Energy Agency. An agreement obligates a company to implement a number of energy-saving measures and to introduce energy management. In return, the Energy Agency issues a contract whereby it pledges payment of subsidies for coverage of the CO₂ tax imposed on the company.

The agreement scheme has two objectives. The scheme is partly a means of encouraging energy efficiency in energy-heavy companies. It is also to ensure that energy-heavy companies and companies in highly competitive sectors are not burdened by the taxes to such an extent that the competitiveness of the companies is noticeably weakened. The scheme is thus to ensure that energy efficiency is achieved in energy-intensive companies even though they are not heavily taxed.

Agreements can be made for both light and heavy processes. All companies with heavy processes are defined as energy intensive, and have the right to enter into an agreement with the Danish Energy Agency. Companies with light processes are defined as energy intensive – and obtain this right – only if the yearly tax on their energy use amounts to at least 3 per cent of their value added.

Agreements are entered upon for a maximum of three years, after which a company and the Energy Agency enter a new agreement in order for the company to continue to receive subsidies.

Individual agreements and group agreements

In the case of individual agreements, the Danish Energy Agency enters into an agreement with an individual company. The agreement contains the precise requirements that the company is to fulfil in return for receiving subsidies for coverage of the CO₂ tax.

Group agreements are a way in which a group of companies with similar uniform processes, products, and energy consumption patterns can enter into an agreement, and which makes it possible to compile mutual guidelines for an agreement. In the case of a sector agreement, the Energy Agency enters into an agreement with a sector or a group of

companies which contains guidelines for the obligations which the individual companies are to fulfil in order to receive subsidies to cover their CO₂ taxes. The agreements with the individual companies are then made in such a way that the individual companies enter into the group agreement, thereby committing themselves to the obligations laid down in the agreement.

Group agreements make it possible to include relevant organizations in the implementation of inter-company projects, e.g., in connection with the development of new technology, energy management, information, employee training, etc., as part of the agreements.

Companies, which fulfil the conditions for entering an agreement, can submit a statement of intent to the Energy Agency in which they confirm their intention of entering into an agreement. On the basis of a statement of intent, the Energy Agency issues a conditional pledge for subsidies for a maximum period of eight months. During this period, companies must compile the basis for an agreement in the form of an energy audit, proposals for energy management, energy-efficiency projects, etc. When an agreement has been reached, the Energy Agency issues a pledge for subsidies to cover CO₂ taxes for a period of three years from receipt of the statement of intent.

Subsidies

In the case of agreements on heavy processes, subsidies are granted for coverage of CO₂ taxes on energy consumption in heavy processes. In the case of agreements on light processes, subsidies are granted for energy consumption in light processes. The subsidies for coverage of the CO₂ taxes increase from DKK 2 per ton of CO₂ in 1996, to DKK 22 per ton CO₂ in 2000. See Table 3.9

DKK per ton CO ₂	1996	1997	1998	1999	2000
CO ₂ tax for heavy process, no agreement	5	10	15	20	25
Subsidy for heavy process	2	7	10	17	22
Heavy process with agreement (net)	3	3	3	3	3
Light process, no agreement	50	60	70	80	90
Subsidy for light process	0	10	20	22	22
Light process with agreement (net)	50	50	50	58	68

Reporting

Companies which have entered agreements must regularly report to the Energy Agency how realization of energy-saving measures and special studies are progressing. If the Energy Agency cannot approve a report, the Agency can cancel an agreement and require that the subsidies, which have been paid out, are repaid.

Box 3.1 Content of agreements

Agreements include three elements:

- *Energy-saving measures* comprise well-defined energy-saving projects. Companies, which enter into agreements on heavy process, must implement the energy-efficiency measures pertaining to the heavy process, and which have repayment terms of less than four years. Companies, which enter into agreements on light processes, must implement the energy-efficiency measures pertaining to the light process, and which have repayment terms not exceeding six years.
- *Special studies* comprise studies which cannot be accomplished by energy inspection, e.g., particularly complicated measures which cannot be thoroughly analysed within the time-frame established for compilation of an agreement. In the event that these studies reveal energy-saving measures which have repayment terms of up to four and six years for heavy and light processes respectively, these measures are to be implemented within a year of submission of the results.
- *Energy management* comprises guidelines for how companies ensure that savings achieved in daily operations can be maintained, that intervention takes place in cases of ineffective operations, and that new possibilities for efficiency are evaluated as a natural aspect of daily operations. As a part of energy management, guidelines are laid down for the organization of efficiency activities, energy control, energy-effective purchasing, training and motivation of staff.

Adjustments on the way

Agreements have not previously been used as regulative instruments in Danish energy policy. Therefore, the Danish Energy Agency has continuously evaluated the need for adjustments in the administrative guidelines. On the basis of experiences gained from the first round of the agreement in 1996, the guidelines have been adjusted in a number of areas.

In 1996, the stipulation for the Energy Agency was that energy inspections should either be verified by an independent authority, or that inspections should be done by an approved energy consultant. Nearly all companies chose to have inspections done by an approved consultant. This gave consultants a double role. On the one hand, the consultants inspected on behalf of companies. On the other hand, these consultants guaranteed the Energy Agency that the inspection was an appropriate basis for agreements. At the same time, the consultants were financially dependent on the companies, since they, in other connections, also performed tasks for these same companies.

As of December, 1996, it was determined that all energy inspections should be verified by an independent authority which is approved by the Energy Agency. At the same time, the guidelines for energy inspection and energy management were reinforced and made considerably more precise.

Experiences with agreements

At the beginning of 1999, 230 agreements will have been made, i.e., 101 individual agreements and three group agreements:

- an agreement with the condensed milk sector, comprising nine companies.
- an agreement with greenhouses which at the end of April, 1998, comprises 99 greenhouses. A total of some 100 greenhouses is expected to become party to the agreement during 1999 and 2000.
- an agreement with the structural clay production sector, comprising 21 companies.

The number of active agreements, the energy consumption of the companies and the payment of tax subsidies are shown in Table 3.10. Here, "active agreement" means an agreement which engenders payment of subsidies to cover the energy taxes.

Table 3.10 No. of active agreements, end of year			
	1996	1997	1998
<i>Individual agreements:</i>			
Mining and quarrying	3	6	7
Food and beverages	5	29	47
Wood industries	1	3	3
Paper industries	5	6	6
Mineral oil industries	1	1	1
Chemical industries	5	8	11
Rubber and plastic industries	0	2	2
Stone, clay and glass industries	4	7	10
Metal manufacturing	1	1	2
Iron and steel goods industries	0	4	4
Sub-suppliers	5	7	7
Sewage works, renovation companies, maintenance companies, etc.	0	0	1
Total individual agreements	30	76	101
<i>Group agreements:</i>			
Greenhouses	39	81	99
Milk condensation	0	9	9
Structural clay products	0	0	21
Total group agreements	39	90	129
Total agreements	69	166	230
Energy consumption covered by agreements ¹⁾ : PJ	27	41	47
Subsidies paid, DKK mill.	5	26	70

1) Energy consumption eligible for CO₂ tax subsidies.

It is expected that the total number of agreements will reach some 370 in 2000, corresponding to the payment of a total of DKK 125 million in subsidies.

The total energy consumption of the companies which have joined the scheme equals the consumption anticipated on passage of the scheme. As expected, it is the large companies which have joined first, while small companies have tended to wait until the subsidies, which will increase from DKK 2 per ton CO₂ in 1996 to DKK 22 per ton in 2000, correspond to the costs of entering an agreement.

Relatively few companies have availed themselves of the opportunity to enter agreements on light processes. See Table 3.11. Most of these have heavy processes and have therefore already entered into heavy process agreements.

Table 3.11 Agreements on light processes in 1998

	Total agreements on light processes	Also have heavy process agreements
Grain, feeding stuffs	9	9
Agr. drying operations	6	6
Plastic	1	1
Greenhouses	5	5
Other	9	6
Total	30	27

4

EVALUATION OF THE ENERGY PACKAGE

4.1 Introduction

The objective of the Energy Package is to reduce CO₂ and SO₂ emissions, and was presented as an initiative which would not affect the competitiveness of trades and industries. It was also asserted that production, private consumption, etc., would not be influenced by the tax. In the evaluation, which has taken place, these conditions have been evaluated, including the retransferring of tax increases and the effect of the administrative burdens.

The projections of the total CO₂ emissions up to 2005 have also been included in the evaluation.

4.2 Environmental effects of the Energy Package

The effects of the taxes on CO₂ emissions

The CO₂ taxes contained in the Energy Package influence the CO₂ emissions of trade and industry with several mechanisms:

- the CO₂ taxes encourage trade and industry to choose fuels containing less CO₂. For example, a company can use oil instead of coal. The CO₂ tax makes it more profitable to change fuels.
- the CO₂ taxes make energy consumption more expensive, and companies are encouraged to reduce energy consumption. This can, e.g., be done by investing in energy-saving capital equipment, i.e., by increasing the capital apparatus, or by reorganizing the production process by making it more labour-intensive.
- the CO₂ taxes gives the more energy-efficient companies an advantage compared to the less efficient due to reduced energy costs.

It is estimated that in 2005, the total increase in energy tax revenues will be some DKK 2.5 billion. The energy costs of VAT-registered companies without the Energy Package are some DDK 14.7 billion. The tax increase will thus increase the energy costs of trade and industry by some 16 per cent in 2005.

The environmental effects have been estimated on the basis of model calculation, using the macroeconomic model EMMA. In this model, the estimated demand for energy by trade and industry is based on historical data. The demand for energy is dependent upon production, the relative price of energy, technological development, etc.

The effect of the tax system is calculated to give a reduction of CO₂ emissions by 1.2 million tons in 2005. In 1996, total CO₂ emissions from VAT-registered companies were approximately 24.3 million tons excluding transportation. Thus, the CO₂ emissions of trade and industry will be reduced by about 5 per cent as a result of the tax increases.

The effect of the taxes can only be evaluated meaningfully with the aid of a mode analysis. This is due in part to the fact that experience has shown that trades and industries react with some delay to changes in taxation. Moreover, the most important CO₂ changes in the tax system will not be implemented until 1998 and thereafter. It would therefore not be possible to evaluate the effect of the taxes by means of interviews, etc. Finally, it is doubtful if more direct gauging of the effect of the taxes would be able to isolate the effect of taxation changes in relation to other conditions which influence energy consumption.

To the extent, which the CO₂ tax is handed on to private households, the households will be encouraged to utilize more energy-intensive products.

The effect of the taxes on SO₂ emissions

The sulphur tax is, in principle, a tax on the emission of sulphur into the atmosphere. In addition to the mechanisms which have been described for the CO₂ tax – the use of gas instead of coal, energy savings, etc. – the SO₂ tax also encourages the choice of fuels with lower sulphur content, e.g., low-sulphur coal, and by encouraging desulphurization of flue gas.

The most important contribution to sulphur reduction is evaluated as coming from lower sulphur content in fuels. It is estimated that up to 2000, there will be a gradual reduction in the sulphur content in fuels as an increasingly larger portion of the sulphur content in fuels is taxed, because the base deduction in the sulphur tax is being phased out.

At the same time, the phasing out of the base deduction means an increased incentive to change to other fuels with lower sulphur content, or to increase desulphurization of flue gas measures.

Quotas regulate the emission of sulphur in the production of electricity at the large electricity plants. Up to 1999, the plants will be exempt from the emission tax, since consumers instead pay an increased tax on the electricity produced. However, this does not directly encourage electricity plants to reduce SO₂ emissions. On the passage of the SO₂ tax legislation, it was determined that the sulphur tax would be changed from a consumption tax to a fuel tax from 2000. This way, the electricity companies will have increased incitement to reduce sulphur emissions.

It is estimated that the total reduction of sulphur emissions into the atmosphere will have been reduced by 34,000 tons in 2005 as a result of the sulphur tax.

The target is to reduce SO₂ emissions by 80 per cent by 2000 in relation to 1980. The SO₂ tax has meant that the sulphur content of fuel used outside the electricity sector has fallen considerably, and that the emission of sulphur is expected to be reduced more than required by the 2000 target.

The effects of subsidies and agreements on CO₂ emissions

As a step in the transferring of tax increases on the energy consumption back to trade and industry, companies receive increased subsidies for investments in energy savings. Subsidies totalling DKK 1.8 billion are being granted between 1996 and 2000. As some of the funds are being given to projects which are being carried out as part of an agreement, the effects of subsidies and agreements on CO₂ emissions are considered collectively.

The effects of subsidies for energy savings on CO₂ emissions

An extensive evaluation has been carried out of effects of projects for energy savings. The evaluations are based on interviews, calculations and measurement of energy consumption before and after investments in energy savings in more than 100 companies.

The energy savings from all the subsidies are then calculated on the basis of the applications for subsidy with the information given by applicants on the expected savings, changes in fuels, etc. These figures have been adjusted in view of the fact that, in practice, there are typically fewer savings than indicated in the applications, that some projects because of the subsidy scheme are carried out earlier than planned, and that there is a gradual shift towards less attractive projects as the most advantageous projects are implemented. On the whole, this adjustment means that the effect of the subsidies on society is approximately halved in relation to the applications received from companies.

The effects of agreements on CO₂ emissions

An extensive study has been carried out of the effects of the agreements which have been entered hitherto. Here, the total effect of the agreements is estimated to have resulted in CO₂ reductions of 6 per cent by 2005 in companies with agreements.

It is estimated that approximately 40 per cent of these reductions are due to energy-efficiency projects directly connected with agreements. The remaining part is attributed to the effects of the introduction of energy management systems, as these are cautiously estimated to be able to improve energy efficiency by 0.5 per cent per year.

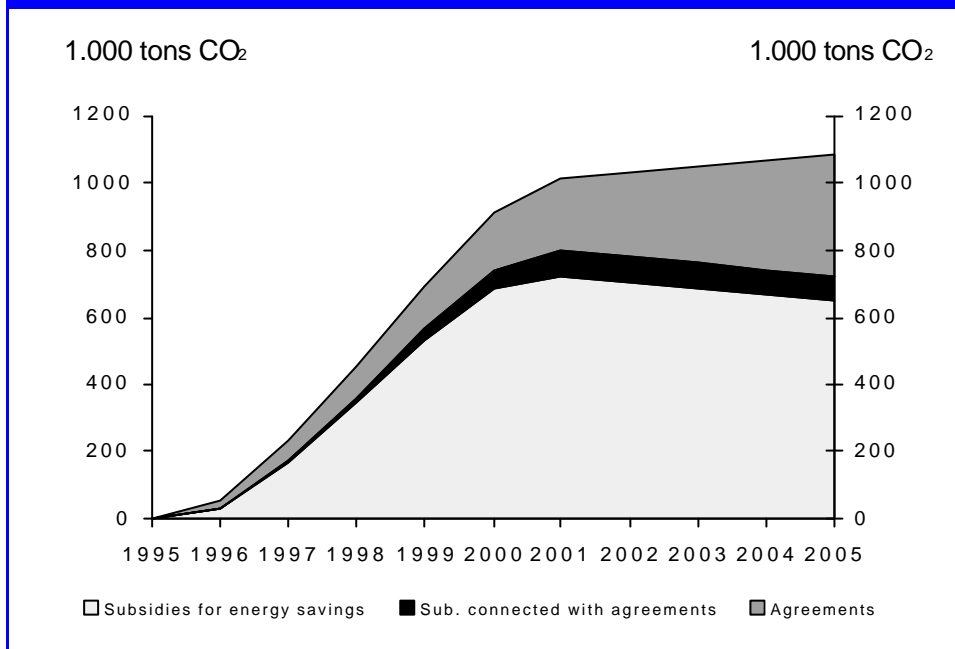
On the basis of the above study, and with regard to the fact that the agreement instrument only had been used for a short time, as well as the fact that the long-term effects are still uncertain, a cautious estimate assumes that the effects of energy management, etc., will result in an annual improvement of the energy effect by 0.4 per cent per year up to 2005.

The total effect of subsidies and agreements

In 2005, total reductions of CO₂ have been calculated as being 1.1 million tons. See Figure 4.1. This corresponds to just under 5 per cent of the CO₂ emissions of VAT-registered companies in 1996. Total investments in these companies comprise approximately DKK 6 billion as a result of the subsidy scheme, corresponding to some 2 per cent of the total machinery investments of the VAT-registered companies between 1996 and 2000. When the Energy Package was presented, it was estimated that investment subsidies would contribute to a reduction of 0.5 kg CO₂ per subsidized DDK. In this report, the effect is

estimated as being 0.4 kg per DDK. This estimate does not include the CO₂ effect of the subsidies which are granted in connection with agreements.

Figure 4.1 CO₂ reductions resulting from subsidies and agreements



Total environmental effect of the Energy Package

The total environmental effect of the Energy Package corresponds to a large extent to the expectations held when the package was presented. The distribution of the effects of the package on taxes and subsidies corresponds, by and large, to expectations. See Table 4.1.

Table 4.1 Environmental effects of the Energy Package

Reduction in:	Pct		CO ₂ emissions 2005		SO ₂ emissions 2000	
	Before	Now	Before	Now	Before	Now
Taxes	2.1	2.0	1.3	1.2	32	34
Subsidies	1.8	1.2		0.7	-	-
Agreements		0.6	1.1	0.4	-	-
Total	3.9	3.8	2.4	2.3	32	34

Before is the estimate made when the Energy Package was passed by the parliament.

Now indicates the current estimate of the environmental effects, excluding the effects of the Whitsun Package.

As is the case with other calculations of the environmental effects of major programmes, there is considerable uncertainty regarding the effects of the Energy Package. Time may very well show that the effects of the package are greater than indicated in Table 4.1.

4.3 Economic effects of the Energy Package

The Energy Package means that the energy costs of trade and industry will be increased by approximately 0.2 per cent in 2000. See Table 4.2. By the same means, retransferring reduces the costs of trade and industry in connection with utilization of labour, investments, etc., by approximately 0.2 per cent of the GNP in 2000. All in all, the costs of VAT-registered trades and industries are not significantly influenced by the Energy Package.

Table 4.2 Tax increases and retransferring with the Energy Package, incl. the Whitsun Package

Pct of GNP	1996	1998	2000	2003	2005
Tax increases	0.07	0.16	0.19	0.17	0.16
Retransferring	0.05	0.16	0.22	0.20	0.19
Total tax increases	0.02	0.00	-0.03	-0.03	-0.03

Adding 0.2 percent to the costs of trade and industry in the form of higher energy taxes would increase costs and result in noticeable negative effects on production and employment, etc. When the tax increases are combined with retransferring which reduces the costs of trade and industry with a corresponding 0,2 per cent, the costs of trade and industry are largely unaffected, and the effects on total production and employment figures are correspondingly insignificant.

The conclusion regarding production and employment is also true, even if tax increases exceed the amounts retransferred up to 2000, and less than the amounts retransferred after 2000. This is due to the fact that deviations from a balance comprise a very limited influence on the costs of trade and industry as a whole. However, in a few sectors and companies, tax increases can exceed the amounts transferred back to such an extent that production and employment are effected.

On the passage of the Energy Package, it was a prerequisite that energy-intensive trades and industries, in certain cases, should pay tax increases that exceeded the value of amounts retransferred for these trades and industries. The costs in these companies – especially in the manufacturing sector and agriculture – will rise. Experience with the Energy Package shows that, up to now, the tax system has this effect on certain trades, industries, and individual companies. On the other hand, the amounts transferred back will exceed the value of tax increases for the more energy-extensive trades and industries – especially labour-intensive trades and within building, construction, trades and services. Thus, costs in these trades and industries will be reduced.

It is estimated that total production in private trades and industries will remain largely unchanged. The number of persons employed will rise more slowly as a result of the fact that labour-intensive trades and industries are burdened less than energy-intensive trades and industries. See Table 4.3.

Table 4.3 Effects of the Energy Package					
	1996	1998	2000	2003	2005
Employment, 1000 persons	-0.3	-0.3	0.9	1.6	2.6
GVA in fixed prices in private trades and industries, pct	-0.05	-0.02	0.04	0.02	0.12
Private consumption in amounts, pct	-0.03	0.00	0.05	-0.04	0.00
Balance of payments, pct of GNP	0.04	0.02	-0.01	0.04	0.01
National balance, pct of GNP	-0.02	-0.02	-0.04	-0.04	-0.04

Model calculations of the effect of the Energy Package must be evaluated with caution. The calculations have been carried out under assumptions of trade and industrial structures, energy consumption, etc., which can develop differently than assumed. The model gives an overall description of the economy, but also includes assumptions, which are a simplification of reality.

In the long term, developments in employment are to a very great degree determined by developments in the labour market, especially structural redundancy. Therefore, the evaluation is that the Energy Package will have no significantly positive lasting effects on employment.

Although the effect on the production remains largely unchanged, individual trades, industries and companies are affected differently by the Energy Package, depending upon energy and labour-intensity, etc. There can be changes in production and employment for individual companies as a result of the Energy Package.

4.4 Balance sheet for tax revenues and retransferring

The Energy Package places higher CO₂ and SO₂ taxes on private trades and industries, which are registered for VAT. On the passage of the package, it was announced that the revenues of these tax changes would be fully transferred back to trade and industry as a whole.

There is considerable uncertainty in connection with the computation of tax rises and retransferring. This is due to the fact that developments in tax payments depend upon the development in energy consumption in process and space heating, which are sensitive to projected results for developments in trade and industry, etc. Also the computation of retransferring is dependent upon developments in, e.g., future employment rates, etc. It is only the computation of increased taxes and retransferring in 1996, which are based entirely on account-sheet figures.

The calculation of the tax burden is based on a projection of energy consumption to 2005. The total energy consumption of VAT-registered trades and industries is expected to rise by 0.8 per cent annually, while CO₂ emissions will fall. It is assumed that the consumption of space heating will fall until 2002 as a result of the gradual introduction of the high tax for space heating. It is assumed that the distribution of the energy consumption of industrial trades and industries for process and space heating are as stated in the 1997 and

that fuel consumption is distributed as stated in the 1996 Energy Matrix of the Danish Bureau of Statistics.

The energy tax on space heating in trade and industry will be rise during the period from 1998 to 2002, due to the Whitsun Package. This will increase the tax burden even more.

Up to 2000, calculations show that there is a balance between increased revenues and retransferring (see Table 4.4). During the first years there is an increase, which is countered by the increased retransferring by reduced labour market contributions during the latter part of the period.

Along with the increased tax burden, the value of retransferring with labour market contributions is higher than formerly expected.

Box 4.1 Axioms of the retransferring balance sheet

- The basis is the final energy matrix for 1996 from the Danish Bureau of Statistics. The matrix consists of 130 trades and industries, and 25 energy products.
- The distribution of processes etc., follows the 1996 census of industrial production for 1996, and 1997 for the years 1997 to 2005. For agriculture, it has been assumed that all fuel consumption is for light process with the exception of greenhouses, in which fuel consumption is for heavy process. It is generally assumed that all electricity consumption outside of the manufacturing sector is for light process. For trades and services, the basic assumption is that all fuel consumption is for space heating.
- Energy consumption for space heating has been adjusted 8 pct downwards in relation to the energy matrix, due to adjustment to normal climate. In 1996, the number of degree-days was 16 pct higher than in a year with a normal number of degree-days. In the Energy Statistics, it is assumed that half of the variation in degree-days is significant for energy consumption.
- It is assumed that total energy consumption will develop as projected in the evaluation. This entails that the energy consumption of trade and industry will grow at a rate of 0.8 per cent per year during the period 1996 to 2005. As the tax on space heating is 10 times higher than the price on processing, it is assumed that energy consumption for space heating will fall by 20 per cent during the period between 1997 and 2002. Energy consumption for processing will grow somewhat more than space heating consumption, so that the development in total energy consumption is consistent with the projected figures.
- It is assumed that price of natural gas will corresponding to the prices of oil included all taxes. This entails that the gas companies will have higher incomes than was assumed earlier.
- It is assumed that the manufacturing sector always pays at least the minimum EU tax on fuel oil. The sulphur tax for the manufacturing sector will be reduced proportionately.
- It is assumed that the original tax system taxes all energy consumption, with the exception of fishing, etc., at a rate of DKK 50 per ton of CO₂. It is also assumed that there is a special refund, and that there is a residual tax subsidy totalling DKK 375 million. In the years after 1996, the special reductions will follow developments in energy consumption.

Table 4.4 Evaluation of the burden for trade and industry, incl. the Whitsun Package

DKK million	1996	1997	1998	1999	2000
<i>Taxes:</i>					
CO ₂ tax	1505	2040	2695	3000	3175
SO ₂ tax	185	200	210	300	315
Total taxes	1695	2235	2905	3300	3495
<i>Retransferring:</i>					
ATP	-190	-195	-200	-200	-200
Labour market contributions	0	-360	-940	-1175	-2015
Funds for self-employed	-180	-210	-255	-255	-295
Investment subsidies	-200	-345	-445	-575	-230
Administration costs	-30	-30	-30	-30	-30
Old CO ₂ taxes	-990	-995	-1020	-1040	-1060
Total tax increase:	105	100	15	25	-335

Figures are rounded off to the nearest DKK 5 million.

Up to 2005, retransferring in the Energy Package will compensate for the original tax increases and the increases in the space heating tax contained in the Whitsun Package. The main reason for this is the fact that the labour market contribution, which is the most important component in retransferring after 2000, will rise faster than that CO₂ emissions and energy consumption in trade and industry. The amount transferred back will therefore be larger than the increases in tax revenues, and the difference will grow, i.e., in 2005, there will be a difference of approximately DKK 1.9 billion for the entire period from 1996 to 2005. See Table 4.5. Thus, there will be full retransferring as was intended when the Energy Package legislation was passed.

Table 4.5 Balance sheet for increased tax revenues and retransferring, incl. the Whitsun Package

DKK million	1996-1998	1999	2000	2001	2002	2003	2004	2005	1996-2005 accumulated
Retransferring minus tax increases	-220	-25	335	175	250	355	460	570	1900

Figures are rounded off to the nearest DKK 5 million. The table shows the difference between the retransferring and increased tax revenues from the Energy Package.

4.5 Competitiveness

The market share of Danish trade and industry on the Danish and foreign markets is influenced by a number of structural and trading conditions which are difficult to quantify. However, it has been of great importance for competitiveness that wage costs for the 1993 to 1996 period developed more advantageously than was the case with Denmark's major trading partners. Since 1996, wage costs in Denmark have risen faster than in most other countries, due, in particular, to the fact that these countries have not had the same strong economic growth that Denmark has had.

It is especially conditions on the labour market that have been important for competitive ability. During a period of accelerated business activity, it is difficult, in some sectors, to obtain sufficient qualified labour, and the labour market becomes a limiting factor in production. This can hurt sales – also abroad.

Company costs are also influenced by changes in energy taxes. However, the influence of energy taxes on business costs is of less importance than, e.g., fluctuations in wages, interest or inflation.

Energy taxes for trade and industry are primarily transferred back by means of reductions in labour market contributions for employers, and investment subsidies. On a whole, trade and industry costs are therefore not influenced, and the total effects of the taxes on the economy are modest.

However, there are significant differences among the various sectors, as energy consumption is very unevenly distributed, with resulting differences in the energy tax burdens in trade and industry. There are also differences in sales opportunities in certain sectors, e.g. trades and services, and also building and construction, since these do not sell to markets with foreign competition. The tax system takes broad and necessary consideration to trades and industries with heavy energy consumption, and those which have foreign competition.

The uneven distribution of energy consumption means that the trades and industries which are responsible for 20 per cent of the growth in value in the private sector, are also responsible for nearly 70 per cent of energy consumption.

The tax system with its process, space heating, agreement rebates, etc., implies a redistribution so that the 20 per cent most energy-intensive companies only pay just under 40 per cent of the CO₂, SO₂ and energy taxes.

Even though there is considerable redistribution with the tax system, a number of industries are burdened by the Energy Package. See Tables 4.6 to 4.8, which show the net burden – additional taxes minus retransferring distributed by trade or industry.

In the calculation of the sector-specific effects, an estimate has been made regarding the funds for self-employed. Half of the reductions in fees can be directly assigned to specific sectors. The remaining parts of reductions, which cannot be assigned to specific sectors are distributed among sectors according to the number of companies with fewer than 10 employees.

In most sectors, the amounts transferred back will exceed rises in taxes in 2000 because labour market contributions will be fully implemented in that year.

Within the 27 sectors shown in Tables 4.6 to 4.8, there can be differences in the tax burden. Depending upon the energy-intensity of the individual company, employment, use of technology, energy management, etc., the burden can be larger or smaller than for the sector in general. Thus, certain companies with particularly high space heating consumption have a high tax burden.

If the burdened companies sell to the home market without foreign competition, they will be able to transfer part of the tax rise to the sales price. Likewise, the trades and industries

in which the amounts transferred back exceed the tax rises will be able to transfer cost reductions to lower sales prices.

In all cases, the effect will be limited in size in relation to the influence from wage rises, the exchange rate of the DDK, interest rates, etc.

Table 4.6 Energy Package tax rises, incl. the Whitsun Package

DKK million	1996	1998	2000
Agriculture horticulture and forestry	-60	-105	-10
Fishing	-5	-5	-5
Mining and quarrying	0	0	0
Mfr. of food and beverage	10	10	70
Mfr. of textiles, wearing apparel and leather	5	20	15
Mfr. of wood products, printing and publishing	0	0	-15
Mfr. of chemicals, plastic products etc.	20	100	115
Mfr. of other non-metallic mineral products	20	40	60
Mfr. of basic metals and fabr. metal prod.	80	125	60
Mfr. of furniture; manufacturing n.e.c.	10	15	10
Electricity, gas and water supply	0	-10	-20
Construction	-10	-85	-190
Sale and repair of motor vehicles etc.	15	15	-5
Wholesale and commis. trade	35	15	-70
Retail trade and repair work	15	25	-5
Hotels and restaurants	5	10	-5
Transport	-15	-30	-55
Post and telecommunications	5	-5	-25
Financial intermediation and insurance etc.	0	-5	-5
Letting and sale of real estate	0	-15	-15
Business activities etc.	5	-75	-190
Public administration and defence etc.	0	0	-5
Education	0	0	-5
Human health activities	0	0	-5
Social institutions etc.	0	0	0
Ref. disposal, organiz., entertainment etc.	10	10	-10
Total	135	45	-305
Administration	-30	-30	-30
Total	105	15	-335

Rounded off to DKK 5 million. + indicates a loss, - a gain.

Table 4.7 Energy Package tax increases, pct of increase in value

	1996	1998	2000
Agriculture horticulture and forestry	-0.21	-0.35	-0.03
Fishing	-0.10	-0.13	-0.14
Mining and quarrying	-0.01	0.00	0.01
Mfr. of food and beverage	0.04	0.04	0.23
Mfr. of textiles, wearing apparel and leather	0.09	0.35	0.27
Mfr. of wood products, printing and publishing	0.00	0.00	-0.05
Mfr. of chemicals, plastic products etc.	0.09	0.43	0.46
Mfr. of other non-metallic mineral products	0.28	0.47	0.64
Mfr. of basic metals and fabr. metal prod.	0.13	0.18	0.08
Mfr. of furniture; manufacturing n.e.c.	0.11	0.15	0.11
Electricity, gas and water supply	0.00	-0.05	-0.08
Construction	-0.02	-0.17	-0.34
Sale and repair of motor vehicles etc.	0.09	0.10	-0.02
Wholesale and commis. trade	0.05	0.02	-0.09
Retail trade and repair work	0.03	0.06	-0.01
Hotels and restaurants	0.03	0.05	-0.03
Transport	-0.03	-0.05	-0.09
Post and telecommunications	0.02	-0.03	-0.12
Financial intermediation and insurance etc.	0.00	-0.01	-0.01
Letting and sale of real estate	0.00	-0.01	-0.01
Business activities etc.	0.01	-0.11	-0.24
Public administration and defence etc.	0.00	0.00	0.00
Education	0.00	0.00	-0.01
Human health activities	0.00	0.00	-0.01
Social institutions etc.	0.00	0.00	0.00
Ref. disposal, organiz., entertainment etc.	0.02	0.02	-0.03
Total	0.01	0.00	-0.03

+ indicates a loss, - a gain.

Table 4.8 Energy Package tax increases, pct of wages			
	1996	1998	2000
Agriculture horticulture and forestry	-0.99	-1.48	-0.11
Fishing	-0.27	-0.44	-0.47
Mining and quarrying	-0.14	-0.01	0.19
Mfr. of food and beverage	0.05	0.05	0.33
Mfr. of textiles, wearing apparel and leather	0.14	0.52	0.41
Mfr. of wood products, printing and publishing	-0.01	0.01	-0.08
Mfr. of chemicals, plastic products etc.	0.16	0.66	0.69
Mfr. of other non-metallic mineral products	0.46	0.77	1.05
Mfr. of basic metals and fabr. metal prod.	0.18	0.26	0.11
Mfr. of furniture; manufacturing n.e.c.	0.16	0.20	0.15
Electricity, gas and water supply	-0.01	-0.21	-0.37
Construction	-0.03	-0.23	-0.46
Sale and repair of motor vehicles etc.	0.15	0.15	-0.03
Wholesale and commis. trade	0.09	0.03	-0.13
Retail trade and repair work	0.06	0.10	-0.02
Hotels and restaurants	0.06	0.08	-0.06
Transport	-0.06	-0.09	-0.15
Post and telecommunications	0.02	-0.05	-0.18
Financial intermediation and insurance etc.	0.00	-0.02	-0.02
Letting and sale of real estate	-0.01	-0.18	-0.20
Business activities etc.	0.01	-0.17	-0.39
Public administration and defence etc.	0.00	0.00	-0.01
Education	0.00	0.00	-0.01
Human health activities	0.00	0.00	-0.01
Social institutions etc.	0.00	0.00	0.00
Ref. disposal, organiz., entertainment etc.	0.03	0.04	-0.04
Total	0.02	0.01	-0.05

+ indicates a loss, - a gain.

When the Energy Package legislation was passed, it was expected that the agriculture sector and manufacturing industries would be taxed more heavily than the other main sectors.

Figures show that manufacturing industries are the only major sector which is taxed significantly more heavily than anticipated when the Energy Package was introduced. See Table 4.9.

Table 4.9 Distribution of tax burden on primary sectors - tax burden including the Whitsun Package, though prior to investment subsidies and self-employer subsidies

DKK million	1998		2000		2001	2002
	<i>Before</i>	Now	<i>Before</i>	Now	Now	Now
Agriculture, etc.	95	85	145	150	150	150
Mining and quarrying	5	0	5	5	5	0
Manufacturing	365	590	250	495	470	450
Electricity, gas and water supply	0	-10	-5	-20	-20	-20
Construction	-55	-75	-140	-180	-190	-200
Trades and services	275	140	40	-200	-235	-275
Public and personal service	30	15	30	-20	-25	-25
Total	715	745	325	225	150	75

Before is the estimate made when the Energy Package was passed by the parliament.

Now indicates the current estimate of the environmental effects.

The reason that the net tax burden falls with time for most trades and industries is the fact that moderate growth in energy consumption has been assumed, while retransferring rises with wages.

Trades and services as well as building and construction are burdened less than previously estimated. This is due to the fact that retransferring by means of labour market contributions has greater value for these sectors than previously assumed. It is also due to the considerable rise in employment in these sectors.

4.6. Government subsidies in the Energy Package

The EU Commission approved the Energy Package in the autumn of 1995. Approval was given with reference to the fact that the Danish CO₂ tax system is in accordance with the fundamental environmental political targets for the Union. Moreover, the Danish CO₂ tax system is in accordance with the principle that the polluter pays.

EU Commission approval was based on the view that the general retransferring schemes as such cannot be characterized as government subsidies. In approving the various elements of the Energy Package, the EU Commission emphasized that the tax refunds to energy-intensive companies are degressive over time, and that possible lacks in degressiveness ensuing from voluntary agreements with energy-intensive companies is countered by requirements for energy savings.

The EU Commission also placed importance on the fact that the process list does not have the objective of protecting special sectors, with no consideration for their energy-intensity. The evaluation confirms that the Danish government has attempted to avoid unwarranted distortion of competition in connection with the process list.

The EU Commission approved the original process list, and the following revisions have also been approved.

Emphasis was also placed on the fact that energy-intensive companies for which the higher refund and tax reimbursement are advantageous, do not obtain a net financial advantage from the Energy Package, since retransferring to these companies will not exceed total energy taxes.

The evaluation shows that the companies which gain advantages from the higher refunds and reimbursements corresponding to processes included in the process list, do not have net financial advantages from the Energy Package, since the total amounts transferred back do not exceed total energy tax revenues. These companies in the agricultural and manufacturing sectors have such high energy consumption that they have a positive net tax burden, even after energy tax refunds and retransferring.

The EU Commission also emphasized the fact that subsidies are only granted for investments in energy efficiency which companies would not have carried out without subsidies, as well as the fact that the directive frameworks have been complied with, regarding subsidy activities and their intensity in general.

4.7 Administrative effects

There is considerable uncertainty in connection with computing the administrative consequences of laws and regulations. Computation of the administrative effects of the Energy Package has been a significant element in the evaluation of the Energy Package.

Administrative effects for the public sector

According to the Office of the Auditor General, the administrative costs for the public sector were estimated to be approximately DKK 50 million. Funds amounting only to DKK 30 million are set aside to cover public sector costs. Thus trade and industry do not contribute fully to the administrative costs in the public sector.

The Energy Package gives rise to a number of complicated administrative duties for the Central Customs and Tax Administration, and the Danish Energy Agency. The two authorities must also co-operate in the administration of the energy tax rebates when companies enter into agreements.

However, the Office of the Auditor General is in favour of improving the monitoring of company statements of energy tax payments. The Office of the Auditor General also wishes to improve collaboration between the Central Customs and Tax Administration and the Danish Energy Agency concerning registration and monitoring of the so-called agreement subsidies.

Administrative effects for companies

The results of the computation of the actual costs for companies shows that there can be very large differences in the administrative burdens caused by the Energy Package from company to company. The size of the administrative costs is partially dependent upon whether a company has heavy production processes or uses fuel for light processes. Companies which receive investment subsidies, and especially agreement subsidies have

larger administrative burdens than other companies have, but, at the same time, also have more advantages in the form of subsidies. In addition, administrative burdens also depend on the size of a company, etc.

The evaluation of the administrative consequences shows that one-time costs in connection with the energy tax system itself have been significantly higher than on-going costs.

Administrative effects of the CO₂ and energy taxes

The Energy Package changed the possibility for energy-consuming companies for compensation of taxes, though there were no major changes regarding the energy-supplying companies.

The administrative burden for energy-consuming companies consists of two elements. Firstly, a company computes its taxable energy consumption during a given period if it wishes to obtain compensation. Secondly, a company must categorize energy consumption in the various categories if it also wishes to obtain full compensation for the portion of its energy consumption for which the energy tax is lowest.

For energy-consuming companies there are rarely costs for physical measurement of total energy consumption, since energy suppliers must indicate the taxable amount of energy on delivery. Company costs therefore consist of on-going identification of special invoices for energy costs for individual forms of energy (electricity, coal, oil, etc.) which can be compensated. In addition, a company must study the rules for compensation when the rules are changed. The costs per company are normally modest, though they include many companies.

The costs of a possible distribution of energy consumption among various uses vary a great deal. In certain cases, distribution according to use can be done on the basis of the qualities of the fuel. In other cases, the same fuel or the same energy source is used for several different purposes. A company must thus bear the costs of installing and reading meters if it wishes to obtain full compensation.

In most cases, all electricity is used for processing purposes, and companies do not have to categorize electricity consumption. Only if a company uses electricity for heating, etc., is it necessary to categorize consumption separately. This is done by metering or by simplified methods which, however, normally result in less compensation than accurate metering does. The extra administrative costs are therefore limited as a result of Energy Package changes in the taxation of electricity consumption.

Of some 400,000 VAT-registered companies, approximately 175,000 received electricity tax compensation. It is not expected that changes in the Energy Package rules for compensation have caused extra costs in these companies. The reason for this is that in nearly all cases, all electricity consumption has been for processing use. Thus companies do not have to categorize electricity consumption (processing, space heating).

With regard to the consumption of fuel, it is more often the case that companies will have additional costs for categorization of consumption for various purposes (space heating, processing). From 1995, the changes could mean somewhat increased costs – especially for installation and reading of meters – for companies which use fuel for both purposes. Some 105,000 companies received compensation for their fuel consumption in 1997.

It is estimated that some 5000 companies use the same fuel for both space heating and processing, especially in the food and beverage industry. In the case of these companies, it is assumed that the extra costs for installing and reading meters have an annually average cost of DKK 5000.

For the remaining approximately 100,000 companies which received compensation for taxes on fuels in 1997, some 65,000 companies do not consume fuel for space heating, and therefore have only process consumption, while some 35,000 companies only consume fuel for space heating.

The administrative burden for these 35,000 companies will cease to exist from 1 January, 1998, as space-heating taxes will no longer be compensated. As companies will no longer compute the amounts they receive in compensation for space heating, they will no longer have any costs in this connection. It is estimated that savings engendered by this change will be approximately DKK 7 million.

It is not expected that the changes in compensation in the Energy Package have resulted in extra costs for the approximately 65,000 companies which consume energy for processing. These companies do not need to categorize energy consumption for various purposes (processing, space heating). They only need to compute their taxable energy consumption if they wish to receive compensation. Computation costs have been evaluated as being unchanged, since companies also had to compute processing consumption prior to the passage of the Energy Package, if they wanted tax deductions.

However, in cases in which companies have both space heating and processing, it is estimated that the rise in company administrative burdens exceeds the reduction in the administrative burdens for those companies which have space heating only. See Table 4.10.

Table 4.10 Changes in administrative burdens caused by energy taxes

DKK million	1996-1997	From 1998
Electricity compensation	0	0
Fuel in companies which use fuel for both space heating and processing	25	25
Fuel in companies which use fuel only for space heating	0	-7 ^{1) 2)}
Fuel in companies which use fuel only for processing	0	0
Total fuel compensation	25	18

1) Change in force from 1.1. 1998

2) Costs resulting from changes in costs for reading and reporting.

There is a great deal of uncertainty regarding these figures. This is especially true of the computation of fuel consumption.

The distribution of the costs will be large. Thus, some companies will have significantly higher costs, especially for meters, e.g., those companies which categorize their process energy-consumption as both light and heavy process. Other companies have had considerably lower costs for meters.

Administrative sulphur tax costs

Companies pay sulphur taxes on goods which contain more than 0.05 per cent sulphur. However, there are only about 350 companies which report or receive compensation for energy taxes in compliance with one of the following methods:

1. according to the sulphur content of fuels – approximately 300 companies use this method
2. according to emissions – approximately 20 companies use this method
3. according the fuel content of fuels less the sulphur content in the ashes – approximately 30 companies use this method.

The administrative costs are estimated as being modest for the approximately 300 companies which report for compensation according to the sulphur content of the fuels. Companies must take regular samples of their fuels to determine their sulphur content. Companies also took samples of their fuels prior to the passage of the sulphur tax law. Companies which report the sulphur content of their fuels for compensation have not had extra costs for meters, either. It is estimated that the administrative costs for these 300 companies totals approximately DKK 1 million annually. This amount includes the computation of the sulphur tax and possible invoicing of the sulphur tax, as well as reporting to the Central Customs and Tax Administration.

The administrative costs for companies which receive compensation for the sulphur tax on the basis of sulphur emissions from the company is estimated as being modest, since these companies also metered their emissions prior to the passage of the Energy Package legislation. Against this background, the rise in administrative costs for companies with sulphur emissions is estimated as totalling approximately DKK 100,000 annually.

The administrative costs for companies which receive compensation for the sulphur tax according to the sulphur content in their fuels less the sulphur content in the ashes is estimated to be larger for some than is the case when other reporting principles are used. Companies may choose between computing the sulphur content in the ashes according to stipulations laid down in the law, or may take samples.

It is estimated that the administrative costs for companies which receive compensation for the sulphur tax according to sulphur content of the fuels and the sulphur content in the fuels less in the ashes have been approximately DKK 0.5 to 1.0 million annually, i.e., an average of approximately DKK 25,000.

Administrative effects of investment subsidies

Application must be made for subsidies for energy-saving measures. All VAT-registered companies may apply for subsidies.

There are two main types of project: standard solutions and individual projects.

Here, administrative work includes completion of application forms and requests for payment. Company work involved in implementing projects for which subsidies are sought is not included. Application for subsidies must be made on special forms supplied by the Danish Energy Agency. These forms must be completed, signed, and expected energy

savings, investments, time-frames, etc., documented to the necessary extent. In all cases, it is a one-time procedure which a company carries out alone or in counsel with an adviser.

On request for payment of subsidies, a special form must be enclosed with the project balance sheets with enclosures. For subsidies exceeding DKK 100,000, balance sheets must be certified by an accountant, while applications for subsidies exceeding DKK 500,000 are audited in accordance with instructions laid down by the Danish Energy Agency. In all cases, this is a one-time procedure which a company carries out alone or in counsel with an adviser.

Payment of subsidies takes place on completion of a project. Depending upon the scope of a project, it can take from a few weeks to several years between the time when subsidies are pledged and payment takes place

As the amounts paid in subsidies vary in size from DKK 2000 to 60 million, there is a corresponding difference in the time and costs involved. See Table 4.11.

Table 4.11 Administrative costs of investment subsidies

Type of application:	Standard solution		Individual solution	
	Internal hours	External, DKK	Internal hours	External, DKK
Application	0.5 - 8	0 - 10,000	1 - 20	0-50,000
Payment	0.5 - 2	0-4,000	1 - 5	0-10,000

With some uncertainty, it can be assumed that the main part of standard solutions are carried out without external assistance, while companies with individual applications have used consultants/accountants in over 50 per cent of cases. Here, it is estimated that the total costs in the use of all subsidies comprises DKK 50 to 150 million, corresponding to 3 to 9 per cent of amounts pledged, or 1 to 3 per cent of the total investments of the projects.

Seen in relation to the total reductions of CO₂ up to 2005 which the projects are expected to cause, the administrative costs comprise approximately DKK 10 to 30 per ton CO₂.

Administrative effects of agreements on energy savings

Agreements on energy efficiency are entered between the Danish Energy Agency and companies. Companies obligate themselves to carrying out energy-saving measures and introducing energy management in return for receiving subsidies to reduce the CO₂ tax. Agreements are voluntary. There are two types of agreement, i.e., individual agreements, or sector agreements.

As a basis for entering an individual agreement, companies must carry out an energy audit, compile suggestions for energy management and an action plan to be implemented as part of the agreement. Energy audit is normally done by a consultant, and must be verified by an approved independent verifier. After negotiations with the Energy Agency, the results are laid down in an action plan which precisely determines the measures to be carried out by a company.

Agreements are valid for three years, and companies must make annual status reports to the Energy Agency on the realization of the action plans.

A group agreement contains the same elements as an individual agreement, but is entered into by a group of companies, which are uniform with regard to processes, consumption patterns and technology. Sector organizations or groups of companies may make agreements. The individual companies enter the group agreement and commit themselves to the obligations contained in the agreement.

Agreements have been made with small and large companies, so there is considerable variation in the costs involved. It is estimated that the following costs are involved in individual agreements:

Table 4.12. Time and costs involved in entering agreements		
	Internal hours	External, DKK 1000
Preparation	50 -1000	20-500
Annual reporting	4-40	0-40

By far the most agreements are worked out with external assistance in connection with energy audit, whereas companies only used consultants/auditors to a limited degree in preparing annual reports.

The average amount of time used to reach an individual agreement is estimated as being 100 to 200 hours, with consulting costs of DKK 100,000 to 300,000. Time used on annual reports is estimated as being 10 to 30 hours at a cost of DKK 0 to 20,000.

The costs involved in entering an agreement are very unevenly distributed during the period in which an agreement is in force, since by far the largest portion of the costs is due to the energy audit, i.e., at the start of the period. This means that the relationship between costs and subsidies, which are lowest at the beginning of the period, must be seen over the entire period. Therefore, the total costs during a three-year period, i.e., an energy audit plus three annual reports, are compared to three year's payments in 2000 when subsidies will have been fully phased in. Companies which have entered agreements during the period from 1996, to and including 1998, are expected to receive annual payments totalling DKK 135 million in 2000. Averaged out over a three-year period, this becomes DKK 400 million. Company costs, which are expected to comprise DKK 20 to 50 million are thus 5 to 12 per cent of the subsidies paid.

In relation to the CO₂ reductions, which the agreements are expected to cause up to 2005, the administrative costs are estimated to comprise DKK 30 to 60 per ton CO₂.

Total administrative company costs resulting from the Energy Package are listed in Table 4.13. Much evidence suggests that the changes in taxes resulting from the Energy Package cause administrative costs per CO₂ reduction of the same size as the investment subsidies of the package, while the costs of agreements per reduced unit of CO₂ are higher than for taxes and investment subsidies.

Table 4.13 Changes in administrative burdens resulting from the Energy Package

Average annual change 1996-2005	Avg. annual administrative costs, DKK mill.	Avg. annual reduction in CO ₂ emissions, mill. tons	Administrative costs comp. to CO ₂ reductions, DKK per ton
Taxes	7-40	0.8	9-50
Investment subsidies	5-15	0.5	10-30
Agreements	7-15	0.2	30-60
Entire CO ₂ package	23-68	1.5	15-45
		Reduction in SO ₂ , 1000 tons	Administrative costs comp. to SO ₂ reductions, DKK per kg
SO ₂ tax	1.6-2.1	15	0.07-0.10

In total, the costs of energy tax increases are highest, followed by agreements and investment subsidies. If the period on which calculations are based is projected into the future, the costs of all three instruments would fall per reduced unit of CO₂.

4.7. Projection of CO₂ emissions to 2005

As a part of this evaluation, total CO₂ emissions have been projected to 2005.

Denmark's national target for the energy sector is that emissions of CO₂ should be reduced by 20 per cent in 2005 in relation to emissions in 1988. This target is to be reached by national measures.

At the passage of the green Energy Package, it was noted that measures were lacking for 5 per cent of the reduction of CO₂, if the target was to be reached.

In the new projection, it is estimated that there still will be a CO₂ shortage of 4 to 5 per cent in 2005 in relation to the national CO₂ target. This shortage is due primarily to the fact that CO₂ emissions from the transport sector are expected to increase by 25 per cent in relation to 1988.

With regard to CO₂ policy, it is a general prerequisite that the policy, which is described in the energy action plan, *Energy 21*, from 1996, is carried out.

The costs of private households will be increased as established in the tax reform and the Whitsun Package. After 2002, the actual tax level will be maintained.

It is a prerequisite that there be an expansion of combined heat and power, and a change of fuel consumption in the supply sector in the direction of increased utilization of renewable energy and natural gas.

In the traffic sector, it is a prerequisite that petrol prices follow the tax rises, which were passed in the Whitsun Package, up to 2002.

Mutual and flexible instruments are included in the Kyoto Protocol (e.g. internationally negotiable quotas) as a means for cost-effective reduction of CO₂ emissions. There is, as

yet, no clarification as to how these instruments are to be implemented, for which reason they are not included in the projected figures.

Due to the regulations in the Energy Package, CO₂ emissions in VAT-registered trades and industries will be reduced by 4 million tons. See Table 4.13.

Table 4.13 Developments in CO₂ emissions up to 2005					
	Level mill. tons	Average growth rate		pct	Changes mill. tons
	1997	1988- 1993	1994- 1996	1997- 2005	1988- 2005
VAT-registered trade & industry	27.6	-0.4	-1.5	-0.4	-4.0
Other enterprises	2.4	-0.4	-1.1	-0.2	-0.4
Households	15.5	-1.6	-2.6	-2.7	-7.3
Transport	11.7	1.4	1.8	0.9	2.5
Total	57.2	-0.5	-1.1	-0.6	-9.1

Other enterprises and households also contribute emission reductions. The transport sector increases CO₂ emissions by 2.5 million tons in relation to the 1988 level, corresponding to an increase of 25 per cent. Emissions from the transport sector will increase by 9 per cent during the 1996 to 2005 period.

CO₂ intensity will fall by 32 per cent in relation to the 1988 level. Part of this reduction will be due to reductions in energy-intensity, but there are also demands for considerable reductions in CO₂ emissions per unit of energy. Restructuring in the supply will contribute more than half of these reductions, but also the fuel purchasing of trade and industry will turn towards fuels with lower CO₂ content, such as renewable energy and natural gas. The CO₂ taxes, subsidies and agreements encourage these trends.