

Emissions trading: decades of existence. Big Future?

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Abstract

In this paper I attempt to make a short overview of the existing emissions trading (ET) systems as well as the ones under preparation. First, the historic insight into the origin of emission trading systems is presented. It is shown how the US Environmental Protection Agency moved from credit-based systems to allowance based Acid Rain Program, which is currently world-known successful program. Further, the case of the Slovak SO₂ emission trading system and carbon trading in Denmark and the United Kingdom (UK) are described. Lessons learned that should be incorporated into the future emission trading systems, in particular, into the European Union CO₂ ET system scheduled to begin in 2008, are emphasised. In the paper I argue that ET is an efficient market-based instrument to tackle environmental problems since it is cost-minimising mechanism, which stimulates implementation of greenhouse gases (GHG) reduction projects. However, some sceptic opinions on ET made me keep the title read as a question rather than a statement.

Introduction

The last decade has greatly modified the understanding and perception of emissions trading philosophy. The United States was the pioneer in the field that implemented the first ET systems. The first schemes developed had a type of credit-based program and were established in 1976. On the

contrary to allowance-based schemes that appeared in the early 1990s they were simpler in establishing, as they did not require setting up the baseline and allocation of allowances. Two models of emissions trading were used by the US Environmental Protection Agency (EPA) before SO₂ Allowance Trading Program birthday. First one is the offset program, which required sources to 'offset' their emission should they want to expand their facilities. Offsets were generated when sources decreased or modified their production and installed emissions abatement technology. Shut down of the facility can also provide the source with offsets. Second emission trading scheme was bubble policy. It set up the single bubble for multiple sources within a facility. Therefore, ways of emissions control and sources best suitable for emissions reduction could be chosen as long as the set bubble was kept. The weak point of these early emissions trading program was that they were not able to keep overall amount of emissions at the certain level. Although, the results of these systems were quite unpretentious their role in providing useful experience should not be underestimated. They became a foundation for establishing more comprehensive and efficient allowance-based Acid Rain Program, which is described in the section US Market.

The reaction of the general public to early trades was very negative – the system was called immoral and unfair. For instance, The Nation commented the trades in the following way: "Why not set up a national Murder Inc. as a murder-rights clearinghouse? Time to subject random violence to free-market discipline". Though the main idea of this market-based mechanism is to solve environmental problem of air pollution in economically efficient way, most of the public did not see anything positive in the offered system.

Table 1. Advantages of emissions trading.

Environmental benefits	Economic benefits
Greater level of environmental certainty	Existence of economic incentive for emissions reduction
Higher accountability, transparency to the public	High flexibility in choosing the way of emissions reduction
Long-term environmental benefits	Benefits for both buyers and sellers
	Stimulation of research and development, investment in innovative technology

However, the program proved to be a big success and the growing interest has followed from policy-makers, regulating authorities, business and environmental organizations. Nowadays the ET system has been winning recognition at the worldwide scale. At the beginning of the 90ties when the US Environmental Protection Agency initiated international discussions about ET, the European Union position was quite sceptic. But a decade later the situation looks completely different: the US is under high criticism for pulling out of the Kyoto and the EU adopted a Green Paper on greenhouse gas ET within the EU, which successfully launched a debate across Europe.

SO₂ markets in operation

US MARKET

In the beginning of 1990ties the US Congress created the Acid Rain Program in response to the alarming results of the research on acid deposition problem by the National Acid Precipitation Assessment Program. The created 'cap and trade' system was first of this kind. It aimed at tackling the acid deposition that has negative impact on the environment and public health and at minimising emissions abatement cost through the use of the market. The Environmental Protection Agency made its choice in favour of establishing the cap and trade system, since it uniquely combines both environmental and economic benefits (see Table 1), thus being the right tool for moving towards so much desired sustainable development while not jeopardising economic growth.

However, several conditions are to be in place for establishing a cap and trade program. First, the nature of the environmental problem makes difference. Various environmental problems require different policy instruments for their solution. To avoid mistakes and complications, while selecting the right mechanism to address a certain problem, the nature of this problem should be thoroughly examined. The more a pollutant is homogeneously spread over a big geographic area the more suitable is the establishing a cap and trade program.

Second necessary condition for establishing a cap and trade program is the developed institutional capacity. Allowance program requires up-front expenditures of time and money by industry and regulating authorities before transactions can take place. Setting the baseline, making the initial allocation of allowances and assurance of accuracy of emissions measurements and monitoring are paramount parts of

the cap and trade system, which have to be properly addressed.

Finally, healthy political situation in a country is an important factor of the emissions trading system functioning as it has to ensure transparent access to the information for all interested parties, like general public, environmental NGOs or brokers. Additionally, establishment and functioning of emissions trading systems require legislation in place, which forces sources to reduce harmful emissions.

If these conditions are met, the setting cap-and-trade emissions scheme may generate multiple benefits.

The environmental benefit of greater level of environmental certainty reflects that the set up cap of maximum amount of allowable emissions cannot be exceeded. On contrary, traditional command-and control approach usually do not set up absolute limits. High penalties prevent sources from violating the cap level. Indeed, since the Acid Rain Program commence in 1995 all sources included into the scheme manage to comply with their caps.

Several-years experience of the program operation proves that the program really ensures emissions reduction for the least cost to society given the continuing declining estimates of the program complying costs. Within the decade it has already fallen from the value of 7.4 billion per year by 2010 according to the Edison Electric Institute prediction in 1989 to the value of \$0.87 billion – a 1998 Resources for the Future estimate.¹ This program success results from the fact that possibility to trade allowances benefits both buyers and sellers. Sources that have high cost of abatement at their facilities can buy additional allowances at lower price. And sources that are able to reduce emissions below their cap are awarded for better environmental performance. They can sell their extra allowances and get revenues. All in all the total cost of reducing emissions through emissions trading is smaller than in case with other policy mechanisms. For instance, it was calculated that the Danish goal of 21 per cent and the EU goal of 8 per cent of GHG abatement would be achieved nine and twenty-four times more costly by using taxation policy than with the use of emissions trading.²

This smooth system operation is also secured by the fact that sources are encouraged to decrease emission reductions. There are two main incentives for this: existence of monetary value for allowances and flexible system of banking. Furthermore, ET provides high flexibility in choosing the way of emissions reduction, which is the most suitable for them. It can be investment into abatement technology, fuel switch, energy efficient measures or utilisation of re-

1. US EPA, 1999.

2. Svendsen & Vesterdal, 2003.

newable energy sources. Contrary command and control approach does not provide any flexibility without prior regulatory approval. Moreover, command and control one-size-fits-all approach leads to case-by-case waivers.³

Further advantage of ET is that emission trading stimulates research and development in the field of emissions reduction, as business sector can foresee profitability of emissions abatement approach in a long-term perspective. In other words, entrepreneurs have new business assets for investment into innovations as their future cost of compliance is reduced.

Next strong point of the system is its higher accountability. Participating sources are obliged to give an account for every ton of emissions by following protocols to guarantee completeness, accuracy and consistency of measurement. Due to the program transparency the public can follow detailed information on allowance transactions provided by the regulating authority.

Finally, if there is an intention to extend the US experience to other countries, let us consider if there are any difficulties in setting emission trading systems. The cost of establishing the emissions trading scheme is quite high. Some specialists argue that different countries are found to be not in equal positions in these terms. For instance the US can easier afford designing and operation of the emissions trading than developing and transitional economies. This is also facilitated by the fact that SO₂ emissions trading is already in operation in the electric utility sector in the US and therefore the marginal cost of introducing a carbon trading is relatively small. For countries starting from zero the incremental cost of the ET schemes would make up the cost of a compound regulatory system.⁴ However, the example of the emission trading system case from Slovakia, which will be described later, proves that these difficulties can be successfully overcome.

So far the Acid rain Program proved to be a big success. The data show that significant cuts in emissions levels have been achieved and ambient air quality in the polluted regions has been improving.⁵ The main results derived from the program performance are the following:

- Emission reduction target exceeded in case of SO₂,
- SO₂ allowance prices turned out to be lower than it was expected,
- Acid Rain Program became the most well-known emissions trading system in the world,
- Emission reduction targets achieved in case of NO_x,
- Actual price of NO_x allowances turned to be lower than it was expected,
- NO_x market is more unpredictable than SO₂ as NO_x market has less liquidity.⁶

Lessons learned from the USA experience:

The first lesson learned is that it is essential to make the system design as simple as possible, especially at its initial phase. This implies including only one sector and covering only one gas in the scheme. That will secure not only easy and reliable monitoring but also better understanding the scheme mechanisms by business sector. Enhanced understanding will motivate business for active participation in emissions trading. However, if the market launched by the system, functions efficiently, the system can be further developed towards inclusion new market players and covering more pollutants.

Second, it has been learned that it is quite difficult to predict the price of emission permits. For example, in case of US Acid Rain Program different models predicted the permit prices would range from \$389 to \$1 005 per ton SO₂. Though, the market price did not exceed \$250 since 1994. This difference was observed since there were some factors that were not included into models but in practice they influenced permit prices. For instance, many plants found possible to switch to lower-sulphur coal and in this way to reduce their demand for emissions allowances. Technological progress in utilisation new ways of emission reduction also exceeded the expectation. Additionally, forward-looking entrepreneurs realised economic incentives for early measures.⁷

SLOVAK SO₂ EMISSION TRADING SYSTEM

In 1999 amendment to the Air Law (No. 309/1991) gave authority to the Slovak Ministry of Environment to establish emissions trading system for regulated pollutants, including SO₂ and CO₂. In 2000 the Ministry set quotas for SO₂ emissions in administrative districts, which were enforced in 2002. The Ministry set quotas taking into account international commitment⁸, historical level of emissions in the district, expected heat consumption, environmental action plan and development program of the district. District authorities are responsible for allocating quotas to individual emitters. The system covered sources with thermal capacity greater than 50 MW and trapped about 80% of Slovak SO₂ emissions. Initial quotas for the years 2002-2004 are higher than the current emissions but the intent is to decrease them gradually until 2010 to meet SO₂ emission reduction goal. Limitations of the system include prohibition of allowances banking and allowances transfer to the sources located in areas where ambient air quality is non-compliant.

First lessons learned showed that allocation raised some complaining and disagreements from the operator's side, as in some cases distribution of allowances turned to be unfair. Therefore, it was decided to consider possibility of allowances allocation for the period longer than one year and permission of limited banking. It was also learned that there is a need for awareness raising of operators and public and inclusion all stakeholders in debates on the system design.

3. Palmisano J., 1998, *Which Path Best...*US EPA, 2002.

4. Palmisano, 1998.

5. US EPA, 1999.

6. PCFplus, 2002.

7. Springer & Varilek, 2003.

8. Slovakia is a signatory to the Protocol to Abate Acidification, Eutrophication and Ground-Level Ozone according to which it has to reduce its SO₂ emissions by 110 thousand tons until 2010.

Given that Slovak CO₂ cap-and-trade program became the first one implemented in the country with economy in transition, this experience is valuable for other countries with similar economic and political conditions, which intent to establish own emissions trading systems.

Currently Slovakia is preparing carbon emission trading scheme. Lessons learned from the SO₂ ET will be incorporated into a new emission trading scheme. Especially helpful are seen experiences with building necessary institutional capacity, checking accuracy of inventories, measurement and monitoring, and allowance allocations. Slovak CO₂ emissions trading scheme will include about 300 sources greater than 5 MW thermal capacity and cover more than 60% of country's carbon emissions. Domestic trading will help Slovak companies to prepare for participation into international emissions trading.⁹ The fact that Slovakia is under its Kyoto commitment and the existence of many low-cost opportunities for further GHG reduction place the country into position of CO₂ credits supplier for the Western buyers. In fact, Slovak companies and the government have already started taking advantage of that. At the end of 2002 the Slovak government sold 200,000 metric tons of carbon dioxide equivalent to a Japanese trading house under the Kyoto using the services of the US Evolution Markets LLC broker. Laszlo Miklos, Slovak environment minister commented the deal in the following way: 'By tapping the international carbon market, this innovative transaction allows us to pursue green investments'¹⁰. Indeed many Central and Eastern states can generate revenues under the Kyoto mechanisms and use them for investment in renewable energy, energy efficient technology and clean fossil fuels.

GHG markets in operation and under development

Green house gases are well suited for using cap and trade program, as they do not have local environmental and health impact. Emission reduction of GHG achieved in the United States will contribute to the global atmospheric concentration of these gases in the same way as reductions made in Europe.

UK MARKET

Establishing the emissions trading scheme the UK government beard in mind the following objectives: to prepare the UK government, UK business and the City of London to take the lead in the EU-wide trading scheme; to start the transition to a lower carbon economy and stimulate investments in innovative clean energy technology. The UK Emission Trading Group (ETG) in collaboration with business, academic and NGO sectors developed the scheme by 2000, which is open to all companies operating in the UK on

a voluntary basis.¹¹ The year of the scheme operation brought the following results:

- Typical size of transactions is 5 000-15 000 tCO₂e for 2002,
- Early prices were around \$7-\$9. There are indications that prices have been increasing up to \$18. UK is considering inclusion of international CDM/JI credits¹²,
- More than 150 trades have been recorded,
- Total volume of CO₂ emissions is about 1 million tones.

The study undertaken by the Enviro Consulting proves that the scheme provided local companies with necessary experience to enter the EU-wide emissions trading and other international carbon markets but questions its effectiveness in decreasing the UK carbon emissions. The authors of the study hope that as the scheme matures it will contribute more significantly to the UK Kyoto target. To improve the scheme operation, the Enviro Consulting recommends change voluntary enforcement to mandatory one and address training and education by special concern.¹³

DANISH MARKET

Denmark has set up an ambitious goal to decrease its carbon dioxide emissions by 21% by the year 2012 compared to 1990's level. The country relies on the market-based mechanisms in meeting this target. In words of the Danish Finance Minister Thor Pedersen Denmark wants 'the most improvement for the environment we can get for as little money as possible'¹⁴. This concern and intention have resulted in developing measures both inside and outside the country. Denmark as one of the first countries applied CO₂ national trading system with the aim of mitigation climate changes.

The system characteristics are as follows:

- The cap is established for the power sector,
- The system will expire in 2003 with possible extension until 2004 and modification in 2005 to adapt to EU-wide system.

The following main results achieved can be named:

- Program likely to meet emissions reduction target,
- A small number of trades recorded: 15 transactions until July 2002,
- 11 trades, 4 swaps, total estimated volume 460 000 tCO₂e,
- Typical size: 5 000-15 000 tCO₂e,
- Price: US \$2-4.6 tCO₂e,
- Non-compliance penalty: \$5-6/tCO₂e serves as price cap,

9. Gardner, 2002, *First Kyoto greenhouse...*Williams et al, 2002.

10. Gardner, 2002.

11. UK DEFRA, 2000.

12. PCFplus, 2002.

13. Enviro Consulting, 2003.

14. Reuters 2003.

Companies investigating flexible mechanisms allowed for under the Kyoto protocol: Joint Implementation and Clean Development Mechanism.¹⁵

Notwithstanding some positive results achieved, the level of CO₂ emissions remains almost the same as in the base-line year. Therefore, Denmark realised that it would be difficult to meet its goal by measures only within the country. Thus, the country is also ready to buy emissions credits from other countries, which are below their Kyoto targets. Hence, Denmark is likely to become an active participant in the EU wide emissions trading scheme as well as in other international schemes and projects aimed at GHG reduction.

EU DIRECTIVE ON EMISSION TRADING

By designing the Emission Trading Scheme (ETS) the European Union intends to contribute to meeting its greenhouse gases reduction commitments. The European Union Emission Trading Scheme promises to become the largest international emissions trading market. It would be applicable in throughout the EU as well as in accession countries and the countries of the European Economic Area.

The European Union Emission Trading Scheme would cover about half of EU CO₂ emissions in the period 2005-2012. About 6 000 facilities from industrial and energy sectors (e.g. refineries, power stations and cement manufacturing plants) would be included into the scheme. Currently they account for more than 500 million tonnes of carbon dioxide per year.¹⁶ Each of these facilities will be allocated a certain number of emissions allowances by the national government. At the end of each compliance year each facility would have to hold sufficient number of allowances to cover all tons of CO₂ emissions emitted. In case of non-compliance it would be a subject of imposing penalties by the regulating authority.

Briefly the system can be described in the following way:

- Mandatory and absolute target is unknown,
- Will operate in 2005–2007, 2008-2012 and cover CO₂ emissions only,
- Will include industrial and energy sectors; not chemicals,
- Allocation by grandfathering 2005; about π of allowances may be auctioned,
- Inclusion of links to projects-based mechanisms,
- Financial penalty: 2005-2007: 50 Euro/tC; 2008-2012: 100 Euro/tC,
- Environmental Penalty: 1 for 1 deduction for overage.

Assuming 7% target some experts estimate potential price in internal trading in the enlarged EU around 4.5-10 Euro/tCO₂e in 2005-2007¹⁷.

In December 2002 the EU Directive on Emission Trading was submitted to the European Parliament for the second reading and its finalisation. The main questions that have to be proceeded are emissions permit allocation plans and establishing tight restrictions on the types of greenhouse gas abatement projects that will be admissible within the planned scheme. Bohringer has found that the choice of emission permits allocation will have impact on the compliance costs: auctioning will reduce it while grandfathering will lead to the cost increase.¹⁸

What are the key challenges in developing the EU wide emissions trading? *First* it is how to harmonised fragmented national markets. For instance, the first examples of emission trading systems in the UK and Denmark are not compatible with each other. Complications in harmonisation of national systems will result in higher transaction cost and subsequently lead to raising the price of GHG emission permits. Therefore, it is necessary to adopt regulations, which would lay down uniform technical and functional requirements for national registries. Trades between facilities in different member states would need the transparency of allowance allocation systems and adjustment of assigned amount units between states under the scheme. It has to be ensured that monitoring, reporting and verification procedures are carried out by accredited organisations. It is suggested that the EU should hold the decisive responsibility for ensuring compliance so that to guarantee non-bias treatment of all participants.¹⁹ *Second* issue is that how to make possible interaction between parties covered by the EU scheme with other Kyoto parties on the base of bilateral agreements. The system should also be open to potential transactions with the US carbon markets. According to International Emission Trading Association (IETA) the scheme 'should aim to be outward and not inward looking'. After all, in terms of climate change mitigation, contribution to the creation of a global carbon market is more important than the establishing of purely European market. *Third* challenge aims at building up links with project-based Kyoto mechanisms for more efficient functioning of carbon market. However, this idea should be considered carefully, as there are voices strongly against the use of credits from JI and CDM in the EU emission trading system. In its letter to the European Commission on 28 February 2003 the Climate Action Network (CAN) Europe expressed its serious concern and outlined the following mottos: 'We need to reduce emissions in the EU!' and 'Keep the emission trading scheme as a domestic measure for cutting industry emissions!' This concern is based on the fact that JI and CDM mechanisms are not fully developed and tested yet. Besides, CAN argues that some of these projects are non-additional and even environmentally destructive.²⁰

In the future other greenhouse gases should be included into the scheme. For instance, IETA has already had the technical expertise needed for measurement of nitrogen ox-

15. PCFplus, 2002.

16. Shell International Limited, 2003.

17. PCFplus, 2002.

18. Bohringer, 2002.

19. CAN, 2003, *Letter to the European ...*

IETA, 2002, *Comments on the EC ...* Svendsen & Vesterdal, 2003.

20. CAN, 2003.

ide and methane emissions and it is ready to provide assistance in further scheme development.²¹

Future active operation of the scheme can be anticipated based on the first emissions trade terminated between two big players in energy sector – Shell Trading and Nuon. Shell trading will sell a considerable number of allowances to Nuon during the first compliance year.²²

Perspectives

Since its origin emission trading has matured and won recognition among scientists, policy-makers and general public. Business sector has been learning to make use of opportunities offered by this market-based mechanism. The volume of emissions transactions has been growing: volumes transacted in 2002 are approximately 4 times higher than volumes transacted in 2001. According to the World Bank estimates there were about 150 million tons of GHG traded since early trades of 1996-1997.²³ More rapid increase is anticipated during the first compliance period of the Kyoto, when emissions transactions volume should make up 700 millions tons CO₂ annually.²⁴

Wide use of emission trading could have a positive impact on implementation of projects in the field of energy efficiency and renewable energy sources utilisation with the aim to abate GHG emissions. Project/trading specialists from Nat-source, DZ Bank and other organisations see a big advantage of carbon market in the fact that it will enable 'bringing future revenues from forward GHG contracts to the beginning of the project, rather than payments at the back end'. In their view it will help to get 'lots of projects off the ground because of the ability to accelerate cash flow in projects where cash is required in the early stages.'²⁵

However, in order to draw an objective picture of debates on market-based instruments there is need to reflect some critical opinions. Martin Tampier argues that renewable sector will not be able to benefit by involving into emissions trading since renewables installations will not be covered by the awaited EU emissions trading scheme. Therefore, the only possibility for them to get involved is to offer renewable energy to those, who might wish to substitute some fossil fuel generation. Unfortunately, paying the non-compliance penalty might appear to be cheaper and hence more preferable option. Thus, it is unlikely that emissions trading will help renewables to cover the gap between production costs and electricity prices, or in other words to become more competitive with conventional fuels. Nevertheless, some hope is left for the future, which might bring decrease of renewable energy prices but increase in prices for emission credits and energy from fossil fuels.²⁶

Conclusion

The emission trading system has been gradually transforming from the innovative conception into a well-utilised mechanism for effective mitigation of climate change. Denmark, the UK and some other countries have already established their national emission trading systems and gained first results and experiences, which should be used while developing future emission trading systems. Most of the EU countries are not in a hurry with setting national schemes since they are waiting for the commence of the EU-wide system to ensure systems compatibility. World Bank estimates show that if the Kyoto gets into force, carbon market will get boosted during the first compliance period. It is anticipated that emission trading will have a positive effect on financing GHG reduction projects since a clear value on carbon will re-allocate future revenues from these projects to the project beginning. However, some professionals doubt that ET will stimulate implementation of renewables projects, especially during the first compliance period when prices for emissions credit will keep relatively low.

References

- Bohringer, G., 2002. 'Industry-level emission trading between power producers in the EU'. *Applied Economics* 34/2002:523-533.
- Climate Action Network (CAN) Europe, 2003. Letter from Can-Europe re CDM/JI and ET draft proposal [Internet]. CAN Europe, 28 February 2003 [cited 3 March 2003]. Available from www.climnet.org/EUenergy/ETCDMJ1.pdf
- Enviros Consultancy, 2002. First year of the UK Trading Scheme: Summary [Internet]. European Business Council for a Sustainable Energy Future, 17 March, 2003 [cited 1 April 2003]. Available from www.e5.org/modules.php?op=modload&name=news&file=article&sid=165
- Gardner, Timothy, 2002. First Kyoto greenhouse deal snapped up by Slovakia [Internet]. Planet ARK, 9 December 2002 [cited 3 April 2003]. Available from www.planetark.org/dailynewsstory.cfm/newsid/18951/story.htm
- Innovest, 2002. 'Climate Change & the Financial Services Industry: Module 2 – A Blueprint For Action'. Report prepared for the UNEP Finance Initiatives Climate Change Working Group July 2002. Nairobi, Kenya: United Nations Environmental Programme.
- International Emissions Trading Association (IETA), 2002. Comments on the EC Proposal for an Emissions Trading Scheme [Internet]. IETA, May 2002 [cited 15 November 2002]. Available from http://www.ieta.org/Documents/New_Documents/IETA_Position_on_the_EC_Proposal_May_2002.doc

21. IETA, 2002.

22. Shell International Limited, 2003.

23. PCFplus, 2002.

24. Loschel & Zhang, 2002.

25. Innovest 2002, 28.

26. Tampier 2003, 47-9.

- Loschel, A., and Z.X. Zhang, 2002. 'The economic and environmental implications of the US repudiation of the Kyoto Protocol and the subsequent deals in Bonn and Marrakech'. *Weltwirtschaftliches Archiv* 138/2002: 711-746.
- Palmisano, Jogn, 1998. 'Which Path Best Leads to the Development of Greenhouse Gas Emissions Trading Programs'. Discussion Paper III-F, June 1998. Washington, DC: Enron International.
- PCFplus, 2002. 'State and trends of the carbon market' PCFplus Report, October, 2002.
- Reuters, 2003. Emissions credits to curb Denmark's CO₂ pollution [Internet]. Reuters, 28 February 2003 [cited 2 March 2003]. Available from www.icta.org/library_links/IETAEnvNews/Feb28_Denmark.htm
- Shell International Limited, 2003. Shell Trading and Nuon Complete Historic First EU Emissions Trading Scheme trade [Internet]. International Emissions Trading Association, 27 February 2003 [cited 28 February 2003]. Available from http://www.icta.org/Library_Links/IETAEnvNews/Feb27_SW_Final_Press_Release_EU3_1.doc
- Springer, Urs, and Matthew Varilek, 2003. 'Estimating the price of tradable permits for greenhouse gas emissions in 2008-12'. *Energy Policy*, Articles In Press, Corrected Proof.
- Svendsen, Gert Tinggaard, and Morten Vesterdal, 2003. 'How to design greenhouse gas trading in the EU?' *Energy Policy*, Articles In Press, Corrected Proof.
- Tampier, Martin, 2003. 'Emissions Credit Trading & Renewables: An Assessment of Present and Future Opportunities'. *REFOCUS (The International Renewable Energy Magazine)*, March/April 2003: 46-9.
- UK Department for Environment, Food & Rural Affairs (DEFRA), 2000. A Greenhouse Gas Emission Trading Scheme for the United Kingdom [Internet]. DEFRA, 8 November 2000 [25 September 2002]. Available from www.defra.gov.uk/environment/consult/ggetrade/02.htm
- US Environmental Protection Agency (EPA), 1999. 'Progress report on the EPA Acid Rain Program'. EPA430-R-99-011. US EPA, November, 1999.
- US Environmental Protection Agency (EPA), 2002. *Tools of the Trade: Designing and Operating a Cap and Trade Program*. US EPA, 2002.
- Williams Eric, Stanislav Kolar, Ellina Levina, and Jia Li, 2002. *Developing a CO₂ Emission Trading Design for Slovakia*. Center for Clean Air Policy, May 2002.