DANIELA KLETZAN, ANGELA KÖPPL

CO_2 EMISSIONS TRADING – AN INSTRUMENT FOR THE AUSTRIAN CLIMATE STRATEGY

International commitments constitute a considerable challenge for the climate policy pursued in Austria. At the EU Environment Council of 1998, Austria undertook to reduce its greenhouse gas emission rate by 13 percent below 1990 levels. With the introduction of "flexible mechanisms" at the Kyoto climate conference, incentive-based climate policy instruments are increasingly gaining in importance. A national emissions trading system as part of an Austrian climate strategy could help Austria to achieve its goal.

Daniela Kletzan and Angela Köppl are economists at WIFO. The authors are grateful to Norbert Knoll and Kurt Kratena for useful and constructive comments. The data were processed and analysed with the assistance of Alexandra Wegscheider • E-mail addresses: Angela.Koeppl@wifo.ac.at, Daniela.Kletzan@wifo.ac.at, Alexandra.Wegscheider@wifo.ac.at • A WIFO study is available on this subject: Daniela Kletzan, Angela Köppl (WIFO), Barbara Buchner (University of Graz), Ein Erstansatz für ein nationales CO_2-Emission-Trading-System (commissioned by the Federal Ministry of Agriculture and Forestry, Environment and Water Management, 2000; 90 pages, ATS 450/EUR 32.70; orders to be sent to Christine.Kautz@wifo.ac.at)

Under international agreements and commitments, Austria has undertaken to take steps to mitigate greenhouse gas emissions. To this end, incentive-based instruments are taken into greater consideration, in addition to administrative measures. Below, a short overview of the international frame applying to climate policy in Austria is followed by a description of the components of a national CO_2 emissions trading system. An analysis of sectoral CO_2 emissions from energy generation and of taxes on energy in Austria indicates the potential available for national emissions trading. This basis can then be used to discuss possible approaches to such a trading system.

The international frame applying to climate policy in Austria

Ever since the Intergovernmental Panel on Climate Change (IPCC)[1] published its first report, it is widely understood and agreed that anthropogenic activities lead to a growth of greenhouse gas concentration in the atmosphere. A central conclusion of the report was that this increase in concentration consequently contributes to a global rise in temperature.

The IPCC's first report provided a foundation for negotiations at an international political level, which ultimately led to the negotiation and signature of the United Nations Framework Convention on Climate Change (UN FCCC)[2] at the Rio Earth Summit in 1992. By July 1998, 175 countries had ratified the Framework Convention (http://www.iisd.ca/climate/).

The UN FCCC acts as a milestone and base for further negotiations and political action to limit climate change at an international level. The ultimate objective of this Convention is to achieve stabilisation of greenhouse gas concentrations in the atmosphere, and in doing so it assigns a leading role to the industrialised countries (Annex I Parties): article 4 of the Convention commits them to implement measures to effect a reduction of their greenhouse gas emissions. The goal envisaged by it was to reduce emissions to 1990 levels by 2000, however, without stating any legally binding obligations. Developments since have shown that this goal has been clearly missed.

The Convention has as its supreme body the Conference of the Parties (COP), which is responsible for regular reviewing and monitoring national programmes for climate protection and for recording and measuring emissions. It may also agree new commitments in addition to the Framework Convention and adopt protocols on the Convention, as it did in the case of the Kyoto Protocol. The COP is supported in its decision-making proc-

[1] Founded in 1988, the IPCC initially comprised mainly industrialised countries, but grew into a global platform in the 1990s. The first IPCC report was presented in 1990 and attracted considerable attention.

[2] For the full text of the Convention see the Internet under http://www.unfccc.int/, which also offers other documents and links on the Kyoto Protocol and the Framework Convention.

ess by Subsidiary Bodies which prepare the ground for important technical and political issues. The Framework Convention entered into force on 21 March 1994; six COP sessions have since been organised.

The Third UN FCCC Conference of the Parties, attended by 158 parties and held in Kyoto in December 1997, produced what were probably the most far-reaching results. The Protocol adopted at that conference[3] defines binding goals ("Assigned Amounts") for greenhouse gas emissions in 2008–2012, to be applied to 38 industrialised countries (essentially the countries included in Annex I of the Framework Convention). These goals are binding under international law once the Kyoto Protocol is ratified. The objective is to reduce greenhouse gas emissions by 5 percent below 1990 levels. The European Union committed itself to reduce emissions by altogether 8 percent; the contribution by its member states was defined in a "Burden Sharing Agreement"[4]. According to this agreement, Austria needs to reduce its greenhouse gas emissions by 13 percent below 1990 levels.

The Kyoto Protocol of 1997 was the first document to determine binding goals for greenhouse gas emissions in the industrialised countries for 2008-2012. Within the scope of an internal EU burden sharing agreement, Austria commited itself to reduce its emissions by 13 percent below 1990 levels.

Adoption of the Kyoto Protocol has created great expectations with regard to mitigating anthropogenic effects on climate change. The greatest achievement of this Protocol was to set binding emission targets for individual countries. With this Protocol, the first concrete steps were taken towards achieving a reduction of emission volumes as had been formulated in the UN Framework Convention. The Protocol will become effective when at least 55 countries have ratified it which stand for at least 55 percent of the 1990 greenhouse gas emissions caused by Annex I Parties.

Emissions trading as an incentive-based instrument for climate protection

The Kyoto Protocol also makes reference to "flexible mechanisms"[5] in order to achieve the targets. These market-based instruments are founded on the idea of realising potentials for emission reduction by investment in other countries and a transfer of resources at the lowest possible cost. These flexible mechanisms are:

- emissions trading,
- joint implementation (implementation of joint projects to reduce greenhouse gas emissions in Annex I countries),
- clean development mechanism (projects organised by Annex I countries and developing countries).

The instrument allows parties to trade in emissions permits within the scope of a predefined amount of emission allowances. Participants which exceed their respective emission targets are able to sell surplus permits and thus get monetary compensation. This in turn offers an incentive for parties to search for low-cost methods to reduce emissions, and encourages technical change and environmentally friendly technologies.

Both theoretical and political discussions are dominated by emissions trading[6]. The EU Commission published a green paper (*European Commission*, 2000) which aims to act as the foundation for discussion on how to design a EU-wide emissions trading system. In addition, some EU countries have developed strategies for implementing a national system – Denmark and the U.K. will be starting trading emissions permits already in 2001[7].

Under article 17 of the Kyoto Protocol, legal bodies such as governments and companies from Annex I Parties may participate in trading their assigned amounts. This allowed quantity of emissions is defined by a political goal, and the quantity of permits issued corresponds to this maximum allowance. Emissions trading consists of selling and buying emissions permits, which thus constitute a traded good. In this way, emissions permits become assets[8] for those participants which reduce their emissions below the amount assigned to them, and which obtain a monetary compensation by selling their excess allowance. The emissions trading system permits one participant to exceed its own allowance when another emits less than the amount assigned to it and is ready to sell its "unused" permits. A prerequisite for this trade to work is the difference between marginal costs of abatement accruing to the parties concerned. For the environment emissions trading is not detrimental, since the same state is achieved as would prevail if both participants had fully used their permits and exactly met their emission limits.

[3] For a general overview of the Kyoto Protocol and its background see *Grubb – Vrolijk – Brack* (1999).

[4] The emission targets for each EU country were negotiated at the Environment Council in June 1998.

[5] The Kyoto Protocol focuses on flexible mechanisms. For a national climate policy, however, other measures such as taxes, regulations or voluntary agreements are important as well.

[6] Experience in emissions trading is available, i.a., from the SO_2 emissions trading system practised in the USA.

[7] For the Danish quota system see *Danish Parliament* (1999) and *Zarganis* (1999), for the British system see *Emissions Trading Group* (1999).

[8] The value of emissions permits is limited in time: they are generally valid only for a given period (e.g., for the first commitment period of 2008-2012).

The key aspect of emissions trading thus is to be found in its economic efficiency: a market mechanism makes sure that activities to cut emissions take place exactly where they generate the lowest costs. In addition, emissions trading is effective also in environmental terms, since it makes sure that a given environmental goal is achieved. Trading in emissions permits offers an incentive to exceed the individual goal and then sell surplus permits. The search for low-cost methods to reduce emissions encourages technical change and the development of environmentally friendly technologies.

Design elements for an emissions trading system

The concrete design of an emissions trading system involves a number of options, each of which results in different effects and incentives. Among the key elements[9] are:

- type of trading system, i.e., the number and kind of companies and sectors included;
- allocation of permits to participants;
- design of an efficient control and monitoring system for actual emissions, permit transfers and compliance.

Type of trading system

The type of trading system to be implemented (i.e., the definition of participants) is of great importance for ensuring that the environmental goal is achieved and that permits are actually traded. To this end, as many emitters as possible should be included and the maximum amount of emissions covered. Criteria are technical and administrative feasibility and the resulting costs. Possible alternatives for a CO_2 emissions trading system are the upstream and downstream approaches:

- The upstream approach (*Hargrave,* 1998) obliges producers and dealers (including importers) of fossil fuels and of goods and substances which cause emission of CO_2 to hold permits. The end user receives a price signal from the market: energy sources are getting more expensive.

  An upstream system offers a number of advantages: always providing that the price effects caused by limiting emissions are actually effective and that the cost for the permits is passed on to consumers, the price signal will reach most of the CO_2 emitters in the various economic sectors. Depending on energy intensity, the cost for end users will rise, which also provides for equitable distribution of the cost burden. What is more, the upstream system includes only a limited number of companies, so that the administrative effort required for monitoring is lower.

  The upstream system nevertheless entails disadvantages as well: the price effect of limiting emissions is difficult to determine – it is extremely complicated to assess how the price will increase and how the permit cost will be shared among production stages. The incentive for end users to reduce emissions may be lower than in a system which is applied directly to the end users. Another problem may be that the number of participants with different marginal abatement costs may be insufficient to start effective trading in emissions permits.

- In contrast, the downstream approach (*Festa,* 1998) obliges emitters, in their capacity of polluters, to obtain permits, which puts a direct burden on the consumption of fossil fuels. According to the polluter-pays principle, the end user needs to hold permits corresponding to the emissions caused by the user.

  With given cost structures and technological opportunities, emitters are entirely flexible in determining how they will comply with their emission targets. Consequently they have a major incentive to search for the most cost-effective options to reduce emissions, since they can then sell unused permits and obtain monetary compensation. The incentive to change the input, strive for technological innovation or use energy more efficiently is much higher for the end user than in the upstream system. The downstream system would include a higher number of emitters, which in turn would increase the probability of a functioning market (greater differences in marginal abatement costs). On the other hand, however, the downstream system is much more complex than the upstream system, due to the heterogeneous structure of emitters and the greater number of participants. The result would be greater administrative burden, and monitoring and implementing the trading system would be more expensive.

  A downstream system would not cover all emitters, since it appears to be impossible to include all SMEs, private households and traffic participants due to the high administrative effort required. The emissions not considered by the downstream system

Key design elements for an emissions trading system include a definition of participants, allocation of permits and efficient monitoring. These elements should be designed to ensure a functioning market as well as achievement of the environmental target, with due regard to different incentives and distributional effects generated by alternative options.

[9] Other elements would be, e.g., "cap and trade" versus "baseline and credit" (*OECD,* 2000) or ways to consider early emissions reductions.

should thus be regulated by complementary policy measures, including in particular other economic instruments.

Allocation of emissions permits

Another key element of emissions trading is the allocation[10] of permits. Basically, two methods are available: auctioning and grandfathering, i.e., the free allocation of permits based on historical emissions.

Provided that they are carried out regularly and transparently, *auctions of emissions permits* offer all participants equal opportunities to acquire permits. Auctioning ensures that permits are obtained by those emitters who assign the greatest value to them. In this way, an economically efficient distribution is achieved which provides an incentive to actually reduce emissions, for as long as the cost of abatement is lower than the cost of buying the permits by auction. The method is also in line with the polluter-pays principle.

The revenues accruing to the state from the auction can be "recycled" by mitigating distorting taxes (e.g., wage taxes) or promoting measures to improve energy efficiency. Regular auctions make for a level playing field for incumbents and new emitters, since all participants can acquire permits at the same terms. Auctioning also quickly assigns a price to permits, which in turn minimises the planning risk for business.

From a theoretical point of view, this allocation method would be preferable, due to its economic efficiency. When the revenues are redistributed, consideration can be given to specially affected participants. Auctioning, however, causes higher costs for those who are required to hold permits, already at the start of the trading system (because of its interference with existing rights).

Grandfathering means that emitters are issued free permits shared out by a specified allocation formula. It is usually based on the emissions of one or a few base years, which would be 1990 according to the Kyoto Protocol. The advantage of this mechanism is that existing company rights are not affected and that those companies would not find themselves confronted with additional capital requirements at the start of emissions trading.

A disadvantage is that exact data are required on past emissions for each emitter, figures which are not always available. It is also important to develop a formula for distributing the permits which is deemed fair by the participants. Grandfathering is also in contradiction to the polluter-pays principle: emissions permits represent a rise in the net assets, which accrues to the emitters free of charge.

With this type of allocation, special consideration should be given to opportunities for newcomers to the market. Grandfathering could put those companies which enter the system at a later date at a disadvantage: rather than obtaining permits in the same simple manner as incumbent firms did or at an auction, they need to acquire them on the secondary markets, i.e., they have to find somebody to buy unused permits from. Newcomers thus would be faced with higher capital costs than companies which are assigned permits free of charge, and would thus find themselves confronted with barriers to entry. For this reason, a modified version of grandfathering is being discussed. This provides for a number of permits to be retained for market entrants which would then be distributed free of charge under a similar formula. Nevertheless this poses the question of whether these new emitters would not be given preferential treatment by being assigned free permits, since they can design their activities in line with emissions trading requirements (e.g., by using environmentally friendly technologies) and they are not burdened by the cost of stranded assets.

The type of allocation also impinges on the distributional effects for participants and non-participants in emissions trading. Regardless of the allocation mechanism actually used, the (opportunity) costs of holding permits are – at least partly – passed on to downstream sectors and consumers. These could thus find themselves in a worse position if emissions permits were allocated for free than if they were auctioned off, since the state does not receive revenues which could then be used to cut other taxes. The allocation of free permits would thus discriminate in favour of companies and sectors participating in emissions trading (*OECD*, 1999).

[10] On the allocation method see, i.a., *Cramton – Kerr* (1998), *Fischer – Kerr – Toman* (1998), *Australian Greenhouse Office* (1999), *Zhang* (1999A, 1999B) or *European Commission* (2000).

Administration and monitoring of emissions trading

Once an emissions trading system has been established, achievement of the target depends on how consistently monitoring and implementation procedures are applied[11]. The success of the trading system is to a large extent determined by the type of administration, data collection and monitoring. A transparent system based on standardised monitoring processes strengthens the confidence of participants in the system, and at the same time eliminates incentives to exceed emission limits, which in turn guarantees that the environmental goal is achieved. Administration needs to meet the following requirements:

- measuring and monitoring of CO_2 emissions of all participants, possibly by way of quantity accounting of energy sources used;
- reporting emission data to the monitoring body; the data should be kept in individual accounts jointly with information on permit transfers, which makes it easier to monitor whether a given participant holds an adequate number of permits to cover its emissions;
- if the emission target is not met, penalties should be imposed which are sufficiently severe to make non-compliance unattractive. These might include fines which are considerably higher than the market price for permits, or a pro-rata reduction in the allocation of permits for the next year.

Ancillary benefits accruing from emission reducing activities

The main line of argument in favour of international emissions trading is cost efficiency, but in a national system ancillary benefits to be achieved from emission-reducing activities should be considered as well[12]. Reducing greenhouse gas emissions at a national level may have three types of ancillary benefits (*Barker et al.*, 2000):

- Other environmental externalities, such as the negative impact of emissions on health, could be avoided;
- Revenues from, e.g., auctions could be used to reduce distorting taxes and thus have a positive effect;
- Investment into emission-reducing measures triggers an increased demand for clean technologies, which in turn stimulates innovation and technological change. When production factors are underused, such investment could stimulate aggregate demand and thus cause growth effects (*Schleicher – Buchner – Kratena,* 2000).

Emissions trading thus must not be viewed solely in terms of emissions reduction at minimum cost. Measures to reduce emissions should also be assessed by their welfare effects, as well as their dynamic competition effects (first mover advantage), which can be expected primarily in a national emissions trading system.

Framework and potential for a national emissions trading system in Austria

The actual design of a national emissions trading system, i.e., choice of sectors and companies to be included, and allocation mechanism to be used, depends on the general framework, which in turn is determined, on the one hand, by the sectoral structure of greenhouse gas emissions and, on the other hand, by existing regulatory measures such as laws and economic instruments such as taxes on energy.

CO_2 emissions as shown in the energy balance by Statistics Austria

Highly detailed knowledge of the emission structure is required in order to design and implement a CO_2 emissions trading system for Austria. Initial data are supplied by a WIFO analysis based on the energy balance furnished by Statistics Austria, which supplies a detailed breakdown of CO_2 emissions by 44 sectors, showing energy consumption by type of energy source and sector. Based on these data, WIFO calculated the CO_2-relevant energy consumption by sector and, based on emission factors, CO_2 emissions by sector, for the period of 1990-1998. In this way a figure was obtained for CO_2 emissions produced by the use of fossil fuels for energy generation; process emissions (e.g., by the cement industry) are not accounted for in this analysis.

Table 1 indicates the trend of CO_2 emissions by aggregate sectors. In 1990, 55.6 million tons of CO_2 were emitted from the consumption of energy, compared to 59.5 million tons in 1998. The transport sector is included in the services category, which contributed 10.4 percent to energy-caused CO_2 emissions in Austria in 1998. Other traffic-caused emissions are allocated to the respective sectors.

[11] For the administrative tasks see, e.g., *Tietenberg et al.* (1999), *Hargrave et al.* (1998) or *Schubert – Plöchl – Zerlauth* (1999). For a discussion of compliance mechanisms and procedures see, e.g., *Tietenberg et al.* (1999), *Hargrave et al.* (1998), *Fischer – Kerr – Toman* (1998) and *European Commission* (2000).

[12] An ancillary benefit may also be achieved by the use of other climate policy instruments.

Table 1: Energy-caused CO_2 emissions broken down by aggregate sectors

	1990	1991	1992	1993	1994	1995	1996	1997	1998
					1,000 metric tons				
Agriculture and forestry, fishery and fish farming	1,693	1,958	1,881	1,826	1,819	1,831	1,877	1,919	1,869
Manufacturing	34,186	35,208	30,898	29,971	30,642	33,032	33,850	35,921	35,072
Public administration, defence, social security	485	496	546	590	527	528	384	366	361
Services, including transport	4,610	5,004	5,339	5,556	5,110	5,716	6,107	6,459	6,211
Private households	14,580	16,817	16,047	16,664	16,419	16,747	17,138	15,681	15,985
Exterritorial organisations and bodies	0	'0	0	0	0	0	13	14	12
Total	55,553	59,484	54,711	54,607	54,517	57,854	59,369	60,361	59,510
					Percentage shares				
Agriculture and forestry, fishery and fish farming	3.0	3.3	3.4	3.3	3.3	3.2	3.2	3.2	3.1
Manufacturing	61.5	59.2	56.5	54.9	56.2	57.1	57.0	59.5	58.9
Public administration, defence, social security	0.9	0.8	1.0	1.1	1.0	0.9	0.6	0.6	0.6
Services, including transport	8.3	8.4	9.8	10.2	9.4	9.9	10.3	10.7	10.4
Private households	26.2	28.3	29.3	30.5	30.1	28.9	28.9	26.0	26.9
Exterritorial organisations and bodies	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Statistics Austria, energy balances for 1990 to 1998; WIFO calculations.

At almost 60 percent, manufacturing is the main source of energy-caused CO_2 emissions in Austria. An analysis of the energy balance finds that emissions are concentrated in a small number of sectors and operations. More than a quarter of emissions are caused by private households.

The share of manufacturing (including construction and electricity generation) declined slightly in the period under observation. By 1998, the sector contributed 58.9 percent of CO_2 emissions. About a quarter of energy-caused CO_2 emissions was generated by private households in the late 1990s, which translates into 5 tons of CO_2 per household and year, given the number of households found by the microcensus (3,208,600 in 1998). Agriculture, forestry, fishery and fish farming produced some 3 percent of energy-caused CO_2 emissions in 1998.

Manufacturing (including construction and electricity generation) is the main source of energy-caused CO_2 emissions. The six sectors with the highest emission intensity and highest emission rates in 1998 (Table 2) emitted 25 million tons of CO_2, or about 70 percent of the emissions generated by the manufacturing sector in that year. This volume originated from 5.4 percent (692 operations) of the companies included in the Statistics Austria business statistics.

Electricity utilities alone produced 7.9 million tons of CO_2, or 22.4 percent of the emissions generated by the manufacturing sector, or 13.2 percent of overall energy-caused CO_2 emissions.

Table 2: Sectors with the highest emission intensity in 1998

	Total balance of CO_2 emissions 1,000 metric tons	Manufacturing operations Number	Emission intensity (emissions per gross output) 1,000 metric tons per ATS billion
Production of pig iron, steel and piping	9,008.4	36	164.5
Electricity utilities	7,871.2	115	72.2
Production and processing of paper and paperboard	2,300.5	99	41.1
Coking, mineral oil processing, fertile materials	2,127.7	8	98.3
Manufacturing and processing of glass, stone and earth products	1,960.2	411	36.0
District heating utilities	1,806.5	23	282.5
Total of emission-intensive sectors	25,074.5	692	
Total of manufacturing sector	35,071.8	12,892	

Source: Statistics Austria, energy balance for 1998, business statistics for 1998; WIFO calculations.

This analysis of CO_2 emissions based on the energy balance provides a starting point for designing an emissions trading system for Austria. The data clearly indicate that energy-caused CO_2 emissions are concentrated in a small number of sectors and opera-

tions. But it has to be taken into account that the manufacturing sector produces less than 60 percent of total CO_2 emissions.

Energy-based taxes and charges in Austria

The framework for introducing an emissions trading system in Austria is affected by existing taxes on energy. These include the mineral oil tax, electricity tax and natural gas tax, which are summarily described below and all of which are quantitative taxes.

The mineral oil tax rates were last raised in 1995. The tax is levied on mineral oil used as an energy source. Light, medium and heavy fuel oil, and liquefied gas for electricity generation are exempt from the tax. In 1999, the state obtained revenues of ATS 37 billion from the mineral oil tax[13].

The quantitative tax on electricity and natural gas was introduced in 1996. Natural gas was taxed at ATS 0.60 per cubic metre, and electricity at ATS 0.10 per kWh. The rate for the electricity tax was doubled in mid 2000.

If the tax on electricity and natural gas exceeds 0.35 percent of a manufacturer's net output, the excess tax will be refunded upon application, i.e., the tax is capped for energy-intensive operations. An important exemption to payment of the natural gas tax is when natural gas is used to generate electricity or put to other than energy uses.

In 1998 and 1999, net revenues from these taxes (reduced by refunds) made up about ATS 5.6 billion (Table 3). Almost two thirds of gross revenues derived from the tax on electricity, the rest from the tax on natural gas.

Table 3: Revenues from taxes on energy

	1996	1997	1998	1999
		ATS billion		
Tax on electricity (gross)	1.4	5.1	5.2	5.2
Tax on natural gas (gross)	0.6	3.4	2.5	2.9
Refund		– 1.0	– 2.2	– 2.5
Net revenues from taxes on electricity and natural gas	2.0	7.5	5.5	5.6
Mineral oil tax	36.2	34.6	35.6	37.1
Total revenues	38.2	42.1	41.1	42.7

V.A.T. is not shown.

For a sectoral breakdown of gross revenues from the taxes on electricity and natural gas see Table 4. The natural gas data include revenues from the tax and tax exemptions. The negative figures are the result of the tax being levied from the energy sectors whereas the refunds benefit processors and industries.

Table 4: Gross revenues from taxes on electricity and natural gas, 1999, by sectors

	Tax on electricity		Tax on natural gas		Total	
	Number of operations	ATS million	Number of operations	ATS million	ATS million	Percentage shares
Agriculture and forestry	35	2.6	–	–	2.6	–
Energy and water utilities	282	4,219.9	40	3,443.2	7,663.1	94.8
Mining, rock and earth extraction	17	5.1	3	96.7	101.8	1.3
Processors, industry	269	494.9	43	– 577.4	– 82.5	– 1.0
Construction	51	45,6	4	– 56.6	– 11.0	– 0.1
Other	184	385.4	22	28.1	413.5	5.1
Total	838	5,153.6	112	2,934.0	8,087.6	100.0

Source: Federal Ministry of Finance, WIFO calculations.

In 1997, altogether 442 energy-intensive companies profited from the provision to refund taxes in excess of a maximum level. They were refunded ATS 1.9 billion, or ATS 4.4 million per company on average. The highest average refund per company was made to operations active in the production and processing of paper and pulp, followed

[13] The tax rate for unleaded petrol and similar products is ATS 5,610 for 1,000 litres; the rate for other mineral oils is ATS 3,890. Liquefied gas used as fuel is taxed at ATS 3,600 per 1,000 litres; when used for heating, it is taxed at ATS 600 per ton. The tax on light, medium and heavy fuel oil used for heating is ATS 500 per ton, and ATS 3,890 per 1,000 litres when used for other purposes.

by operations producing iron and non-ferrous metals, and mining, crude oil and natural gas exploitation (Table 4).

In an emissions trading system, the participants will also pay the above taxes on energy. Thus, in order to give them an incentive to become actively involved in trading emissions permits, it would be conceivable to grant them an exemption from these taxes. The effects emanating from such a procedure (e.g., on public households, distributional effects between participants and non-participants) would, at least to some extent, depend on the mechanism used to allocate the emissions permits.

Proposals for alternative CO_2 emissions trading systems for Austria

Starting out from economic theory, the framework as set out above and international examples, it is possible to deliberate a design for a national CO_2 emissions trading system. Three options are described below which offer a preliminary basis for discussion. Their individual impact on sectors and the overall economy need to be assessed by an economic ex-ante evaluation. The proposed options are limited to CO_2 for two reasons: the sheer quantitative importance of this greenhouse gas and the uncertainties of monitoring other greenhouse gas emissions. The limitation also means that reduction potentials which may be highly cost-effective are not considered in this first approach. Nevertheless, limiting the system to CO_2 emissions can be justified from the experience to be gained in handling a new instrument. The system naturally needs to be incorporated in a wider Kyoto strategy for Austria, which encompasses all the other greenhouse gases and uses other (economic) instruments as well.

Option 1: Emissions trading system limited to one sector

The first option would limit the emissions trading system to a single sector of the economy, e.g., electricity utilities or an energy-intensive industry. Such a system would correspond the most to an upstream approach and could clarify the limits that this approach (which will be applied in Denmark as of 2001) would meet with in Austria.

Electricity utilities produce the second highest CO_2 emissions. In 1998 they generated some 22 percent of energy-caused CO_2 emissions in the manufacturing sector (including electricity generation and construction) or 13 percent of total emissions in Austria. The sector includes 115 operations[14] of more than 20 employees each. Not all the operations are emission-intensive, however, since that number also includes hydropower operations. This low number of participants could create limits for the trading system.

The overall economic impact of the electricity sector's trading in emissions permits would also be affected by the liberalisation of the energy market, which is likely to trigger substantial change in the sector and cause a reduction of electricity generation from thermal power plants.

In order for a trading system to work in the electricity sector the factor of crucial importance is therefore the difference in marginal abatement costs between operations. Only when that gap is large enough will it be possible to institute trading between the participants. This problem might be mitigated by allowing companies from other sectors to opt into the trading system. If a national trading system is initially introduced primarily to acquire experience, it might alternatively involve another energy-intensive sector, such as the paper and pulp industry, where the difference in marginal abatement costs could be greater than in the electricity industry.

Option 2: Emissions trading system involving the largest companies of the most emission-intensive sectors

Another option to introduce an emissions trading system in Austria would be to identify emission-intensive operations by sectors. This approach is likely to provide greater heterogeneity of marginal abatement costs and thus a greater incentive for trading. Compared to a system concentrating on a single sector, this option would be clearly more efficient.

Based on the information given in Table 2 (which, however, lacks data on company size), the three most emission-intensive sectors are made up of 143 operations, which jointly emit some 13 million tons of CO_2. Including also the electricity sector, the trading system would thus cover some 21 million tons of CO_2 emissions and 258 operations.

Limiting the trading system to major companies is plausible inasmuch as the transaction costs resulting from trading are more important for SMEs than for major operations. Nevertheless the trading system should be designed so as to allow smaller operations to be included voluntarily.

When the system is limited to the largest companies, complementary policy measures will become particularly important. If only a few operations of a given sector are subject to emissions trading, this might distort competition within that sector; "leakages" might

[14] A basic decision needs to be made whether operations or companies will be participants in an emissions trading system.

occur if companies split their activities into several companies or operations or shift production abroad.

Option 3: Emissions trading system on a voluntary basis

The third option proposes a system for the voluntary trading of emissions permits[15] which would include the residential construction industry (residential building co-operatives and energy contractors).

This option would reach beyond the manufacturing sector and include a large part of the private household sector by extending to residential builders and contractors. This might produce incentives to improve the thermal quality of buildings, by investments in insulation systems and by improving the efficiency of heat supply systems and the use of renewable energy sources.

In Austria, private households contribute about a quarter of energy-caused CO_2 emissions. In general it is assumed that such emissions cannot be directly included in an emission trading system. But if a system is introduced in Austria prior to the commitment period of 2008–2012, participation on a voluntary base could be considered and thus at least part of these emissions be included.

One element of this option could be voluntary agreements by participants. They could be given an incentive by being allowed to bank emission reductions for the commitment period.

Outlook for the Austrian climate policy

The objectives underlying climate policy in Austria are defined by international agreements (UN FCCC, Kyoto Protocol, EU burden sharing agreement). Specifically, Austria has undertaken to reduce its greenhouse gas emissions by 13 percent below 1990 levels in 2008–2012. In mid November, the Sixth Session of the UN FCCC Conference of the Parties was held in The Hague. The outcome of COP 6 and following conferences, and in particular the regulations how to apply "flexible mechanisms" will have an impact on whether or not the Kyoto Protocol will be ratified by the industrialised countries.

But even if no prompt ratification is in sight, Austria considers itself committed to its own Kyoto target. A national climate strategy harmonised between regional authorities is currently being drafted, and it will cover residential heating, electricity and heat generation, waste management, transport, industry, agriculture and forestry and other gases (H-FKW, PFKW, SF_6)[16]. This framework is also used to discuss options of applying the Kyoto mechanisms in addition to national measures (laws, economic instruments, information campaigns). A national CO_2 emissions trading system is therefore one of the instruments to achieve the Austrian target for climate protection. But its design and application need to be discussed and developed within the greater context of a comprehensive climate strategy.

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[15] Examples for a voluntary emission trading system are the Pilot Emission Reduction Trading (PERT) and the Greenhouse Gas Emission Reduction Trading (GERT). Both projects were initiated in Canada, with the active contribution of industry, government and environmental organisations.

[16] See the report by the Federal Minister of Agriculture, Forestry, Environment and Water Management, and by the Federal Minister of Finance to the Council of Ministers on 7 September 2000.

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CO_2 Emissions Trading – An Instrument for the Austrian Climate Strategy – Summary

International commitments constitute a considerable challenge for the climate policy pursued in Austria. In 1997, the first obligatory targets for greenhouse gas emissions were defined by the Kyoto Protocol, and Austria, within the scope of an internal EU burden sharing agreement, undertook to reduce its emissions by 13 percent below 1990 levels.

The Kyoto Protocol raised great expectations with regard to reducing anthropogenic effects on climate change. In November 2000, the Sixth Session of the UN FCCC Conference of the Parties (COP 6) was held in The Hague. Its outcome is likely to affect the probability of whether the Kyoto Protocol will be ratified.

Achieving the emission targets is to be facilitated by the introduction of so-called flexible mechanisms laid down in the Kyoto Protocol, which include emissions trading. A key aspect of emissions trading is its economic efficiency, i.e., it provides a market mechanism to ensure that necessary reductions will be made where their costs are lowest. Emissions trading is also effective from an environmental policy point of view because it makes sure that the specified environmental goal will be attained. The trade in emissions permits offers an incentive to exceed individual goals and thus be able to sell surplus permits. This provides an incentive to search for cost-effective ways to reduce emissions, which in turn promotes technical change and the development of environmentally friendly technologies.

Key aspects of the framework for a national CO_2 emissions trading system are the sectoral emission structure and existing taxes on energy. From the sectoral emission structure in Austria it can be seen that CO_2 emissions in manufacturing are concentrated on a few sectors and a small number of companies.

With regard to energy-related taxes, consideration should be given to how taxation can be used for companies and sectors which do not participate in the emissions trading system.