7. Policy measures in industry sector

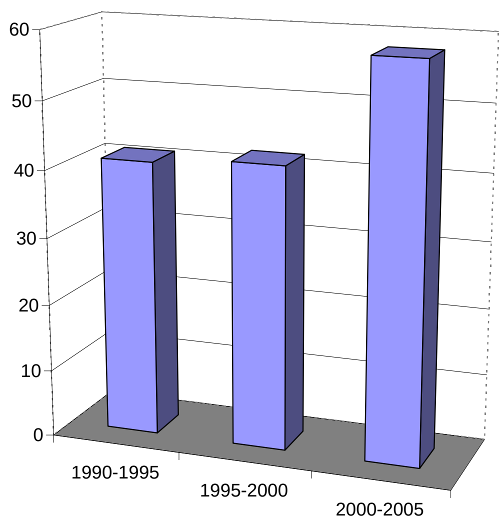
Industrial energy efficiency has been decreasing regularly over time; progress in energy efficiency, in contrast, has stagnated at the EU-15 level since around the year 2000. The question to be asked is whether new market-based instruments such as the EU Emission Trading Scheme (EU ETS) can boost energy efficiency measures in the future? Although some measures, such as subsidies to support industrial audits and investments in energy efficiency continue to be promoted, there has been a substantial change in the policy measures used over the past decade. These have passed through a phase in which voluntary/negotiated agreements or benchmarking agreements were used as the instrument of choice to the new EU-wide emission trading scheme. This scheme also allows CO_2 emission reductions to be made elsewhere to some degree through the EU Linking Directive which encourages Clean Development Mechanism (CDM) projects. This section discusses the extent to which the different types of measures have affected industrial energy efficiency.

7.1. Patterns and dynamics of energy efficiency measures

Increasing number of industry measures in recent years due to new market-based instruments

The number of measures in the industry sector remained fairly constant over the 90s but has grown substantially in the current decade (**Figure 7-1).** This can be explained by the fact that the ongoing and renewed voluntary agreements, which were the main policy instrument in the period 1995-2000, have been increasingly accompanied by new market-based instruments. This development reflects the increasing recognition that at an EU-wide approach to industrial energy efficiency is necessary in order to cope with intra-EU competition. Voluntary agreements at the national level suffered in many countries from the fact that most of the apparent efforts made by industries were actually only business-as-usual developments.

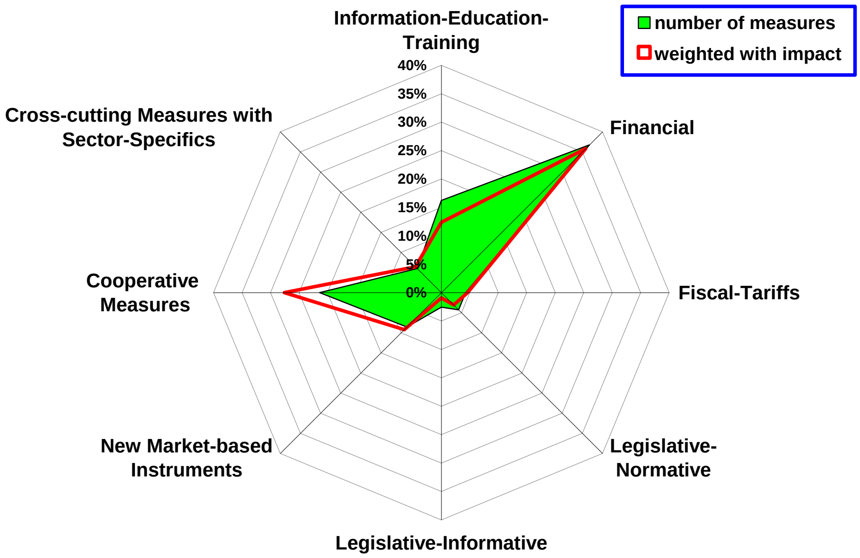
Figure 7-1: Evolution of the number of measures in the industry sector (EU-15)



Main focus in industry on financial and cooperative measures

Which types of measures have governments used the most to try and stimulate industrial energy efficiency? Energy efficiency in the EU industry has mostly been promoted through financial support (e. g. for industrial energy efficiency audits and investments) or co-operative measures (voluntary/negotiated agreements), see **Figure 7-2**. Information/education/training measures and measures based on new market instruments, such as the EU ETS, are less common. When differences in impact are taken into account, voluntary agreements appear to be more significant than their actual number indicates. However, this varies from country to country; the Dutch Long-Term Agreements and Benchmarking Covenants appear to be the most efficient ones.

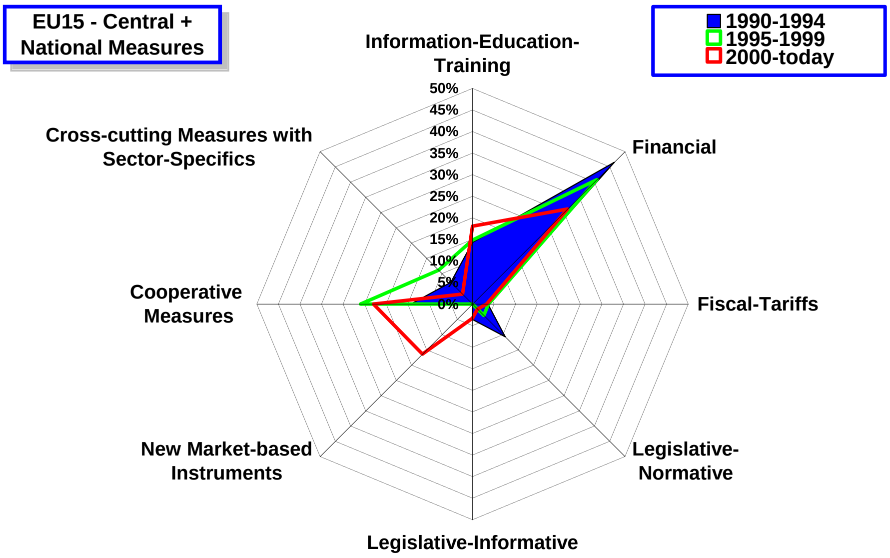
Figure 7-2: Measure types and impacts in industry since 1990 (EU-15)



There is a tendency to replace voluntary agreements with new market-based instruments, but some were still being initiated until very recently

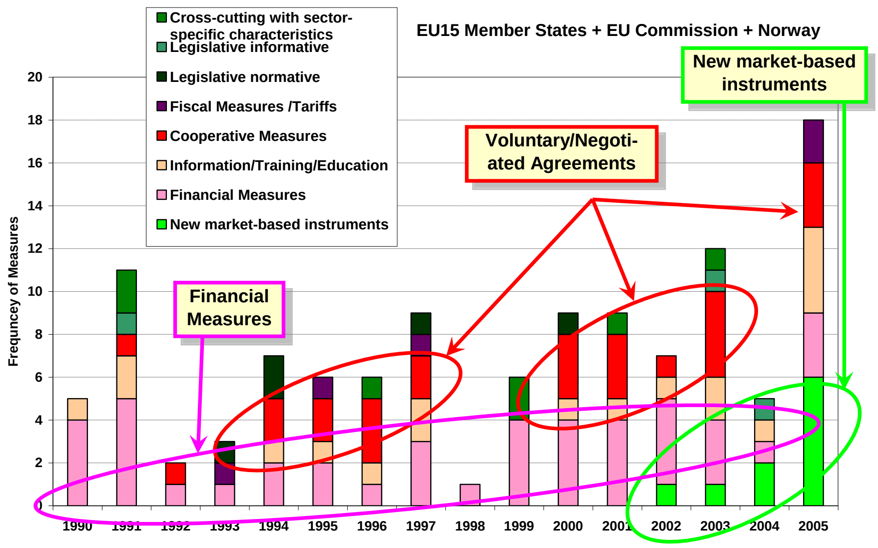
The relative importance of financial measures has been decreasing slightly over time when compared with the recent growth in cooperative measures and new market-based instruments (**Figure 7-3**).

Figure 7-3: Development of measure types over time in the industrial sector (EU-15)



With respect to voluntary agreements, the main question is whether they will continue to be as important due to the increasing use of new instruments. A closer look indicates that, since the second wave of voluntary agreements at the beginning of the decade, they are now being increasingly replaced with new instruments while financial measures continue to be used (**Figure 7-4**). Nevertheless, in 2005, three new voluntary agreement schemes were set up in Ireland, Spain and Sweden.

Figure 7-4: New market-based instruments are replacing or complementing cooperative and financial measures (EU-15)

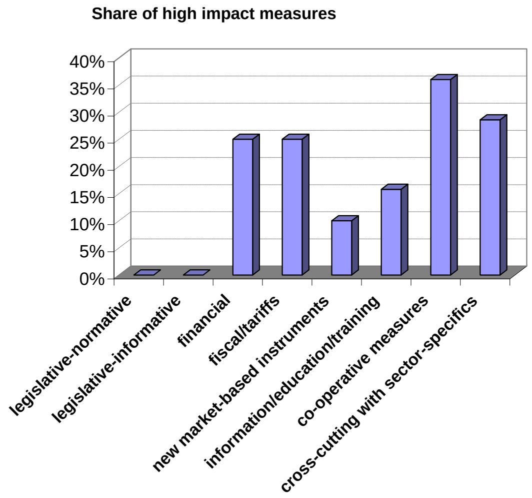


When looking at the impacts of measures[101] (**Figure 7-5)**, however, cooperative measures have the largest share of high impact measures. About 35 % of this measure type is considered

[101] For most measures a qualitative impact "low", "medium" or "high" has been specified. These ratings represent different ranges of energy savings, expressed as a percentage of the total consumption in the sector regarded. Low is given for 0-0.1% of total use, medium for 0.1-0.5% and high for >0.5%.

to have high impacts. High impacts are also associated with financial and fiscal measures, including cross-cutting measures such as energy/CO_2 taxation, while the share of high impact measures in information/education measures and new market-based instruments is low.

Figure 7-5: High impact measures by type (industry sector, EU-15)

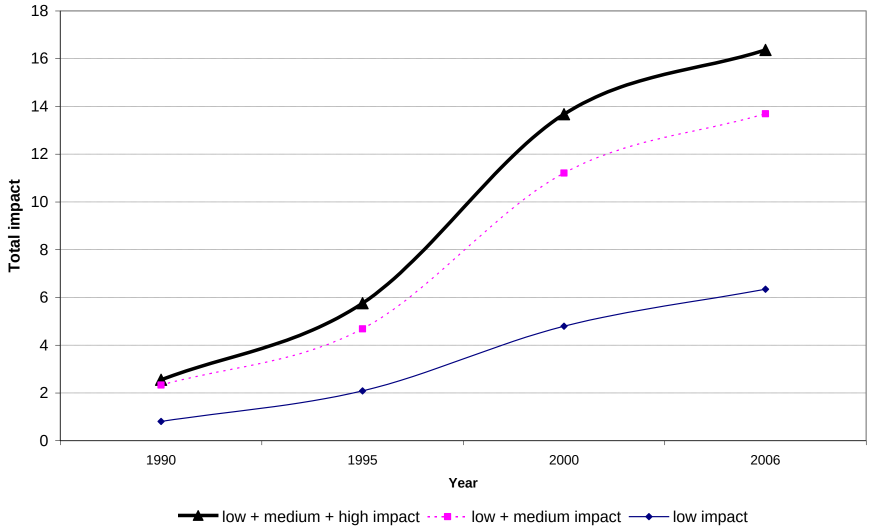


There seems to be some contradiction in the fact that about one third of all financial measures in the industrial sector are regarded as inefficient compared to only 12 % low impact measures among cooperative measures. Financial instruments continue to be the most common instrument in the industrial sector and they are very important in combination packages with energy audit schemes and voluntary agreements as applied in Finland (see below).

No high impacts are associated with legislative-normative or informative measures in the industry sector, but the overall importance of these measure types is low.

Figure 7-6 shows the development of the total policy impact at EU-level for the period 1990-2006. The overall impact has been increasing continuously, with particularly marked growth during the 90s indicating a larger density of measures, but this then stagnated after 2000. This is due to the dearth of high impact measures after 2000 and taking into account the fact that the new market-based instrument of emission trading has not yet had time to affect energy efficiency. Attributing the total impact to measures rated low, medium or high shows that the policy measures rated "medium" have the most important impact. The most commonly used type of measure, voluntary agreements, was considered to be a medium impact measure in many countries.

Figure 7-6: Development of total impact of policy measures per category at EU-level[102]



Note: ongoing and completed measures, weighting factors 5 (high), 3 (medium) and 1 (low). The impact results for all countries have been averaged using industry final energy demand in 2000 as a weighting factor.

The lifetime of measures in the industry sector depends on the type: the vast majority of financial measures have limited duration. To a smaller degree, information/education/training and some cooperative measures also had limited duration.

Lack of specific measures for cross-cutting industrial technologies

Although cross-cutting technologies in the industrial sector (compressed air, pumps, electric motors, ventilation and air conditioning, steam generation, cooling etc.) are in principle covered by a large number of general measures aiming at industrial energy efficiency, they would benefit from specific programmes devoted to cross-cutting technologies. Finland and Germany, for example, have specific compressed air programmes while the EU-wide Motor Challenge Programme targets electric motors. In general, cross-cutting technologies are particularly important for electricity savings as they represent around 70 % of industrial electricity consumption. Cross-cutting technologies are also better targeted by benchmarking audits than process-specific technologies because they are more homogeneous and involve a much larger number of units. Therefore, they can also be more easily targeted by energy service activities in the industrial sector.

The hidden importance of audit measures in the industrial sector

Although only around 16 % of the measures are specifically directed at audits (in the form of legislative-informative measures, financial support for audits, or voluntary audits), their true significance is much greater, since energy audits are often a vital part of a package of measures. If measures are included which are indirectly linked to energy audits, the corresponding share rises to 37 %.

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102 The measures are weighted according to their relative energy savings. Given the previously mentioned ranges weighting factors of 5 (high), 3 (medium) or 1 (low) are used.

Audits in the industrial sector generally form the basis for targeted subsidies of energy efficiency which in turn may influence larger investments. **Table 7-1** shows the relationship between expenditure for audits, subsidies and total investments. There are differences observed in the specific costs for audits or subsidies per GJ saved which could indicate differences in the efficiency of the audit/subsidy schemes. However, such comparisons require more detailed study of the different audits involved, as the type of measure and company involved may vary which in turn influences the cost of the audits.

Table 7-1: Examples of expenditures for audits, subsidies and total investment (Euro per GJ saved)

Country ►	Finland	France	France	Norway	Norway	UK
Type of activity ► Euro/GJ saved 🡻	audit subsidies EAP [1]	audit subsidies DMSS [2]	audit subsidies [4]	audit subsidies [4]	subsidy programme [5]	subsidies/ audits [6]
Cost to implement the audit scheme	0.05	0.35				
Subsidies for audits	0.35	3.3	0.81	0.21		
Subsidies for investments					1.6	1.49
Total investments influenced by subsidy programme					9.7	

Note: in 2000 the price of one GJ of oil or gas was typically in the range around 6-9 Euro/GJ. The subsidies related to investments as well as the total investments influenced are related to the savings achieved during the running time of the programme.

[1] Energy Audit Programme (Finland)
[2] Decision Making Support Scheme (France). According to the original source, the high costs may be due to the fact that the start-up phase of a scheme always incurs higher costs than a scheme which has already been running for several years
[3] Energy audits subsidies in industry
[4] "Cleaner production and energy efficiency in industry" (Programme "renare produksjon og energiøkonomisering")
[5] Investment grants for energy-saving measures (Tilskuddsordningen)
[6] Carbon Trust - Industry

Source: Audit II Summary Report

7.2. High impact energy efficiency measures

High impact measures in the industrial sector are frequently cooperative or financial measures[103]

About 22 % of all measures introduced in the industry sector in the EU-15 are considered to be high impact measures. **Table 7-2** shows a list of these measures.

Table 7-2: High impact measures in the EU-15 industry sector

Austria	'Environmental Support' managed by the Austrian Environment Ministry	**Financial**
Belgium	Voluntary agreements on energy efficiency or CO2	**VA/NA**
Germany	Voluntary agreement with German industry I	**VA/NA**
Ireland	Energy Agreements	**VA/NA**
	Best Practice Programme -Large Energy Industry Network	IET
Netherlands	Long Term Agreements with Industry on Energy Efficiency	**VA/NA**
	Long Term Agreements with the Industry (second edition)	**VA/NA**
	Environmental Action Plans by the Energy Distribution Sector	**VA/NA**
	Long Term Agreements with the Oil and Gas Industry	**VA/NA**
	Benchmark Covenant	**VA/NA**
	Vamil Scheme: Accelerated Depreciation on Environm. Investment	Fiscal
	Long Term Agreements with the Refineries Sector	**VA/NA**
	Energy Tax	Fiscal*
	Energy Investment Deduction Tax (EIA)	Fiscal
Norway	Energy management – companies in networks	**Financial**
	Reduced energy use - industry (Redusert energibruk - industri)	**Financial**
	Investment grants for energy-saving measures (Tilskuddsordningen)	**Financial**
Spain	IDAE-ERDF Programme for SMEs (Programa IDAE-FEDER para PYMEs)	**Financial**
	Action Plan 2005-2007: Energy Audits. (Plan de Acción 2005-2007: Auditorías Energéticas).	IET
	ICO-IDAE Financing Line for Renewable Energies and Energy Efficiency Projects	**Financial**
	Savings Programme of the Energy Efficiency and Conservation Plan EECP, 1991-2000 (Programa de Ahorro del PAEE 1991-2000)	**Financial**
	Cogeneration Programme of the Energy Efficiency and Conservation Plan EECP 1991-2000	**Financial**
	Energy Saving & Efficiency Strategy in Spain (E4) 2004-2012: Technologies in New Processes	**Financial**
UK	Emissions Trading Scheme - UK (and EU)	New MBI
	Climate Change Levy	Fiscal*
	Climate Change Agreements	**VA/NA**
	The Carbon Trust - (Various initiatives)	Integral measure set

* Fiscal, cross-cutting (energy/CO_2 taxation)

NA/VA = Voluntary/Negotiated Agreement; IET=information/education/training; New MBI=New market-based instruments

[103] High impact measures are measures with energy savings >0.5% of the total consumption in the sector.

Nearly half of these measures are voluntary/negotiated agreements. Financial subsidies (e. g. for energy audits) also play an important role. Fiscal measures in the form of energy/CO_2-taxes, climate change levies or accelerated depreciation for investments in energy-efficient equipment also appear on the list, while information/education/training measures are less likely to be regarded as having a high impact. The same is true for new market-based instruments such as the EU ETS, which so far has not managed to make a significant impact on CO_2-emissions and, indirectly, on energy efficiency. However, this is a completely new instrument, which needs time to properly develop (see the discussion below).

7.3. Innovative energy efficiency measures

For most of the innovative measures described here it is too early to judge whether they may or may not have a major impact on future industrial energy efficiency, but they do have the potential to be high impact measures.

Examples of particularly innovative measures in the industry sector include:

- ***New market-based instruments, in particular the EU ETS*****:** the EU ETS is by far the most important innovation of recent years concerning industrial energy efficiency measures, even though its main target is actually to reduce emissions of CO_2. Its medium- to long-term impact on improving energy efficiency may be quite large.
- *The* ***inclusion of energy efficiency criteria in environmental permits*****:** incorporating energy efficiency criteria into environmental permits is one of the few regulative measures in the industrial sector.
- ***Energy Audit Procedure for Transport Chains*****:** improving transport chains for industrial companies situated on the crossover ground between the transport and the industrial sector tackles important aspects "upstream" (delivery of production inputs) and "downstream" (product delivery) of the main industrial activity.
- ***Measure packages for the industrial sector*****:** the most complete measure packages for the industrial sector comprise a combination of voluntary agreements, an energy audit and a financial support package to support the realisation of the savings identified in the audit. Such packages achieve synergies from combining the three instruments.

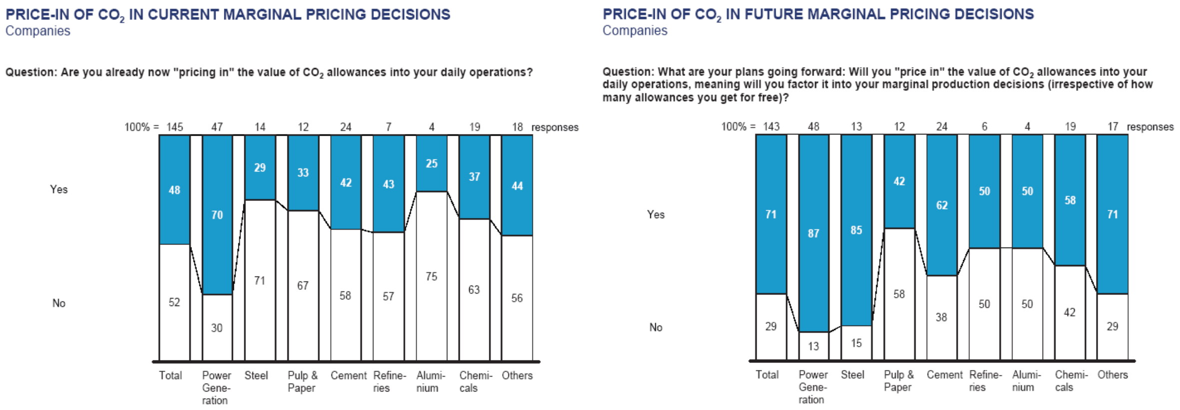
New market-based instruments

January 2005 saw the launch of the European Union Greenhouse Gas Emission Trading Scheme (EU ETS), the largest multi-country, multi-sector greenhouse gas emission trading scheme world-wide. The scheme is based on Directive 2003/87/EC which was implemented on 25 October 2003. From the perspective of energy efficiency, it is particularly interesting whether the ETS will influence companies to undertake investments in energy efficiency. The following conclusions can be drawn so far on the functioning of the system:

(1) **The ETS is functioning as a market and triggers energy efficiency through higher prices:** the participating industrial branches are already pricing carbon into their products to varying degrees as is evident from a survey conducted on the ETS (McKinsey/Ecofys 2005). Energy suppliers are even more advanced in this respect. The percentage of companies who include CO_2 in future marginal pricing decisions will continue to increase (**Figure 7-7**). The fact that CO_2 certificates which were allocated at no cost in most cases via "grandfathering" schemes (i. e. based on historical emissions) have contributed first to the recent increase in fuel prices for

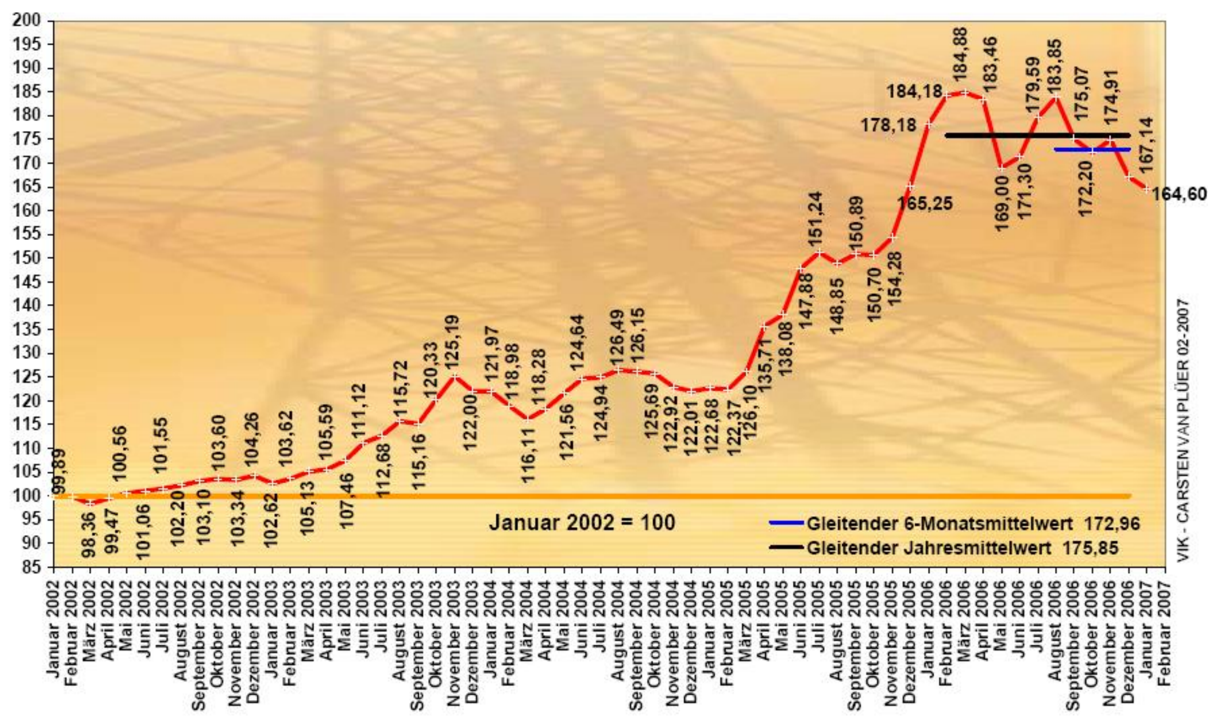
power generators and in particular to the rise in electricity prices for industrial companies (**Figure 7-8**) has resulted in dispute, but is actually the logical consequence of a functioning market and will lead to higher electricity efficiency in the long term. However, the free allocation method is being debated and, in the future, it is being suggested that auctioning should increasingly be used as an allocation method.

Figure 7-7: ETS as a functioning market: CO_2 certificates are priced into products



Source: McKinsey/Ecofys (2005)[104] - MURE Database

Figure 7-8: Development of industrial electricity prices for medium voltage levels (Germany, Index January 2002 = 100)

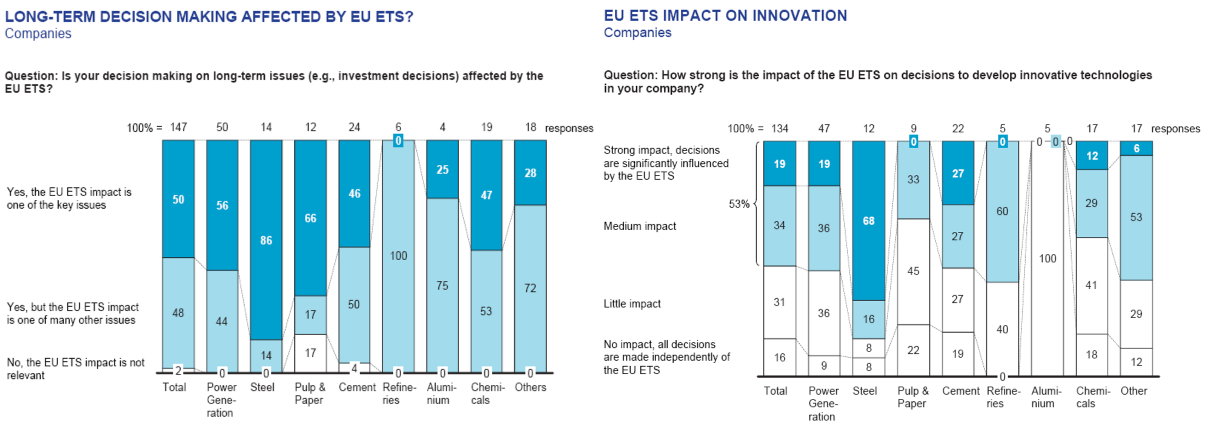


Source: VIK (2007)[105] - MURE Database

[104] http://ec.europa.eu/environment/climat/pdf/highlights_ets_en.pdf
[105] http://www.vik-online.de/fileadmin/vik/Strompreisindex/Index-Grafik.pdf

(2) **Long-term investment decisions and the development of technical innovations are clearly influenced by the EU ETS** (**Figure 7-9**) albeit to a varying extent across branches. While branches like the iron and steel industry which face strong competition world-wide indicate that they are interested in developing innovative solutions, other industries which are less exposed to competition, e. g. cement companies, might pass price increases on to the consumer.

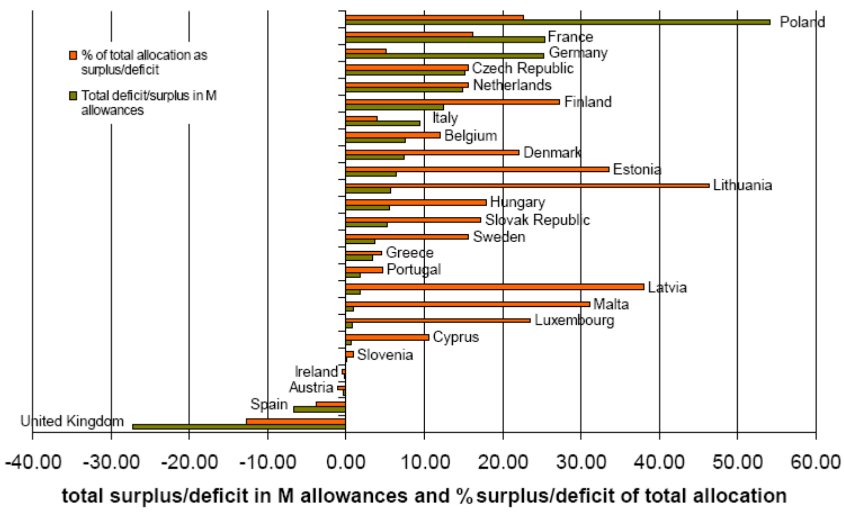
Figure 7-9: Long-term investment decisions and innovation triggered by the EU ETS



Source: McKinsey/Ecofys (2005) - MURE Database

(3) **No major emission reductions can be expected in the first phase of the EU ETS** which lasts from 2005-2007; in particular **no industrial energy efficiency measures will be triggered by the EU ETS**! This was clear after the 2005 emissions were published and it was revealed that, in comparison to the allocated amounts, the real emissions were considerably lower (**Figure 7-10**). The consequence was a large price drop in CO_2 certificate prices from the maximum price of around 30 Euro/t CO_2 to a record low of less than 2 Euro (**Figure 7-11**). Prices will not recover within the first ETS period because banking to the second period is now permitted.

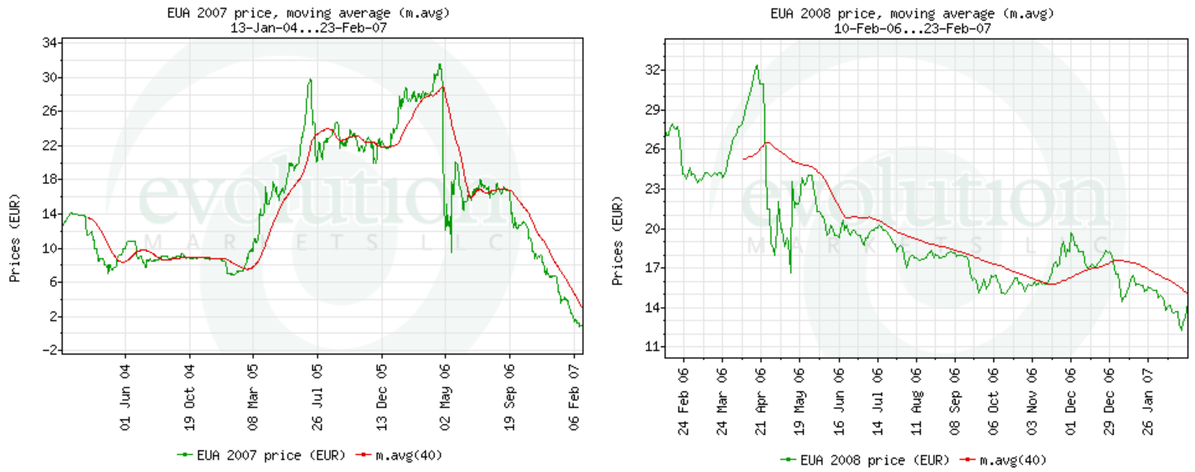
Figure 7-10: The EU ETS – results from 2005



Source: DEFRA (2006)[106] - MURE Database

[106] http://www.defra.gov.uk/environment/climatechange/trading/eu/results/pdf/uk-summary.pdf

Figure 7-11: Historical prices for emission credits in the European ETS 2004-2007 and forward prices for 2008



Source: evomarkets (2007)[107] - MURE Database

(4) The ongoing **decisions on the second ETS period 2008-2012** and hence the decisions on the 2nd National Allocation Plans (NAP II) will show how much the ETS can contribute to enhancing energy efficiency. The EU Commission has drawn some conclusions from the 1st phase and is currently cutting the allocations requested by the EU Member States to the 2005 emission levels on average (**Table 7-3**). Countries which will have to cut their emissions in the future compared to 2005 emissions are still rare, although the unexpectedly strong economic growth of recent times might require greater efforts to reduce CO_2 emissions and hence improve energy efficiency.

Table 7-3: Approved allowances for 2005-2007, verified emissions in 2005, proposed caps for 2008-2012 and approved caps for 2008-2012

Member State	1st period cap	2005 verified emissions	Proposed cap 2008-2012	Cap allowed 2008-2012	Reduction compared to proposed cap	Difference compared to 2005 emissions
Belgium	62.08	55.58	63.33	58.5	-8%	5%
Germany	499	474	482	453.1	-6%	-4%
Greece	74.4	71.3	75.5	69.1	-8%	-3%
Ireland	22.3	22.4	22.6	21.15	-6%	-6%
Latvia	4.6	2.9	7.7	3.3	-57%	14%
Lithuania	12.3	6.6	16.6	8.8	-47%	33%
Luxembourg	3.4	2.6	3.95	2.7	-32%	4%
Malta	2.9	1.98	2.96	2.1	-29%	6%
Netherlands	95.3	80.35	90.4	85.8	-5%	7%
Slovakia	30.5	25.2	41.3	30.9	-25%	23%
Slovenia	8.8	8.7	8.3	8.3	0%	-5%
Sweden	22.9	19.3	25.2	22.8	-10%	18%
UK	245.3	242.4	246.2	246.2	0%	2%
Total 13 countries	**1084**	**1013**	**1086**	**1013**	**-7%**	**0%**

Source: EU Commission (2007)[108] - MURE Database

[107] www.evomarkets.com/mmu

[108] http://europa.eu/rapid/pressReleasesAction.do?reference=IP/07/136&format=HTML&aged=0%3CuageEN&

Box 7-1: Does emissions trading save carbon and energy? – The UK Emission Trading Scheme

The UK-ETS was launched in April 2002 following a 'descending clock' auction held in March 2002. In return for commitments to absolute emission savings relative to historical baselines, thirty-four Direct Participants were allocated a total incentive payment of £215 million over the five years of the scheme (2002 to 2006). Three Direct Participants dropped out prior to the auction which reduced the committed savings relative to the baseline to 1.08 MtCe (MtC equivalent) per annum in 2006. This comprises approximately 0.45 MtC carbon dioxide, 0.4 MtCe fluorinated gases and 0.23 MtCe nitrous oxide and methane. The five annual targets are equivalent to a total cumulative saving relative to the baseline of 3.24 MtCe (11.88 $MtCO_2e$). The incentive payments equate to a price of £65.23 per tCe (£17.79 per tCO_2e).

The original UK-ETS Regulatory and Environmental Impact Assessment (REIA) of July 2001 estimated a carbon saving of 0.7 MtC p.a. by 2010 from the first stage of the UK-ETS. This would rise to 2MtC if the first stage were sufficiently successful to allow expansion of the scheme. Following the incentivised auction, a revised figure of 0.45 MtC was put forward, representing the carbon dioxide component (approx. 42 %) of the total target saving which includes other greenhouse gases. With the advent of the EU ETS, the figure of 2MtC p.a. by 2010 has been upheld to date as the expected contribution to the UK Climate Change Programme from both schemes.

Source: AEA Technology – MURE Database

Energy efficiency criteria in environmental permits in Belgium: In the context of the IPPC Directive (96/61/EC), energy efficiency provisions have been included in Flemish environmental legislation (Flemish government approval on 14 May 2004). For each new plant requiring a permit or for each major alteration to an existing plant – with annual energy consumption in excess of 0.1 PJ – an energy audit must be conducted on energy efficiency. The study must demonstrate that the plant concerned is as energy-efficient as is economically feasible. For existing plants with annual primary energy consumption in excess of 0.5 PJ, an energy plan must be drawn up. Companies which have signed the benchmarking covenant in Flanders meet these requirements de facto. At the same time, the plants with annual primary energy consumption in excess of 0.1 PJ will be required to report their energy consumption.

Energy Audit Procedure for Transport Chains in Finland (KAEMUS): The goal of the energy audit procedure is to develop the transport chain of industries and other operators in close co-operation with the companies using the transport services, associations and companies of the transport sector. The audits include the selection of the transport mode, logistics planning, management of subcontractors, transport fleet selection, driver training, energy-use reporting and communication. In 2005, the focus was on industry and in 2006 on the service sector and cities. Today, industrial facilities which have joined the voluntary agreement scheme in Finland consume approximately 30PJ (835 million litres) of transport fuel per year. This corresponds to fuel expenditures of €500 million and CO_2 emissions of 2.2 Mt per year. The energy saving potential of the transport chains within this group of companies has been estimated at 10 %, corresponding to 3 PJ (84 million litres) reduction in transport fuel use, 220 kt reduction in CO_2 emissions and €50 million reduction in fuel expenditure.

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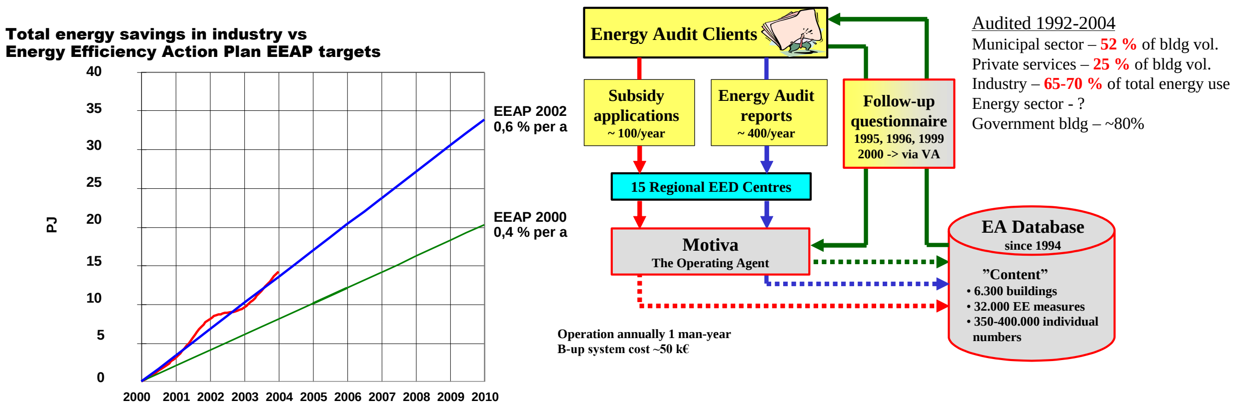
Measure packages for the industrial sector – Finnish voluntary agreements/energy audit/financial support package

The Finnish industrial energy package consists of the following main elements:

- a combination of three instruments: voluntary agreements, energy audits and financial support;
- a highly efficient and relatively cheap data collection (energy audit database, voluntary agreement database and subsidy database) to support the three instruments (**Figure 7-12**);
- a consistent long-term approach from the early 1990s, instead of a stop-and-go policy.

Figure 7-12: Results and energy audit database in the Finnish industrial energy efficiency package



Source: Motiva – MURE Database

7.4. Conclusions

• There are large variations in industrial measure types by country but cooperative and financial measures are by far the most common. The future of voluntary agreements is uncertain due to the introduction of new market-based instruments but they were still being initiated until very recently.

• New market-based instruments such as emission trading are increasingly complementing the measure "tool box". They constitute the strongest link between national measures and EU-policy for energy efficiency in the industrial sector, although the impact on energy efficiency was limited in the first phase of the emission trading scheme.

• Some measures are considered low impact but their number is more limited than in other sectors. High impact measures are mostly negotiated agreements combined with audits and subsidies. Financial measures are regarded as being inefficient compared to cooperative measures but continue to be used as the most common instrument. They are important in measure packages. Similarly, the importance of audit schemes is larger than expected due to their combination with other instruments.

- The coverage of different energy efficiency targets in the industrial sector is generally good but cross-cutting technologies (compressed air, electric motors, pumps, ventilators, industrial lighting, industrial boilers etc.) are not yet sufficiently integrated when compared with process-specific technologies.

- There is a link between policy impacts and improvements in energy efficiency in the industry sector, but there are countries with important policies and low efficiency improvement as well as those with low impact policies but larger changes in energy efficiency.