Emissions Trading Schemes in Europe for SO_2 & NO_X including shipping

Swedish Shipowners' Association

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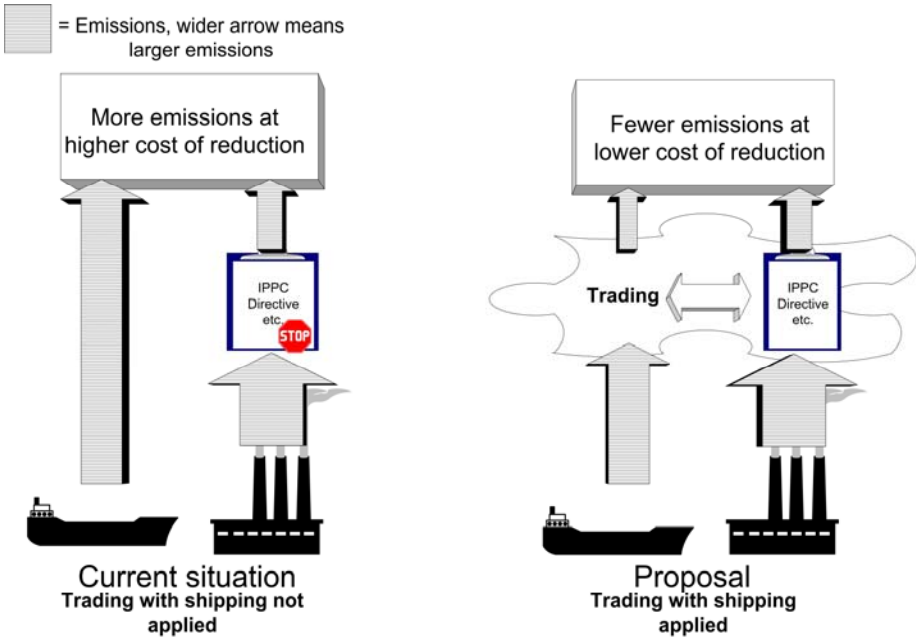
Executive summary

The volumes of waterborne transport are rapidly increasing and now account for close to 50 % of intra EU transport. This creates a growing amount of emissions of sulphur- and nitrogen oxides. The international regulations regarding emission limitations at sea are not in line with the expectations of European citizens. On the other hand, a regional solution should not increase the cost-burden for waterborne transport resulting in an increase inland based freight-transport.

The Swedish Shipowners' Association proposes an open NO_X and SO_2 emission trading scheme throughout the EU, including shipping and land based industry as a means to achieve the reductions anticipated in existing and planned legislation quickly and substantially at a lower economic cost to society as a whole, and, in particular to land based industry. In the proposed scheme the EU-based installation, e.g. the installations covered by the IPPC Directive, will have the flexibility to choose the most cost-effective manner to comply with NO_X and SO_2 emissions legislation, that is, to combine buying and selling allowances with investments in abatement technology, which ever is most advantageous for the particular installation at that time.

A major component of the proposed scheme is the opportunity for sectors, not directly covered by scheme, to generate emission reduction credits (ERC:s) eligible for compliance in the scheme. Shipping is identified as a major supplier of credits at favourable prices. By choosing to invest in abatement techniques and/or purchasing low sulphur fuel, a ship owner can obtain tradable emission reduction credits for the created emission reductions under a certain baseline determined by the authorities, i.e. the reference emission level based on existing regulations (MARPOL Annex VI , Eu- sulpher directive).



The Swedish Shipowners' Association proposes the scheme for SO_2 and NO_x, which includes shipping, for several reasons:

- The main source in Europe for SO_2 and NO_x emissions will, in the coming years, be waterborne transports.
- Previous and current experience of emissions trading has been very successful, in particular the sulphur dioxide trading in North America
- We know that shipping can achieve reductions at a much lower cost than land - based emitters which is a factor which can benefit both sectors.
- To support the modal shift from road transport to waterborne transport, which is a policy adopted by the European Commission.
- The international Conventions of maritime law (UNCLOS)[1] prevents the implementation of local or regional rules for shipping.
- Since waterborne transports are an integrated part of the industrial production supply chain, it is rational to link the two sectors in a "joint venture" of emissions trading.
- Levying taxes and charges on shipping constrain the use of maritime transport within the EU region.
- The regulatory approach on the shipping industry has, until now, not been very successful.

[1] United Nations Convention on the Law of the Sea, http://www.unclos.com

This paper demonstrates the huge potential for cost-efficient reductions existing in an emission trading scheme for NO_X and SO_2 in which shipping is included as a provider of emission credits. We also want to emphasize the great opportunities for cost-efficient solutions and enhanced competitiveness existing for each company operating land-based energy or industry installations, and for the ship owners with ships in European waters.

In order to put these opportunities into practice, the interested companies and ship owners must make efforts to influence policy developers and industry organisations to work in the right direction and with an enhanced speed, e.g. by demonstrating the economic advantages of the proposed scheme. Since much of the legislation regulating air emissions in EU is under review, with regards to emission trading, there is a window of opportunity for achieving a trading scheme which makes use of the full potential of trading. The interested companies and ship owners should, consequently, act now in order to put the proposed trading scheme into practise.

We also see several other developments and results that clearly reveal the great opportunities embedded in our proposal. The most import of these developments and results are:

- that the European Commission, European Union and the member states have a much better understanding of emissions trading and a genuine positive approach to this instrument of control than just a few years ago, mainly due to the launch of the largest emissions trading in the world, the EU ETS,
- the implementation of the EU ETS, which has demonstrated that the technical aspects, e.g. allocation, trading, monitoring, verification, cancellation, etc, of a scheme covering many European installations can, in fact, work.
- that the evaluation conducted on behalf of the European Commission by NERA shows that our proposed scheme is the most promising instrument to reduce ship emissions of NO_X (and SO_2) in a cost-efficient manner,
- that the emissions trading of SO_2 and NO_x in North America has been successful, i.e. these schemes have proven to be highly efficient as regards environmental targets, as well as cost efficiency,
- that the finalised DEMO project, which was launched on request by the European Commission, after presentation of the previous version of this paper, proves that NO_X and SO_2 emission reductions from sea going ships can be monitored, reported and verified,
- that the market players have shown great interest in emission trading, e.g. the exchanges and the OTC-market dealing with the EU ETS market have grown significantly and continue to grow steadily.

We believe that our proposal represents a fruitful input to politicians , policy makers, companies operating land-based installations and ship owners, and that it will serve as a basis for a strategy to influence future regulation in order to comply with necessary environmental targets in a cost-efficient manner.

The Swedish Shipowners' Association is absolutely convinced that the market driven solution presented in this paper is a better option than taxes or regulation. We, therefore, encourage a prompt decision regarding the implementation of an emissions trading scheme for NO_X and SO_2 in the EU in combination with further studies, in order to determine the specific details of the emissions trading scheme.

Öhrlings

PRICEWATERHOUSECOOPERS

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1 Introduction and background

The first time the Swedish Shipowners' Association (SSA) presented the emission trading scheme proposed in this paper was in February 2002. Since then several developments have taken place, which substantially increases the possibility of implementing the proposed scheme. Examples of such developments are the ratification of MARPOL Annex VI, the launch of emission trading schemes for NO_X and SO_2 in EU member states, the review of the IPPC Directive, the studies conducted on behalf of the European Commission showing that emission trading including credits from shipping is a cost-efficient instrument to reduce NO_X and SO_2 emission in Europe and finally the increased awareness regarding air emissions from shipping and the instruments available to reduce these emissions.

The SSA proposal has now been updated regarding several aspects, especially when it comes to demonstrating the economic potential for cost-efficient reductions that exist for companies operating land-based installations and ship owners. Other major aspects considered in the update are the studies conducted on behalf of the European Commission regarding market based instruments as a way to reduce the air emissions from shipping, the development of relevant regulations, the launch of the European Union emissions trading scheme for greenhouse gases (EU ETS) with its possibilities to use emission credits and the results from the finalised DEMO Project (see below).

As stated in the previous version of this proposal, the Swedish Shipowners' Association recognises that, even though shipping complies with emission regulations determined at an international level, i.e. IMO MARPOL Annex VI, and shipping has made efforts to reduce harmful emissions to air, the industry is a major source of NO_X and SO_2 emissions in Europe. The Swedish Shipowners' Association also recognises that shipping still has a large potential to reduce NO_X and SO_2 emissions from shipping on the condition that the right incentives are created. If no incentives are implemented the shipping industry will contribute to a larger and larger portion of these emissions in Europe.

The proposal was first created as a response to the European Commission in their consultation exercise[2] in 2002 regarding a future European Union strategy to reduce atmospheric emissions from seagoing ships[3]. The Swedish Shipowners' Association and PricewaterhouseCoopers created the proposal together, following an analysis of the possibilities to introduce a market-driven instrument. The Swedish Shipowners' Association and PricewaterhouseCoopers also made a joint presentation of the proposal

[2]Informing policy development -consultation exercise 2002, http://europa.eu.int/comm/environment/air/background.htm#transport

[3] A European Union strategy to reduce atmospheric emissions from seagoing ships was finally adopted by the European Commission in November 2002. As a response to the initiative of SSA, the Commision proposed future investigations regarding market based instruments in the strategy.

to the Cabinet of DG Environment and representatives from DG Energy & Transport. The proposal and the ideas connected to it were very favourably received by the Commission.

During the presentation of the proposal to DG Environment, the possibilities for monitoring and verification of emissions from ships were discussed. As a direct response to the request of DG Environment for a demonstration that monitoring and verification of NO_X and SO_2 emission reductions at sea can be feasible, the DEMO Project was launched (see below). The project was finalised in 2005 with results demonstrating in practice that monitoring and verification of NO_X and SO_2 emission reductions from ships is feasible.

Other important inputs are those generated in a recent study[4] conducted on behalf of the European Commission (i.e. an evaluation of market based instruments as a means to reduce ship emissions in the EU). In the study the scheme[5] proposed by SSA was regarded as the most promising economic instrument for reducing NO_X emissions and was also believed to create cost-effective reductions of SO_2 emissions. The general conclusions of the study are that market-based policy instruments have the potential to offer significant emissions reductions at a lower cost than simple regulatory alternatives, and that these instruments, should consequently be developed and implemented.

The Swedish Shipowners' Association proposes an emissions trading scheme for SO_2 and NO_x, which includes shipping, for several reasons:

- Previous and current experience of emissions trading has been very successful, in particular as regards sulphur dioxide trading in North America. Reductions in emissions have surpassed environmental targets. Companies participating in the trading schemes have been able to adopt the most cost-effective strategies to reduce emissions. The outcome for the environment and society, as a whole, has, therefore, fulfilled expectations.

- A model that doesn't increase the cost-burden of the waterborne transport will support the modal shift from road transport to waterborne transport in EU, as planned in the European Commission's White Paper, "European Transport Policy for 2010"[6]. An increased cost-burden for the waterborne transports will, apart from increased congestion and road accidents, also lead to negative environmental effects, e.g. increased climate change impact.

[4] "Economic Instruments for Reducing Ship Emissions in the European Union - European Commission, Directorate-General Environment", NERA Economic Consulting, 26 September 2005, http://europa.eu.int/comm/environment/air/pdf/task3_final.pdf
[5] In the NERA report our proposed scheme is referred to as the "credit-based approach"
[6] COM(2001) 370, WHITE PAPER - European transport policy for 2010: time to decide, Brussels, 12/09/2001

- The international Conventions of maritime law (UNCLOS)[7] prevent the implementation of local or regional rules. Consequently, the trading scheme will function on a voluntary basis for the shipping industry.

- Levying taxes and charges on shipping might constrain the use of maritime transport within the EU region and, might result in, ship-owners finding alternative solutions in order to avoid any disadvantage in terms of competition.

- We know that shipping can achieve reductions at a much lower cost than land-based emitters, a factor which can benefit both sectors.

- Since waterborne transports are an integrated part of the industry production's supply chain, i.e. the majority of ships plying in and around the waters of EU are conducting transports on behalf the land-based industry, it is rational to link the two sectors in an emissions trading scheme and launch the scheme as a "joint venture"

- The regulatory approach on the shipping industry has, until now, not been very successful. The Marpol 73/78 Annex VI[8] concerning international regulations for the prevention of air pollution from ships has now been ratified, but the environmental limits in the agreement, e.g. 4,5% demand on sulphur content in fuel and the IMO NO_X curve, are not sufficient to reach the environmental quality standards which the authorities in sensitive areas are striving to achieve. However, the proposed scheme has the potential to be a major contributor in the process of reaching the overall emission reductions targets in a rapid and cost-efficient manner.

[7] United Nations Convention on the Law of the Sea, http://www.unclos.com
[8] International Maritime Organisations (IMO), International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78), http://www.imo.org/

2 Emissions Trading Scheme for SO_2 & NO_X

2.1 Introduction

We propose a NO_X and SO_2 emission trading scheme throughout the EU as one of the main components of the common European efforts to prevent negative environmental impacts of NO_X and SO_2. The scope of the system is to reduce the emissions to a level equal to the ambitions of existing and planned legislation, in the most cost-effective manner for society as a whole. In this chapter we make a general outline of the proposal.

Before an EU-level scheme will be implemented, a likely and positive scenario would, be the gradual development from NO_X and SO_2 emission limits on installation level to much more flexible systems for installations to comply with emission legislation. Already today national trading schemes for NO_X and SO_2 exist in certain EU member states, e.g. NO_X in the Netherlands and SO_2 in Slovakia, and several other members are considering possibilities. The Dutch industry has been very positive to the launch of a national NO_X trading scheme.

To provide cost-effective means for EU-based industries to cut their emissions and create flexibility for businesses regarding investments in reduction techniques, the installation specific emission limits will be replaced by overall SO_2 and NO_X "emission budgets" for certain parts of the European industry sector, e.g. the installations covered by the IPPC Directive (see Figure 1). Such budgets can be determined based on sector specific emission limits and/or national emissions targets in existing legislation (see further LCP Directive and NEC Directive below). This has been the case in the EU emissions trading scheme for greenhouse gases (EU ETS), in which the member states in their National Allocation Plan have determined an overall emission budget[9] for the industry sectors included in scheme, based on national emission targets.

The use of a trading scheme will allow installations to adopt the most advantageous and cost-effective strategy for the reduction of their NO_X and SO_2 emissions, i.e. creating a flexibility to achieve compliance with legislation, as compliance can be met by purchasing emission allowances or emission reductions credits, or by investing in abatement projects and/or techniques.

[9] The "emission budget" in this context corresponds to the total amount of allowances to be allocated to the national installations included in the EU ETS.

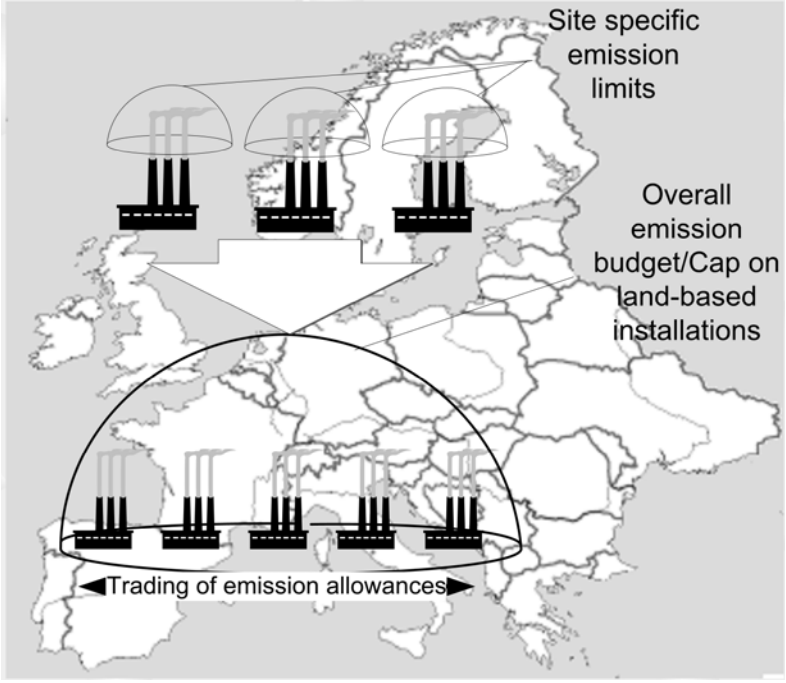

Figure 1. The NO_X and SO_2 emission limits on installation level are replaced by overall SO_2 and NO_X "emission budgets"/caps in order to create flexible and cost-effective solutions for the business sector to reduce these emissions.

The proposed scheme includes the possibility of selling emission reduction credits (ERC) through the trading system as an economic incentive for sectors not covered by the "emission budget", in order to reduce their NO_X and SO_2 emissions. The proposal is focused on shipping industry as supplier of emission reduction credits (ERC:s), but the proposal could be developed to include other sectors.

Our proposed market-based and EU-level allowance and credit trading scheme is, in many respects, centred on the design of and experiences from the US Acid Rain Program, with the SO_2 allowance trading component (in action since 1995)[10], as well as various US NO_X trading schemes (OTC, SIP Call)[11] and the EU ETS with its possibilities[12] for installations to use emission credits from the project-based mechanisms of the Kyoto protocol, i.e. CDM[13], and JI[14] projects, for compliance. The existing "cap, credit and

[10] US Environmental Protection Agency (EPA), http://www.epa.gov/airmarkets/
[11] US Environmental Protection Agency (EPA), http://www.epa.gov/airmarkets/
[12] DIRECTIVE 2004/101/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 27 October 2004 amending Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community, in respect of the Kyoto Protocol's project mechanisms
[13] Clean Development Mechanism, according to rules in article 12 of the Kyoto Protocol, the subsequent decisions in the UN climate negotiations process (i.e. COP-meetings) and the current development of methodologies approved by the CDM Executive Board, http://www.unfccc.de

trade" schemes for SO_2 and NO_X in Ontario, Canada[15] including previous plans on expansion have also, to some extent, been used as a basis for the proposal.

According to the US Environmental Protection Agency (EPA), emissions resulting from the implementation of both the US SO_2 allowance trading scheme and the Ozone Transport Commission (OTC) NO_X Budget Program have been significantly lower than the actual cap. Furthermore, costs have been even lower than anticipated[16].

2.2 General conditions for trading

Our proposal assumes the gradual development of a market for trading allowances and credits, including an institutionalised market place. A well-developed market will ensure cost effective solutions and general accepted rules for trading. The EU ETS has market grown significantly since the scheme was launched in January 2005. It is estimated that in 2005 approximately 360 Mt CO_2 was transacted through brokers, exchanges, and direct bilateral agreements, corresponding to a financial volume of approximately € 7.2 billion. The majority of trading took place in the brokered (OTC) market, but the various exchanges launched at various times throughout the year also saw steady growth.

These brokers and the existing exchanges will commence trading with NO_X and SO_2 allowances and credits once legislation for such trading is in place. Consequently, a market for NO_X and SO_2 allowances and credits with trading, both in OTC and exchanges, has the potential to develop rapidly. The main advantages of an exchange are the centralised clearing, the counterpart risk and the transparency. A counterpart exchange is probably preferable as the counterpart risk is eliminated, although there may be a need for margin calls for outstanding trades.

The trading will depend on the trust of market players in the scheme, that is, it should be clear that the rules, liquidity and products on the market (e.g. exchange) will not change in the foreseeable future. If major changes of the rules are planned, these should be communicated years in advance in order for the market players to take these changes into consideration when acting on the market.

If the above criteria is not fulfilled, the traders, speculators and arbitrators might lack trust in the market and will, consequently, not invest which, in turn, could be negative for the liquidity of the market. Furthermore, the standardisation of the products is important, especially over time. An allowance or credit purchased today should bear the same right

[14] Joint Implementation, according to rules in article 6 of the Kyoto Protocol, the subsequent decisions in the UN climate negotiations process (i.e. COP-meetings) and the current development of guidelines by the JI Supervisory Committee, http://www.unfccc.de
[15] Ontario Ministry of Environment http://www.ene.gov.on.ca, Environmental Finance Vol 3, No 2, p5 and Environmental Finance Vol 2, No 7, p22-23
[16] US Environmental Protection Agency (EPA), http://www.epa.gov/airmarkets/

as one purchased a month ago, or have a determined future value. One of the most important aspects of an exchange is that the framework ensures transparency.[17]

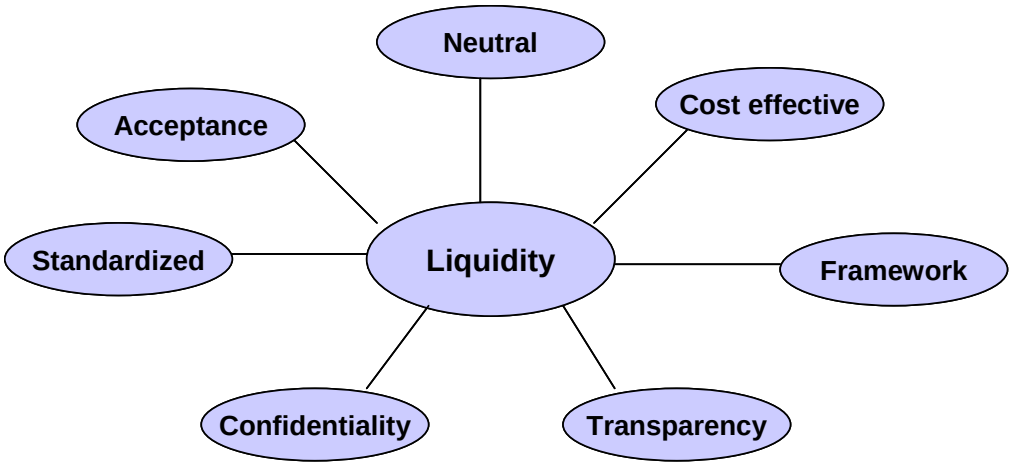

Figure 2: Requirements for an institutionalised market place. Source: PricewaterhouseCoopers

2.3 Bodies and players in the scheme

We propose that a Central Administration of the trading scheme develop and maintain regulations and guidelines for the scheme. Regulations and guidelines should cover all aspects of the scheme. Important departments of the Central Administration are the Central Registry System (that keeps track of all allowances and credits) and the Board of Emissions Reduction Credits (that develops guidelines for, and approves, emission reduction credits). All these functions could be performed at Community level or at Community level and national level, as in the case with the EU ETS.

The market players we foresee in the scheme are the land-based sources which are covered by the emission budgets, the non-capped sources participating through voluntary emissions reduction projects and the traders, such as financial institutions, brokers, etc (See Figure 3).

[17] Source: Financial Risk Management, Risk Management Solutions, PricewaterhouseCoopers AB

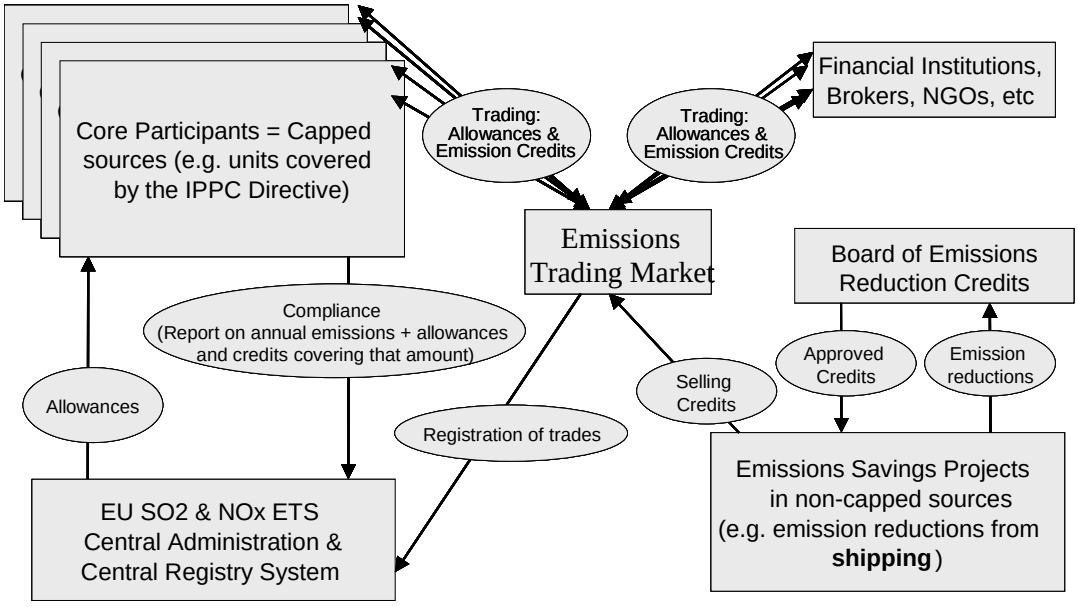

Figure 3: General model of proposed trading scheme

2.4 Trading territory

The proposed coverage of the trading scheme is within the borders of the European Union (currently 25 countries). When new member states join the EU they should be incorporated into the trading scheme. As mentioned above, an EU-level scheme will most likely evolve from national emission trading schemes and regional emission trading schemes including several member states. Already today a national trading scheme for NO_X is implemented in the Netherlands and several countries (e.g. UK) are considering trading schemes for NO_X and SO_2.

There are arguments against having one single trading territory all across the EU. Asacidification is a regional (and in some cases local) environmental problem and ground-level ozone exposure (NO_X is a contributing factor to this problem) is a local and regional problem (see Annex 1). Our view, however, is that the demand for the launch and assessment of a single trading scheme is of overall greater importance than considerations for possible local and regional repercussions. If it transpires that the EU wide trading scheme does not satisfy the regional and local environmental objectives, as a result of predominant weather and wind conditions and variations in ground geology, etc. then this should be taken into consideration in due course. We are of the opinion that the use of National Emission Ceilings[18] and local Environmental Quality Standards[19] should

[18] Directive 2001/81/EC of the European Parliament and of the Council of 23 October 2001 on national emission ceilings for certain atmospheric pollutants

ensure that regional and local objectives are fulfilled (See paragraph below "Maximum emission levels of included installations").

This view is supported by a study[20] conducted on behalf of the European Commission. The objective of the study is to evaluate market based instruments as a means to reduce ship emissions in the EU. According to the evaluator (NERA), it seems sensible to develop a simplified approach in which allowances and created credits are weighed equally, as existing scientific evidence and experience with emissions trading programmes demonstrate that emissions from both SO_2 and NO_X are relevant over broad geographic areas (a result supported by HELCOM[21]), and that there is a risk that the cost of administering a more complex system with different trading territories can be relatively high.

2.5 Cap/Emission Budget

We suggest that the caps/emission budgets for SO_2 and NO_X, embrace the major energy and industry installations in EU, e.g. the installations covered by the IPPC Directive[22], as they are responsible for a major portion of the European industry sector's SO_2 and NO_X emissions. The sources are listed in Annex 2 of the IPPC Directive. The units covered by the LCP Directive[23] are a subset of the ones covered by the IPPC Directive and, consequently, are also covered by the emission budgets.

Through the IPPC Directive, and the subsequent implementation in national legislation, the national authorities concerned will or have already[24] made demands on the installations, in terms of limits on emissions values[25], environmental quality standards, permits, emissions controls, BAT (Best Available Technology)[26] and reporting. In order

[19] Definition from the IPPC Directive 96/61/EC: "Environmental quality standard shall mean the set of requirements which must be fulfilled at a given time by a given environment or particular part thereof, as set out in Community legislation"
[20] "Economic Instruments for Reducing Ship Emissions in the European Union - European Commission, Directorate-General Environment", NERA Economic Consulting, 26 September 2005, http://europa.eu.int/comm/environment/air/pdf/task3_final.pdf
[21] HELCOM MARITIME 3/2004, Document 6/1
[22] Council Directive 96/61/EC of 24 September 1996 concerning integrated pollution prevention and control
[23] Directive 2001/80/EC of the European Parliament and of the Council of 23 October 2001 on the limitation of emissions of certain pollutants into the air from large combustion plants
[24] The major deadline for full implementation of the IPPC Directive is that existing installations must be brought into compliance by 30 October 2007.
[25] Definition from the IPPC Directive 96/61/EC: "Emission limit values shall mean the mass, expressed in terms of certain specific parameters, concentration and/or level of an emission, which may not be exceeded during one or more periods of time."
[26] Definition from the IPPC Directive 96/61/EC: "Best available techniques shall mean the most effective and advanced stage in the development of activities and their methods of operation to reduce emissions and the impact on the environment as a whole"

to allow the emission sources a greater degree of freedom in trading, the IPPC Directive would, most likely, require some modification for the future. However, already today there are installations covered by the IPPC Directive participating in the Dutch emission trading scheme for NO_X. In the ongoing review of the IPPC Directive an analysis of the interaction between the IPPC Directive and emission trading schemes for NO_X and SO_2 is included. This analysis will probably result in proposals for amendments of the Directive in order to improve the possibilities for trading.

The LCP Directive sets parallel NO_X and SO_2 emission limit values and other demands on the large combustion plants, but does not involve the request for best available techniques (BAT). As a consequence, several member states are looking into the possibilities to apply emission trading as a means to implement and comply with the LCP Directive[27].

The aim of our proposal is to create equal emission reductions at a lower economic cost than those proposed in current policies and regulations. Consequently, in order to create a scope for trading, the levels of the SO_2 and NO_X caps/emission budgets in EU should be equal to the environmental objectives already set (e.g. the National Emission Ceilings Directive (NEC Directive)[28] and the emission ceilings in the UN-ECE Convention on Long-range Transboundary Air Pollution protocol (CLRTAP) [29]). A certain degree of flexibility in the national emissions ceilings in EU countries needs to be tolerated (due to net-selling and net-buying between member states), as long as the EU's overall objective is reached. The emission trading between EU countries could, otherwise, become constrained. A review of the NEC Directive is currently ongoing, including the proposal for future National Emissions Ceilings (i.e. national targets) and the analysis of emission trading schemes for NO_X and SO_2. The Commission foresees a new proposal to be adopted in the first half of 2007.

The levels of the SO_2 and NO_X caps/emission budgets in EU should preferably be set to cover a fairly long period of time (5 years) and these levels should gradually decrease to the emission levels determined by the European Commission. With knowledge of the manner in which the emission budget level will change over time, the included installations can prepare long-term and cost-effective emission reduction strategies.

For further reasoning regarding the legal consideration of implementing a EU-level NO_X and SO_2 emission trading scheme, see paragraph 4 "Regulation".

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[27] "Economic Instruments for Reducing Ship Emissions in the European Union - European Commission, Directorate-General Environment", NERA Economic Consulting, 26 September 2005, http://europa.eu.int/comm/environment/air/pdf/task3_final.pdf

[28] Directive 2001/81/EC of the European Parliament and of the Council of 23 October 2001 on national emission ceilings for certain atmospheric pollutants

[29] Convention on Long-range Transboundary Air Pollution, The 1999 Gothenburg Protocol to Abate Acidification, Eutrophication and Ground-level Ozon, http://www.unece.org/env/lrtap/

2.6 Allowances

2.6.1 Definition and function

One SO_2 or NO_X allowance in the trading scheme authorises an included installation to emit a certain quantity of SO_2 or NO_X respectively during a given year (or any year thereafter). Allowances cannot be used for compliance prior to the calendar year for which they are allocated, but banking[30] of surplus allowances should be admitted. Some limits to banking might be needed in order to mitigate the risk for future peak loads. Any possible limits on banking are no obstruction on the market, as long as the rules are very clear.

2.6.2 Allocation of Allowances

We suggest that the allowances be allocated free of charge to the included installations. This would be the main allocation principle in order to avoid imposing any additional costs on the sources covered by the scheme. Free allocation could be based on emission efficiency rates (i.e. "Benchmarking") or emissions during a representative baseline year, calculated as the average emissions of a certain number of years (e.g. three or five), prior to the launching date of the emission trading scheme (i.e. "Grandfathering"[31]). These allocation methods could also be combined in a number of ways. "Benchmarking" and "Grandfathering" were the dominating allocation principles in the first trading period of the EU ETS.

We also suggest that the allocation process also takes into consideration, investment in BAT prior to baseline years, earlier emission mitigation actions, and expanded production capacity after baseline years etc, in order to prevent disadvantages for early movers and unfair advantages to sources with poor emissions reduction equipment and low emissions efficiency rates. The allocation principle must also take the National Emissions Ceilings into consideration. As in the existing EU ETS, the Central Administration of the trading scheme (EU-level and/or member state level[32]) could develop the allocation principles.

Once the allowances are allocated they are tradable in the emission trading scheme.

[30] Emission allowances and credits not used in one commitment period can be saved or "banked" for future use in a subsequent compliance period.
[31] Grandfathering is a method for issuing emission allowances to emitters in an emission trading scheme according to their historical emissions.
[32] In the EU ETS the criteria for the National Allocation Plans are developed by the European Commission, the detailed plans are then developed by the national authorities and then finally approved by the Commission.

2.7 Emission reduction credits

As in the EU ETS, we propose that emissions reduction credits (ERC:s), in addition to allowances, should be tradable within the scheme. The possibility to generate tradable emissions reduction credits (ERC:s) is a cornerstone of the proposed trading scheme, as it will improve the cost-efficiency substantially and will provide a strong incentive for shipowners to reduce the emissions of their ships.

The ERC's are created in emissions reduction projects performed by companies or sources not covered by the emission budget. By reducing the emissions below a certain reference scenario (i.e. "baseline"), credits are generated based on the difference between this baseline and the emissions resulting from the reduction project. One source with large potential to generate emission credits in this proposed scheme is, as mentioned previously, shipping (see Figure 4).

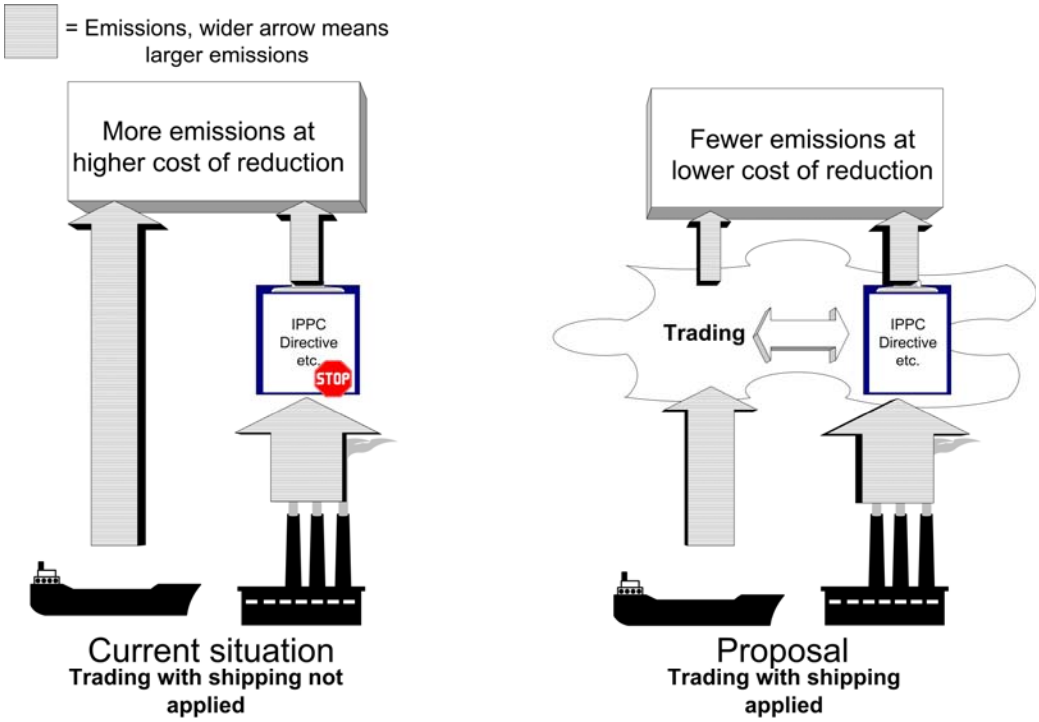

Figure 4. The possibility to sell emissions reduction credits (ERC:s) from shipping will improve the cost-efficiency of the reductions substantially and it will provide a strong incentive for ship owners to reduce the emissions of their ships

We suggest an approach in which an official committee (Board of ERC's) is established to develop general guidelines for the emissions reduction projects. These guidelines should cover rules for determination of baseline, calculation of credits, verification, etc. The Board of ERC's should also function as a supervisor in issuing the credits.

The process of creating marketable credits involves several steps:

1. Reduction of emissions
2. Monitoring of emissions (and other relevant parameters)
3. Calculation and reporting of emission reductions (including definition of baseline)
4. Verification of emission reductions
5. Approval of the verified reductions and issuance of credits by the Board of ERC's

Once the credits are issued and transferred into the account, they have the same value and function as allowances in the emission trading scheme, e.g. tradable and used for compliance. Consequently, one SO_2 or NO_X emissions reduction credit authorises a covered installation to emit a certain degree of SO_2 or NO_X during a given year or any year thereafter. Credits should, as with allowances, be permitted to be banked.

The use of credits is included when designing emission trading schemes in order to improve the cost-efficiency of the scheme and to spread the environmental improvement to other sectors not covered by the emission budget, e.g. shipping. In the EU ETS approved credits from emission reductions projects are recognised[33] as equivalent to allowances, i.e. they can be traded and used for compliance. The fact that credits, generated in cost-effective emission reduction projects in developing countries (i.e. the Clean Development Mechanism[34]) and in countries with economies in transition (i.e. Joint Implementation[35]), are approved in the EU ETS, creates a major driver for investments in reduction technologies in these countries. The use of credits in the EU ETS is also expected to have a number of benefits for the installations covered by the scheme, e.g. increased market liquidity and new options for investments for the companies to reach compliance (e.g. cost-effective reduction projects in developing countries with a wide range of risk exposure). The use of credits also has benefits to the global society e.g. support for sustainable investments and technology transfer in developing countries.

[33] Through the Linking Directive (DIRECTIVE 2004/101/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 27 October 2004 amending Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community, in respect of the Kyoto Protocol's project mechanisms)

[34] According to rules in article 12 of the Kyoto Protocol, the subsequent decisions in the UN climate negotiations process (i.e. COP-meetings) and the current development of methodologies approved by the CDM Executive Board, http://www.unfccc.de

[35] According to rules in article 6 of the Kyoto Protocol, the subsequent decisions in the UN climate negotiations process (i.e. COP-meetings) and the current development of guidelines by the JI Supervisory Committee, http://www.unfccc.de

In the recent study[36] conducted by NERA on behalf of the European Commission (i.e. an evaluation of market-based instruments as a means to reduce ship emissions in the EU) the scheme[37] proposed by SSA was regarded as the most promising economic instrument for reducing NO_X emissions. The proposed scheme was also believed to be able to create cost-effective reductions of SO_2 emissions. A general conclusion of the conducted assessment is that the market-based policy instruments considered in the study have the potential to offer significant emissions reductions at lower cost than simple regulatory alternatives. A final recommendation in the report is, consequently, that the most promising emission trading instruments are further developed and implemented.

The specific process of creating emissions reduction credits for shipping is described in chapter 3 “How to create verified Emission Reduction Credits”.

2.8 Trading and liquidity of the scheme

In order to create opportunities for trading and enhance liquidity in the EU ETS, any corporation, financial institution, broker, municipality, environmental group, etc is allowed to purchase, sell and trade allowances and credits. By applying for an account, any player that wishes to take part in the trading will receive an account in the register. This means of enhancing the market and ensuring liquidity should also be used in the proposed trading scheme trading for NO_X and SO_2.

The number of included installations must also be sufficient. By choosing the sources covered by the IPPC Directive, a large number of installations in each member state would be part of the trading scheme. This should create a sufficient number of participating units. The process of creating credits would also enhance the liquidity of the scheme due to large number of ship owners voluntary providing credits to the land-based installations.

2.8.1 Register system for allowances and credits

In order to keep a record of all allowances and credits created and traded, a register system is required. Each included installation should be assigned at least one account in the registry. Other non-capped parties participating in the trading (i.e. credit providers, brokers, financial institutions) should, have the opportunity to apply for individual accounts in the registry. Performed transactions and credits created by projects should be reported and recorded in the registry.

[36] “The NERA report”, i.e. “Economic Instruments for Reducing Ship Emissions in the European Union - European Commission, Directorate-General Environment”, NERA Economic Consulting, 26 September 2005, http://europa.eu.int/comm/environment/air/pdf/task3_final.pdf
[37] In “the NERA report” our proposed scheme is referred to as the “credit-based approach”

The registry system in the EU ETS consists of 25 national registries which are operated by the member states and connected through the Community Independent Transaction Log (CITL) which is operated by the Commission. The CITL keeps tracks of all transactions within and between the national registries. We believe that this existing registry system can be expanded, without major difficulties, to also function as a registry system for the NO_X and SO_2 emission trading scheme. In this way, functionality would be secured and, at the same time, administrative costs would be kept low.

The experiences and lessons learned from the EU ETS registries can be used when designing and implementing the registry system for the NO_X and SO_2 emission trading scheme. This was the case when the registry was created for the Dutch NO_X emission trading scheme.

2.9 Compliance of included installations

2.9.1 Monitoring and reporting of included installations

Complete and consistent emissions monitoring and reporting by all installations would guarantee that total emissions do not exceed the overall emission budget for the scheme. By complete and consistent reporting of emissions from individual installations, compliance, i.e. that the installations surrender allowances and credits held in their account corresponding to the amount of reported emissions, can be easily supervised by the authorities. If local emission level restrictions have been set (based on local environmental quality standards) the authorities can also use the reporting to supervise to ensure that these restrictions are not exceeded.

The IPPC Directive with the specified EPER decision[38] requires that countries in the EU report SO_2 and NO_X emissions to the Commission. Consequently, the IPPC installations are required to monitor and report their emissions to the national or local regulatory body. According to the IPPC Directive, the permits shall contain ”suitable release monitoring requirements, specifying measurement methodology and frequency, evaluation procedure and an obligation to supply the competent authority with data required for checking compliance with the permit”.

The current reporting could most certainly be adjusted in order to fit required reporting guidelines, the registry and compliance methodology of the trading scheme. In our opinion the present monitoring and reporting of the IPPC installations would need only marginal modifications.

[38] 2000/479/EC: Commission Decision of 17 July 2000 on the implementation of a European pollutant emission register (EPER) according to Article 15 of Council Directive 96/61/EC concerning integrated pollution prevention and control (IPPC)

2.9.2 Verifying reported emissions of included installations

The present reporting of emissions of the IPPC installations does not involve verification. In the proposed trading scheme the reliability of reported emissions data from the included installations is critical to the compliance process and adds credibility to the scheme. To achieve this, it is important that the reported emissions data are verified by a third party. Consequently, it is necessary for the verification to be completed in a consistent, transparent and comparable manner across all included installations. In order to ensure that the reported emissions data are assessed at the same level of assurance, the Central Administration of the trading scheme should develop common guidelines, based on both financial and environmental audits (i.e. as in the EU ETS). It is important that the cost of verification stays at a reasonable level if the cost-efficiency nature of the scheme is to be maintained.

In the EU ETS third party verification is applied to confirm the reliability of the reported annual emissions. We suggest that a similar verification process be applied in the proposed trading scheme.

2.9.3 End-of-Year Settlement and Compliance

As mentioned above, operators of the included installations are able to utilise both credits and allowances for compliance. We propose that end-of-year settlement and compliance be designed in the same secure manner as in the existing EU ETS. Consequently, monitored and verified emissions data, as reported by the included installation to the Central Administrator, combined with allowance allocations, credits and transfers recorded in the Register System, shall provide the basis for determination of compliance.

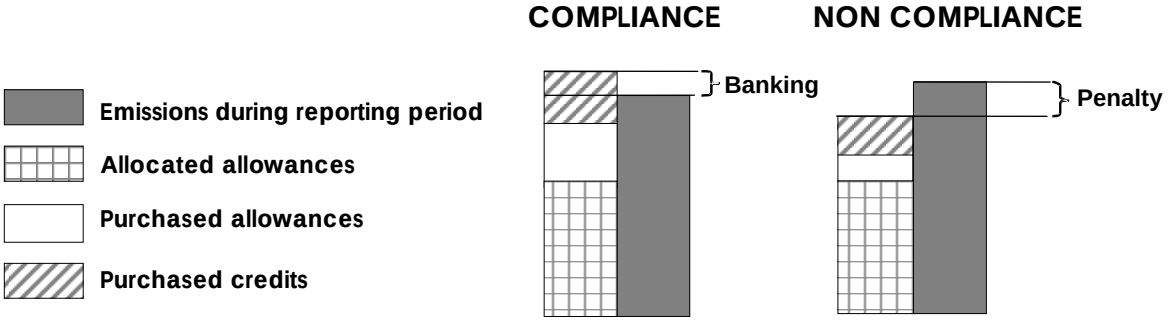

Figure 5: Compliance and non-compliance for an installation (at the compliance date)

In the EU ETS the authorities ensure that the operator of each installation surrenders a number of allowances and credits equal to the total amount of verified reported emissions from that installation, and that these allowances and credits are subsequently cancelled from the accounts. As long as there is a surplus of allowances and credits in the account (compared to the amount of reported emissions during the previous year) at cancellation

date, compliance with the trading scheme rules is secured. The companies can bank or sell any surplus allowances (see Figure 5).

2.9.4 Penalties for non-compliance

If emissions from an included installation exceed the allowances and credits held by the transfer deadline there is a non-compliance situation. The Central Administration shall then have the authority to put a penalty on the operator of the installation.

In the EU ETS the excess emissions penalty is a fee for each excess ton CO_2 (40 € during the 2005-2007 period) and a withstanding obligation to surrender an amount of allowances and/or credits equal to those excess emissions.

In the proposed scheme a penalty approach similar to the one in the EU ETS can be applied. An alternative penalty approach is to deduct allowances from the next allocation round to the installation on the basis of a certain deduction rate, e.g. 3 allowances per excess ton emission. The entity responsible for the installation would then either be required to reduce emissions or to purchase additional allowances and/or credits in order to make adjustment for the penalty deduction. In addition to the following suggested penalties, the Commission should enforce provisions pursuant to applicable law and regulations, including those providing for civil and criminal penalties.

2.9.5 Maximum emission levels of included installations

In order to minimise the risk of negative local effects from emissions, we suggest that, regardless of the quantity of allowances or credits an installation in the scheme holds, it is never entitled to exceed the limits set in the regional or local environmental quality standards (i.e, this portion of the IPPC Directive must be adhered to).

In the implementation phase of the emission trading in the US Acid Rain Program there was concern that “hot-spots” (i.e. locations in which pollutant concentrations and environmental damages were higher than in other regions) could develop. Empirical evidence suggests that these concerns were misplaced, as emission reductions were actually greatest in the areas of greatest concern[39].

[39] “Economic Instruments for Reducing Ship Emissions in the European Union - European Commission, Directorate-General Environment”, NERA Economic Consulting, 26 September 2005, http://europa.eu.int/comm/environment/air/pdf/task3_final.pdf

3 Potential for trading – Volumes, marginal abatement costs and opportunities for industry and shipping

As previously stated, the aim of the proposed trading scheme is to create equal emission reductions of NO_X and SO_2, i.e. those proposed in current policies and regulations, at a lower economic cost to society as a whole, and especially to the land-based industry. The study regarding market-based instruments for ship emissions, conducted by NERA on behalf of the European Commission, clearly confirms that there is an evident potential for the proposed trading scheme to create cost-effective emission reductions in EU (especially as regards to NO_X, but also for SO_2). The basic driver for this conclusion is the analysis that shipping in general can achieve reductions at a lower cost than the land-based emitters, but the proper incentives for shipping to create these reductions have yet not been implemented.

The major benefits and opportunities of the proposed scheme to the companies operating energy or industry installations in EU are;

- that a much more flexible and cost-effective solution for complying with emission limits will be available, consequently the operators will be able to comply with demands on emission reductions by choosing between investments in new low emission techniques and purchase emission allowances and credits, or combining these two measures in any proportion desired (figure 6)
- better planning possibilities for the operators, since in emission trading schemes the overall emission budget and the allocation of emission allowances to each installation are preferably established by the authorities many years in advance, i.e. allocation will be known several years in advance, instead of having site specific emission limits updated without notice.
- the flexibility to choose the most suitable option, e.g. long-term strategic or short-term financially viable, whatever issue is regarded as the most important at the time.
- that operators will have the possibility to sell surplus allowances from the installations which “over-comply”, i.e. achieve reductions so that the annual amount of allocated emission allowances exceeds the annual emissions, and in this way generate revenues.

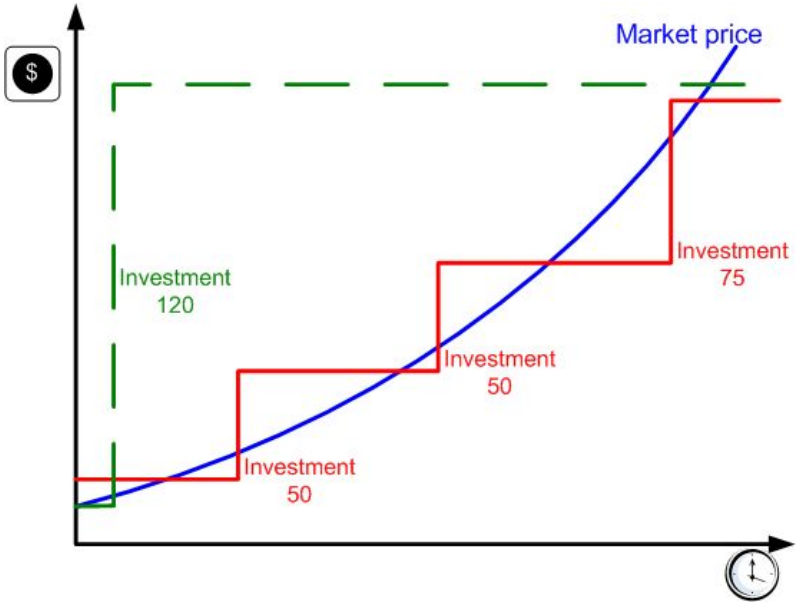

Figure 6: The emission trading scheme will provide a more flexible and cost-effective solution for complying with emission regulations compared to traditional site specific emission limits

The major benefits and opportunities of the proposed scheme for ship owners are that they:

- will be encouraged to make investments to create reductions, as the selling of emission reduction credits in the trading system will generate an additional payback,
- will be ensured a fair competition world-wide by avoiding mandatory regional regulations, as involvement in the trading scheme is voluntary for shipping
- will not be subject to taxes and charges, as the trading system has the potential to achieve the necessary reductions, and
- will be able to invest in advanced emissions abatement technology without facing unfair competition from ship owners who neglect consideration of environmental protection.

3.1 The potential NO_X trading market

3.1.1 Land-based installation - Volumes & marginal abatement costs

In 2001, the total land-based NO_X emissions in EU15 were 9 950 ktonnes. In EU25 they were 11 700 ktonnes NO_X. The land-based installations in EU 25 were accountable for

approximately 40% of these emissions, i.e. 4 700 ktonnes NO_X. [40] As a comparison, the NEC Directive has set national NO_X targets for 2010 adding up to 6 519 ktonnes[41] and 8 319 ktonnes[42] for the countries within EU15 and EU25, respectively. Consequently significant reductions (i.e. about 20 %) are necessary in order to reach the targets.

In addition, a report[43] conducted on behalf the European Commission as part of the ongoing review of the NEC Directive indicates that the national targets in the NEC Directive can be difficult to achieve without additional measures. The projected NO_X emissions in the study for 2010 are 6 800 – 7 100 ktonnes for EU15 and 7 900 – 8 300 ktonnes for EU25 depending on which scenario considered. These figures lead to the conclusion that it is likely that the authorities will continue to set NO_X emission reductions targets for the sector of land-based installations and it can be expected that the land-based installations will at least be responsible for a proportional part of the required reductions, i.e. resulting in a very rough estimate on approximately 1 000 ktonnes of NO_X reductions or demand for emission credits (see Figure 7).

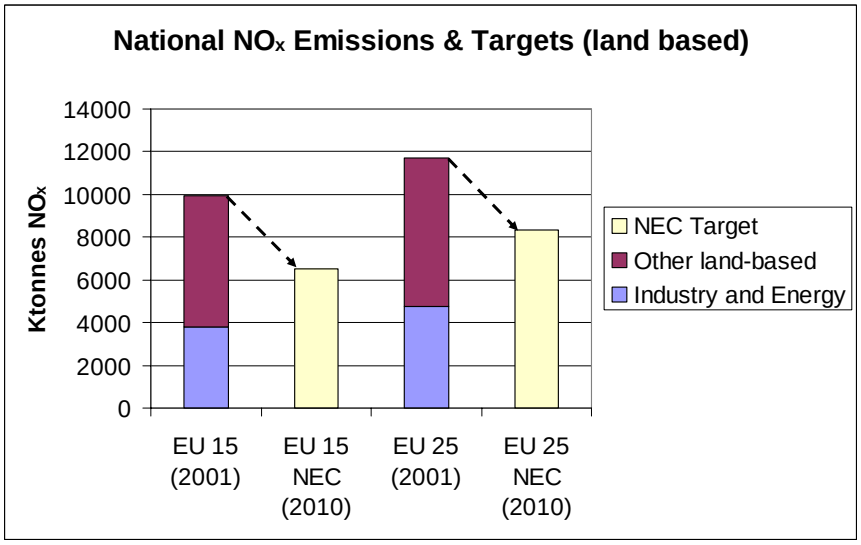

Figure 7. The sum of national emissions in EU 15 and EU 25 (international shipping not included) compared with the sum of national targets in the NEC Directive

The costs of reducing NO_X emissions for the land-based installations vary considerably depending on industry sector and how relatively low the NO_X emissions of the

[40] European Environmental Agency, EEA31 Emission statistics, 2003, http://themes.eea.eu.int/Environmental_issues/air_quality/indicators/
[41] DIRECTIVE 2001/81/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 23 October 2001 on national emission ceilings for certain atmospheric pollutants
[42] "National Emission Ceilings Directive Review, Task 3 – First Draft Review Report Prepared for the Final Report for theEuropean Commission DG Environment", Entec UK Limited, May 2005
[43] "National Emission Ceilings Directive Review, Task 3 – First Draft Review Report Prepared for the Final Report for theEuropean Commission DG Environment", Entec UK Limited, May 2005

installations are. The estimated marginal abatement costs (MAC) for NO_X in the period 2010-2020 within the European industry may vary from as low as 900 €/ton ,within lime production, to 8 700 €/ton in the refinery sector. However, the major volumes of potential reductions in the industry sector in the period 2010-2020 are estimated to be in the upper part of this interval. The European energy sector is estimated to have a cost-range for marginal NO_X abatement from 3 400 to 8 000 €/ton within the same time period (see Figure 8). [44],[45],[46]

3.1.2 Shipping - Volumes and marginal abatement costs

The maximum potential for NO_X emission reductions from shipping has been estimated to several 1 000 ktonnes, based on the fact that a ship using SCR can reduce emissions by more than 90 %.[47] A more realistic assumption is that only a minor part of this full potential will be realised, as actual reductions from the beginning in the emission trading scheme, implying that a volume of 1 000 ktonnes NO_X emission credits[48] from shipping annually is a realistic scenario.

The marginal abatement costs at sea are, in general, noticeably lower. When reducing NO_X emissions from a large-size ferry using SCR technology (see Chapter 6 regarding abatement techniques[49]) the cost is estimated to be below 650 €/tonnes abated NO_X and may be as low as 240 €/ton.[50] In the NERA report the corresponding estimated costs per tonne abated NO_X, for medium[51] and large[52] sized vessels with installed SCR technology, range from 526 to 612 €. For the other NO_X abatement approaches, e.g. internal engine modifications (IEM), humid air motor (HAM) and direct water injection (DWI), on the same types of vessels NERA estimates that the costs range from 9 (basic IEM) to 360 (DWI) €/ per tonne abated NO_X.

The monitoring costs per vessel and year depend on the complexity of the abatement and monitoring technology and the number of engines with installed abatement technology. A

[44] "Service Contract on Ship Emissions: Assignment, Abatement and Market-based Instruments Task 2b - NO_x abatement", Entec Ltd; August 2005

[45]"Förslag till breddning och uppdelning av kväveoxidavgiften, RAPPORT 5525," Naturvårdsverket (The Swedish EPA, December 2005 - has through queries to the land-based industry estimated the cost-range to mainly be between 1 400 to 6 900 €/ton.

[46] Integrated Pollution Prevention and Control (IPPC), Reference Document on Best Available Techniques for Large Combustion Plants gives a cost-range

[47] The NERA report, several reports by Entec UK Ltd, e.g. "National Emission Ceilings Directive Review, Task 3 – First Draft Review Report Prepared for the Final Report for the European Commission DG Environment", Entec UK Limited, May 2005, and Stefan Lemieszewski, (the Swedish Maritime Administration)

[48] i.e. emission reductions below the NO_X and SO_2 baselines based on current regulations, i.e.MARPOL Annex VI and the Sulphur Directive.

[49] Different abatement techniques for NO_X are listed in Chapter 6 "How to create emission reductions"

[50] The BMT report No. 3623 appendix 3 and Stefan Lemieszewski, Swedish Maritime Administration

[51] Medium vessel assumed to have a one main engine with a size of 10 000 kW

[52] Large vessel assumed to have a one main engine with a size of 25 000 kW

wide cost range would be estimated to be between 21 500 and 118 000 €/year for the more advanced monitoring approaches (continuous emissions monitoring).[53] Entec UK Ltd[54] estimates the average monitoring costs to 41 000 €/year. Considering that a large ferry may account for reductions up to 2 000[55] tons of NO_X per year the added cost for monitoring would only be around 20-25 €/ton. As smaller vessel will have more simplified monitoring requirements the cost per tonne NO_X is not estimated to be higher for these vessels. This results in a total marginal abatement cost-range of 300-700 €/tonne reduced NO_X for sea-going vessels using SCR-technology and even lower costs for vessels using other abatement technologies (see Figure 8).

3.1.3 The potential trading market

The above figures show that the European energy sector's average marginal abatement costs is thought to be approximately ten times higher than the average marginal abatement costs for sea-going vessels installing SCRtechnology. Within the European industry sector the abatement costs are thought to be at least 1.5-10 times higher than the than the average marginal abatement costs for sea-going vessels installing SCRtechnology (recalling that the other NO_X abatement technologies for shipping are estimated to have even lower marginal cost. Consequently, there will be a clear driver for the industry to purchase relatively cheap credits and a clear driver for shipping to generate marketable emission credits in the emission trading scheme.

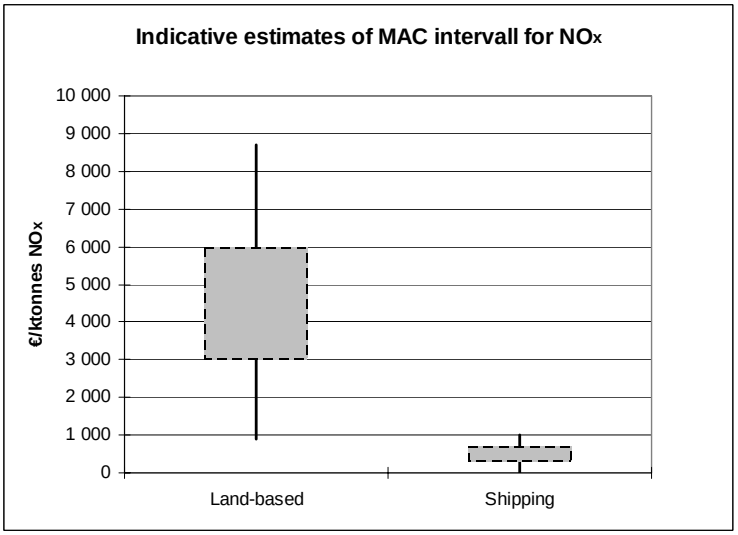

Figure 8: Estimated NO_X Marginal Abetement Cost (MAC) interval for Land-based installations and shipping (high and low end costs are illustrated with thin line and the range in which the major volume of reductions is projected is marked a grey area).

[53] DEMO Project –Final Report, appendix 6 by David Cooper, the costs include monitoring equipment
[54] "Service Contract on Ship Emissions: Assignment, Abatement and Market-based Instruments Task 2 – General report"; Entec Uk Ltd, August 2005
[55] "Service Contract on Ship Emissions: Assignment, Abatement and Market-based Instruments Task 2 – General report"; Entec Uk Ltd, August 2005

The rough estimates of volumes (i.e. reductions required and potential for credits) are also matching which indicates that both sides can meet the other side's demands.

An assumed annual volume of 1 000 000 NO_X credits (i.e. 1000 ktonnes reduced NOx emissions and 1 credit per1 tonne NO_X) and an assumed market price between 1000 and 2000 € per credit[56] would decrease compliance costs for the land-based installations with several 1000 million € annually. At the same time shipping would receive payback for investments in abetment technologies in the range of 1000-2000 million € annually.

In theory, land-based installations with marginal abatement costs (MAC:s) above the allowance market price should purchase allowances from installations with MAC:s below the market price. As demonstrated, shipping has a large potential to provide emission credits well below the average MAC of the land based installations, and can, as a consequence substantially lower the total cost of compliance for the land-based installations.

3.2 SO_2 - Volumes and marginal abatement costs

3.2.1 Land-based industry

In 2001, the total land-based SO_2 emissions in EU15 were 5 500 ktonnes. In EU25 they were 8 600 ktonnes SO_2. The land-based installations in EU 25 were accountable for approximately 93% of these emissions, i.e. 8 000 ktonnes SO_2. [57] As a comparison, the NEC Directive has established national SO_2 targets for 2010 totalling 3 850 ktonnes[58] and 6 543 ktonnes[59] for the countries within EU15 and EU25 respectively. Consequently significant reductions (i.e. about 25 %) are necessary in order to reach these targets.

These figures lead to the conclusion that it is likely that the authorities will continue with SO_2 emission reductions targets for the sector of land-based installations and it can be expected that the land-based installations will at least be responsible for a portion of the required reductions, i.e. resulting in a very rough estimate on approximately 2 000 ktonnes of SO_2 reductions (based on 2001 data) or demand for emission credits (see Figure 9).

[56] A figure in the lower range of the MAC for the land based installations
[57] European Environmental Agency, EEA31 Emission statistics, 2003, http://themes.eea.eu.int/Environmental_issues/air_quality/indicators/
[58] DIRECTIVE 2001/81/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 23 October 2001 on national emission ceilings for certain atmospheric pollutants
[59] "National Emission Ceilings Directive Review, Task 3 – First Draft Review Report Prepared for the Final Report for theEuropean Commission DG Environment", Entec UK Limited, May 2005

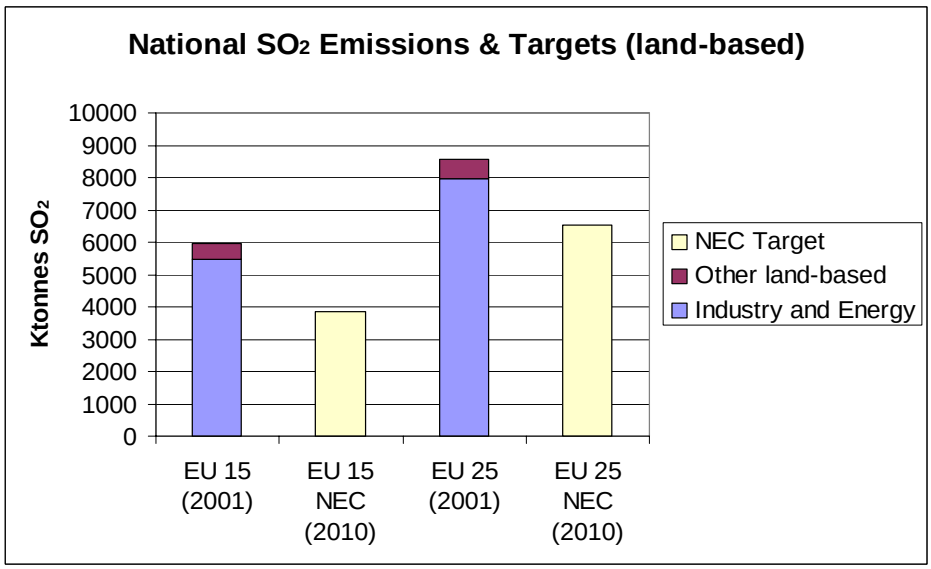

Figure 9. The sum of national emissions in EU 15 and EU 25 (international shipping not included) compared with the sum of national targets in the NEC Directive

The land-based installations reduce SO_2 emissions primarily by using fuels with lower sulphur content, but also by installing scrubbers to "wash" the exhaust fumes (see Chapter 6 for abatement techniques). The estimated marginal abatement costs for land-based installations between 2010 - 2020 are within a wide range, especially within the industry sector.[60] The costs are estimated to be as low as 700 € per ton SO_2, when reducing at an agricultural waste incineration plant. Within the industrial processing of cement, the marginal abatement cost for SO_2 is estimated to be as high as 8 700 € per ton. The energy sectors estimated cost-range is narrower, ranging between 2 000 and 8 900 € per ton of SO_2 (see Figure 10).

3.2.2 Shipping

The potential for SO_2 emission reductions from shipping has been estimated at several 1 000 ktonnes[61]. Even though some ships, e.g. ships owned by Swedish ship owners have used low sulphur fuel for several years, a more realistic assumption is that only a minor portion of this full potential is realised. Resulting in the fact that a volume of at least 1 000 ktonnes of SO_2 credits from shipping annually can be seen to be a realistic scenario.

[60] Entec Service Contract on Ship Emissions: Assignment, Abatement and Market-based Instruments Task 2c - SO_2 abatement; August 2005

[61] The NERA report, several reports by Entec UK Ltd, e.g. "National Emission Ceilings Directive Review, Task 3 – First Draft Review Report Prepared for the Final Report for the European Commission DG Environment", Entec UK Limited, May 2005, and Stefan Lemieszewski, (the Swedish Maritime Administration)

The average sulphur content of marine heavy fuel oil (HFO) produced in Europe was approximately 2.9 % in 2003[62]. Depending on where the reduction of sulphur dioxide is made, different baselines will be applied, i.e. the Baltic Sea is classified as a SECA restricting the sulphur content in fuel to a maximum of 1.5%. In the Mediterranean Sea Marpol VI determines the limit for sulphur content in fuels at a maximum of 4.5%. However, to protect the environmental integrity of the proposed scheme we are, , suggesting as discussed above a baseline of 2.7% sulphur in fuels for ships and areas not covered by the limits in the Marine Fuels Sulphur Directive, e.g. the Mediterranean Sea.

If ships use HFO with 0.5% sulphur and the baseline is 1.5% of sulphur content (e.g. Baltic Sea), the marginal abatement cost is estimated at 2300-4600 € per ton SO_2[63]. In the NERA report the estimated cost for using 0.5% sulphur HFO with an 2.7 % baseline is 1 700 € per tonne abated SO_2 for medium[64] and large[65] sized vessels.

If ships use HFO with 1.5% sulphur and the baseline is 2.7% of sulphur content (e.g. Mediterranean Sea), the price per ton of SO_2 would be in the range of 920-3 400 € per ton.[66]. In the NERA report the corresponding estimated cost is 1 230 € per tonne abated SO_2 for medium and large sized vessels.

In the NERA report the estimated costs for using HFO and a scrubber with an 2,7 % sulphur baseline range from 320 to 540 € per tonne abated SO_2 for medium and large sized vessels (see Figure 10).

3.2.3 Trading

The above figures show that when ships reduce from 1.5% to 0.5% sulphur content the abatement costs are likely to be within the same range as for the land-based installations, though in the lower half of the range.

It is likely that the marginal abatement cost-range is in the region of 1 500 €/ton SO_2 for sea-going vessels using 1.5% sulphur fuel, instead of 2.7%. These figures show that the European energy sector's average marginal abatement cost is thought to be approximately 1.3-2.5 times higher. Within the European industry sector the abatement cost is thought to be either cheaper or, up to approximately 2.5 times higher. Consequently there is a potential driver for the industry to purchase relatively cheap

[62] "Advice on Marine Fuels. Potential price premium for 0,5% marine fuels. Final Report". Beicip-Franlab. October 2003.
[63] Figures used for this calculation are from: Advice on Marine Fuels. Potential price premium for 0,5% marine fuels. Final Report. October 2003. Beicip-Franlab.
[64] Medium vessel assumed to have a one main engine with a size of 10 000 kW
[65] Large vessel assumed to have a one main engine with a size of 25 000 kW
[66] Figures used for this calculation are from: Advice on Marine Fuels. Potential price premium for 0,5% marine fuels. Final Report. October 2003. Beicip-Franlab.

credits and a driver for shipping to generate marketable emission credits in the emission trading scheme (see Figure 10).

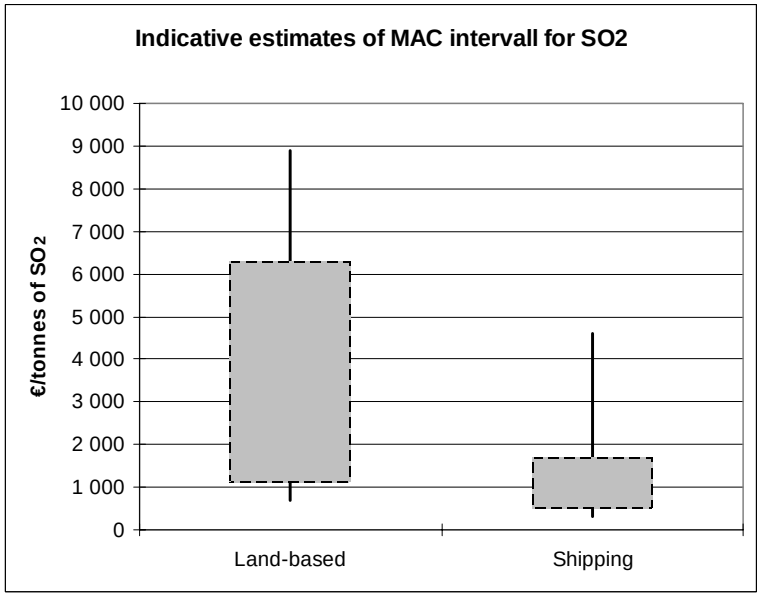

Figure 10: Estimated SO_2 Marginal Abatement Cost (MAC) interval for Land-based installations and shipping (high and low end costs are illustrated with thin line and the range were the major volume of reductions are projected is marked a grey area).

The rough estimates of volumes (i.e. reductions required and potential for credits) are also matching with indicates that both sides can meet the other sides demands.

In the US SO_2 trading scheme the market price has ranged between 600 and 1 600 US$ during the last 18 months (see figure below). Since the average installation in EU has somewhat lower SO_2 emissions per energy input than in the average installation in US, a roughly assumed market price between 1 000 and 1 500 € per credit is not unlikely. An assumed annual volume of 1 000 000 SO_2 credits (i.e., 1 000 ktonnes reduced SO_2 emissions and 1 credit per1 tonne SO_2) would decrease compliance costs for the land-based installations with several 1000 million € annually. At the same time shipping would receive payback for increased costs from low sulphur fuel or investments in abetment technologies in the range of 1 000-1 500 million € annually. In the Swedish fairway due system ships have reduced their SO_2 emissions though only receiving partial payback.

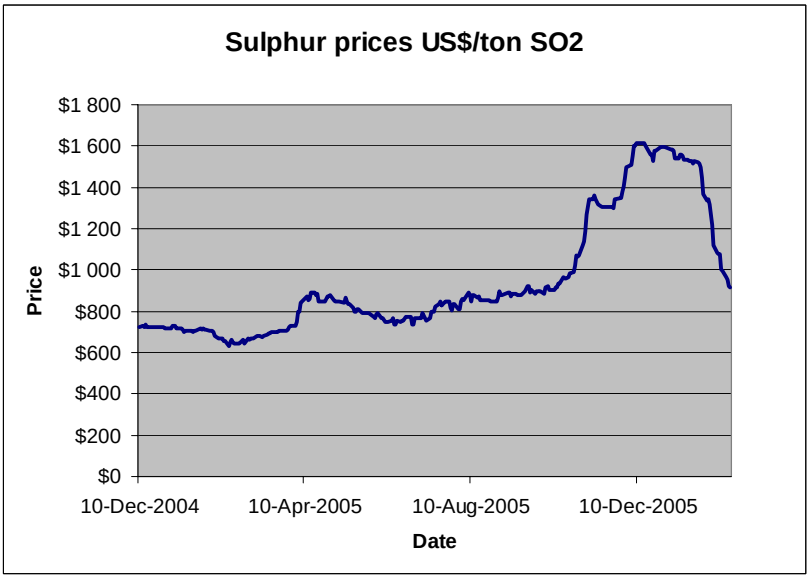

Figure 11. Market price of SO_2 allowances in the US Acid Rain trading scheme. (Ref: www.ccx.com)

3.3 Benefits to society as a whole

The major benefits of the proposed trading scheme to society as an entire scheme are the potential to achieve larger overall reductions of emissions at a lower cost to society, the fact that shipping is likely to adapt to environmental demands fairly quickly, due to the economic incentives, and that maritime transit traffic, which represents a substantial portion of traffic at sea, can be stimulated to achieve reductions.

4 How to create verified Emission Reduction Credits from shipping

As mentioned previously in this report, "the credit based approach" (i.e. our proposed scheme) has been evaluated as the most promising economic instrument for reducing NO_X emissions from ships in the EU in a recent study[67] conducted on behalf of the European Commission. The appointed evaluator (NERA) also believes that "the credit based approach" has the potential to create some cost-effective reductions of SO_2 emissions from ships in the EU. The general conclusion of NERA is that the market-based policy instruments have the potential to offer significant emissions reductions at a lower cost than simple regulatory alternatives. NERA strongly recommends further development and implementation of the most promising market-based policy instruments, i.e. our proposed scheme.

Consequently, in this section we briefly describe the manner in which emission credits (marketable in the proposed trading scheme) can be generated from emission reduction projects. As shipping is identified as a potential major source of credits, this sector is used to exemplify the credit generation process. In this section we also suggest geographical and other boundaries relevant for reporting that can be applied for shipping in the proposed emissions trading scheme.

As declared above, the process of creating marketable credits involves several steps. The steps can be presented as follows

1. Reduction of emissions
2. Monitoring of emissions (and other relevant parameters)
3. Calculation and reporting of reductions (including definition of baseline)
4. Verification of emission reductions
5. Approval of the verified reductions and issuance of credits by the Board of ERC:s

These steps will also be described in this section.

[67] "Economic Instruments for Reducing Ship Emissions in the European Union - European Commission, Directorate-General Environment", NERA Economic Consulting, 26 September 2005, http://europa.eu.int/comm/environment/air/pdf/task3_final.pdf

4.1 Reduction of emissions

4.1.1 Reduction of SO_2 emissions

The SO_2 emissions from mobile sources are dependent upon the sulphur content in the fuel. Theoretically, there are two means to reduce SO_2 emissions from ships:

1. By purchasing fuel with a lower sulphur content than the average fuel the emission reduction will be proportional to the difference in sulphur content.
2. By introducing an end-of-pipe solution, e.g. scrubbing equipment that washes the SO_2 (and other pollutants) into a liquid phase.

4.1.2 Reduction of NO_X emissions

There are two sources of NO_X emissions in the exhaust fumes:

1. Air NO_X (major contributor): the temperature in the combustion engine is sufficient to unite nitrogen gas with oxygen gas and, at certain temperatures, NO_X emissions will be created.
2. Organic nitrogen (minor contributor): Organic nitrogen sometimes occurs in the fuel and upon combustion, it will be oxidised into NO_X.

Today several alternative measures for NO_X abatement on main and auxiliary engines exist. Listed in increasing abatement rate the most common measures are the following:

1. Internal Engine Modifications ("IEM") - Basic to more advanced modifications
2. Direct Water Injection ("DWI");
3. Humid Air Motors ("HAM");
4. Selective Catalytic Reduction ("SCR").

In the low end of the range the simple Internal Engine Modifications are estimated to reduce emissions by approximately 20 percent and in the high end of the range SCR's, in average, reduce emissions by approximately 90 %[68, 69].

4.2 Monitoring of emissions (and other relevant parameters)[70]

For a ship owner it is the reduction of emissions below a certain reference scenario (i.e. baseline) from one or more engines on board during a certain time frame (e.g. 1 hour up

[68] "Demo Project - Final report", PricewaterhouseCoopers (and IVL The Swedish Environmental Research Institute), April 2005, http://www.demoproject.org/
[69]. "Service Contract on Ship Emissions: Assignment, Abatement and Market-based Instruments. Task 1 – Preliminary Assignment of Ship Emissions to European Countries - European Commission", Entec UK Limited. 2005a, August 2005
[70] Demo Project - Final report", PricewaterhouseCoopers (and IVL The Swedish Environmental Research Institute), April 2005, http://www.demoproject.org/

to perhaps 1 year) inside the geographical boundaries of the emission trading scheme that can generate emission credits and consequently represent an economic value. Consequently, in order to generate the tradable emissions reductions the shipowner needs to monitor and record:

- The position of the ship
- Actual time when the emissions occur and when the ship has a certain position
- The emission reductions, resulting from the difference between:
    - The actual generated emissions
    - The emissions of the reference scenario/baseline

The DEMO Project was launched to demonstrate in practice that the monitoring and verification of NO_X and SO_2 emission reductions from sea-going ships in the proposed emissions trading scheme could be feasible. In the recently finalised project it has been demonstrated (through practical tests with an advanced monitoring approach[71]) that this is the case. The main conclusions from the DEMO Project are that:

- Monitoring of NO_X emission reductions created by ships equipped with SCR or "Internal Engine Abatement"/"Internal Engine Modifications" is feasible.
- Monitoring of SO_2 emission reductions created by ships equipped with Scrubbing Technology or by ships using Low Sulphur Fuel is feasible.
- Secure monitoring of position (interconnected with the emissions monitoring) is feasible.
- The construction of an onboard full scale monitoring and reporting system, sending emissions data to a server ashore, is feasible.

More information regarding the DEMO Project is presented in Annex 2 to this report and on the DEMO project web page http://www.demoproject.org/. (see "Summary" and "Final report").

4.2.1 Monitoring of position

As the trading scheme will involve mobile emission sources that may pass in and out of the geographical boundaries of the scheme, it has to be demonstrated whether the emissions took place within or outside the boundaries. There is also a likelihood of different baselines for SO_2 within the boundaries of the scheme e.g. within and outside the Sulphur Emission Control Areas (SECA's). As a consequence, the bearings of the ship must be continuously registered. As mentioned above, this is not seen as a difficult

[71] Corresponding to level 4 of the five levels of emissions monitoring approaches listed by .NERA (below). Level 4 is in practice they highest level available today, which NERA confirms in the report by stating that the added accuracy provided by level 5 would not compensate the added costs of this level.

task and several options are available (more information available in the DEMO Project report and the NERA report).

4.2.2 Monitoring of emissions

Monitoring guidelines should preferably conform to internationally agreed-upon and harmonised standards[72] and should rely on common, available technologies. Existing standards (e.g. the IMO's NO_X Technical Code[73]) and monitoring technologies are improved continuously and this development[74] will most certainly increase once a decision to launch the trading scheme is taken. The Board of ERC should preferably be responsible for the development of specific monitoring guidelines based on the already existing SO_2 and NO_X monitoring guidelines for shipping. In this process the SO_2 and NO_X monitoring legislation and standards[75] for land-based installations should also be taken into account.

There are several options of emissions monitoring for shipping that conform to internationally standards and rely on available technologies and which would be available to work in conjunction with an emission trading scheme. These options range from very advanced to simplified approaches with the corresponding range in accuracy and costs, i.e. higher accuracy brings with it higher costs. NERA[76] has listed five levels of emissions monitoring approaches, listed by increasing accuracy and cost:

1. Periodic Fuel-Based Estimates;
2. Continuous Fuel-Based Estimates;
3. Periodic Exhaust Monitoring;
4. Continuous Exhaust Monitoring; and
5. Continuous Exhaust and Fuel Monitoring.

The demands on the monitoring approach should, and could easily, be adjusted to the size and nature of the ship and the ability to generate reductions. This means of creating cost-effective incentives, even for the small emitters, is applied in the monitoring regulation in the EU ETS, i.e. large emitters/emitters with a major potential to generate credits have higher demands on accuracy and emitters with a lower potential to generate credits have

[72] e.g., standards promulgated through IMO, the International Organisation for Standardisation ("ISO"), or the European Committee for Standardisation ("CEN")
[73] "Technical code on control of emission of nitrogen oxides from marine diesel engines", Annex VI of Marpol 73/78, Resolution 2, http://www.imo.org or http://www.sjofartsverket.se, SJÖFS 1998:13
[74] The IMO is working on guidelines for on-board NO_x monitoring and recording devices, which could be the future standard.
[75] , e.g. ISO and CEN standards are applied in the emissions monitoring of these industrie
[76] "Economic Instruments for Reducing Ship Emissions in the European Union - European Commission, Directorate-General Environment", NERA Economic Consulting, 26 September 2005, http://europa.eu.int/comm/environment/air/pdf/task3_final.pdf

lower demands on accuracy. This could result in smaller vessels using fixed emission factors combined with periodic fuel-based estimates, while larger ships would be required to use some kind of continuous monitoring to estimate fuel and power consumption and as a minimum, periodic exhaust monitoring to produce ship specific emission factors. A combination of these two approaches has proven to work in the Swedish system of differentiated fairway dues[77]. In general, NO_X emissions and the use of scrubber in the case of SO_2 emissions require more advanced levels of emissions monitoring approaches than with the use of low sulphur fuel.

As concluded above, the DEMO Project and other studies[78] have demonstrated that monitoring and verification of NO_X and SO_2 emission reductions from sea-going ships in the proposed emissions trading scheme would be feasible.

4.3 Calculation and reporting of reductions (including definition of baseline)

As discussed above, a starting point or reference scenario/baseline must be determined to be able to measure and calculate an emission reduction. A subtraction, between the monitored “baseline emission” and the monitored "actual emission” (originating from the periods when the ship has been within the boundaries of the scheme), results in the “emission reduction” eligible for emission credits:

Emission reduction (kg) = Baseline emissions (kg) - Actual emissions (kg)

Setting the baseline is, as a consequence, one of the most important issues when designing the emission credit generating process. The baseline approaches suggested for NO_X and SO_2 are presented below.

Once the reductions are calculated (based on the parameters needed to calculate the actual emissions that have occurred and the baseline emissions within the geographical boundaries of the scheme), the reductions can be reported to the authorities (Board of ERC:s). Before the emission report can be approved by the Board, it must be verified (see below). The ship owner should have the possibility to choose the reporting period as the interest can very in different situations, e.g. a ship owner with major emission reductions can choose to report every three months in order to be able to cover the investments made in advanced abetment technologies, while others, with smaller reductions, could choose to report once a year.

[77] http://www.sjofartsverket.se, SJÖFS 1998:13
[78] e.g. the NERA report

4.3.1 Baseline for SO_2 reductions

We recommend that the SO_2 baseline requirements are be based on the different fuel limits[79] set out in the Marine Fuel Sulphur Directive and the Marpol Annex VI[80]).

4.3.2 Baseline for NO_X reductions

We recommend that the baseline be based on the NO_X emission standards (for ships constructed in 2000 and onwards) in the IMO NO_X Curve from Marpol Annex VI. The IMO NO_X Curve will probably be lowered in the future negation process within IMO[81].

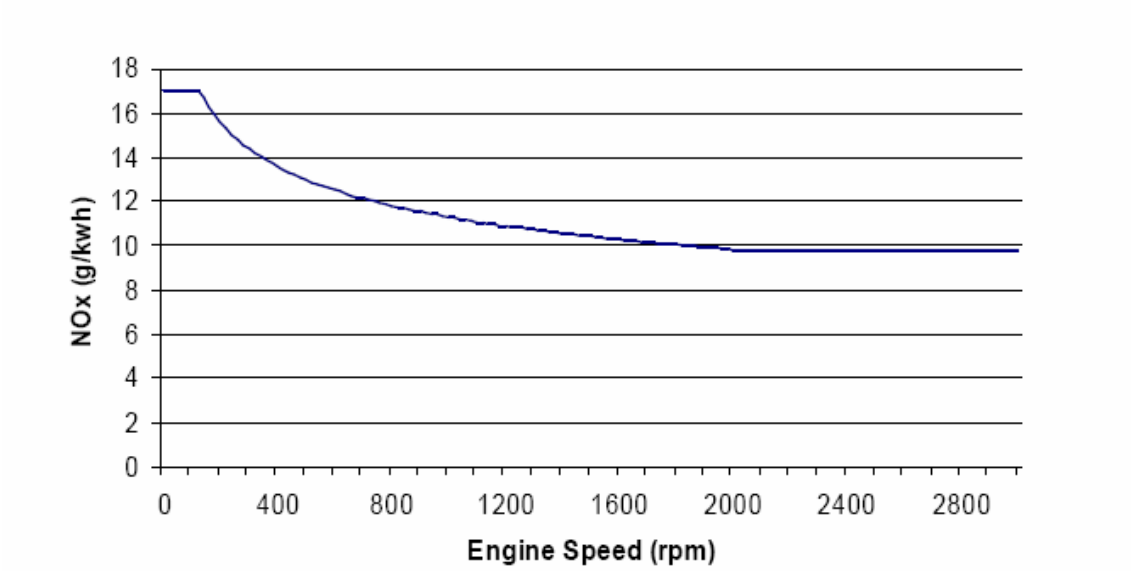

Figure 12: IMO NO_X Curve (Ref: NERA)

The proposed baseline offers incentives for the majority of vessels with various engine types and is also independent of the applied techniques. A ship with a specific engine speed calculates its baseline and, thereafter, compares this with its emissions and the forms the amount of the reduction.

4.4 Verifying reductions

In order to ensure the true value of the emission reductions and create credibility on the trading market, we propose that the reported emission reductions be thoroughly verified

[79] Ships in IMO Sulphur Emission Control Areas (SECA:s) must use 1.5 percent sulphur fuel or better (Baltic Sea in May 2006 and the North Sea and Channel in autumn 2007), zall passenger vessels on regular services to or from Community ports must use 1.5 percent sulphur fuel or better from May 2006 onward and ships at berth in ports must use 0.1 percent sulphur fuel or better from 2010 onward.
[80] International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78), http://www.imo.org/
[81] Stefan Lemieszewski, Swedish Maritime Administration

by a third party. To be able to verify a reduction there must be a framework with guidelines describing the manner in which to calculate and report the emission reductions (see discussion on monitoring frameworks above). When the emission reductions have been monitored and reported according to the guidelines, the reported emissions can be verified.

In order to ensure the quality of the verification process, verification guidelines need to be developed as well. When developing these specific guidelines, a number of audit and verification standards can be used as a basis, e.g. both financial and technical audit guidelines.

The DEMO Project has demonstrated that verification on the emission monitoring can be conducted, as practical tests with pilot guidelines were used to review the monitoring reports from the on-board monitoring tests. These control procedures are applied in the Swedish differentiated port and fairway dues system and could also serve as evidence that verification is feasible[82].

In the more complicated credit process connected to the EU ETS (i.e. the CDM credit generating process as part of the Kyoto Protocol) a third party assessment is needed before a project is approved by the CDM executive board (so called validation) and before the credits are issued (i.e. verification that the reported emission reductions have been monitored and calculated in accordance with the monitoring guidelines).

4.5 Approving reductions and issuing credits

We suggest that the Board of ERC's also function as a gateway for the emission reductions into the trading market. Documentation regarding the verified emissions reductions (i.e. the emission reduction report and the verification statement) would be sent to the Board. After a cursory review, the Board approves the verified emission reductions and issues tradable credits (equivalent to the amount of reductions achieved) in the central register account of the project owner. Once the credit is issued in the account, it is tradable in the emission trading scheme.

As mentioned above, the Board of ERC's resembles the existing Clean Development Mechanism (CDM) Executive Board in the Kyoto agreement, as it also is responsible for supervising and for guidelines development of emission reduction projects.

4.6 Penalties for cheating

If the reported and verified emissions reduction credits differ considerably from the actual emission reductions generated, a penalty must be imposed upon the entity or the

[82] http://www.sjofartsverket.se, SJÖFS 1998:13

legal entity responsible for the credits. In addition to the penalty, the entity should pay a fine to the administrator for the excess credits sold to the emissions trading scheme. The price should be, for example, 2 times of the higher value of either the selling price or the current market value. The Central Administrator should use the funds from the fines to purchase allowances or credits and then retire them in order to maintain the emission budget level, or even lower it.

In addition to the following suggested penalties, the Commission should naturally enforce provisions pursuant to applicable law and regulations, including those providing for civil and criminal penalties.

4.7 Geographical boundaries of the proposed scheme

4.7.1 Distances that emissions travel

As the SO_2 and NO_x emissions are inter-regional, regional and sometimes local environmental problems, borders must be established in order to enclose the area in which reductions can be counted for in the form of a credit or a unit. The emissions have a half-life of 20 hours for SO_2 and 30 hours for NO_x, after which time, 50% of the emissions is still airborne[83]. These conditions show that the emissions with a wind velocity of 10 m/s travel in average between 720 km (SO_2) and 1080 km (NO_x). It has been concluded that a major proportion of the emissions fall on areas of land and that emissions from ships could be considered a cause of acid rain and smog problems on land, if the shipping route is less than 400 nautical miles off shore. Studies show that 60-70% of maritime traffic is found within 200 nautical miles from shore[84].

4.7.2 Existing European borders

The national territorial borders are 12 nautical miles off shore and the Exclusive Economic Zone (EEZ) is 200 nautical miles off shore. It is, however, the responsibility of each individual nation to declare the EEZ, which not all nations have done. There are currently no reporting procedures for ships crossing EEZ borders.

The standard reporting procedure occurs when a ship is 24 hours from the next harbour. This, however, does not apply to the distance from shore and does not cover all ships.

4.7.3 Proposed geographical boundaries of the scheme

We propose that the geographical boundaries enclosing the area in which reductions can be used to generate tradable credits should be routes between European Union ports and also certain pre-established routes through European Union waters.

[83] NMHI, Norway's Meteorological and Hydrological Institute and Swedish Maritime Administration Memo 2001-10-03 by Stefan Lemieszewski
[84] IMO, International Maritime Organisation and Swedish Maritime Administration Memo 2001-10-03 by Stefan Lemieszewski

Another method is to design a computerised emissions reporting system (e.g. with the coordinates of the EEZ) so it would automatically start to report the reductions once the ship is inside the geographical boundaries of the trading scheme.

Another possible simplification is to standardise the distances of the different port-to-port and passing-through routes. This would simplify the process of determining the performed reductions and could also be a means for the transit traffic passing only through European Union waters to calculate and report their emissions reductions, thereby also giving them an incentive to reduce their emissions levels (See Figure 13).

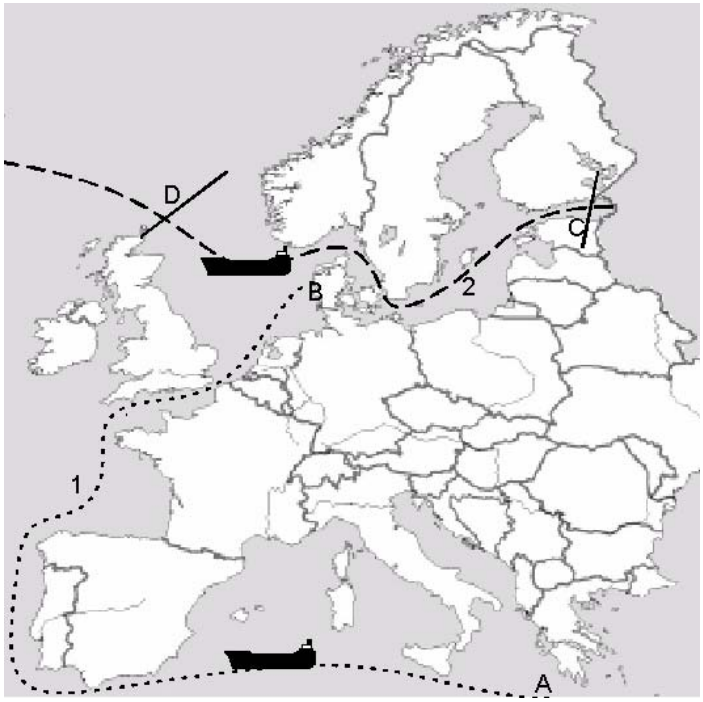

Figure 13: An example of standardised distances would be route 1 and 2 below. Route 1 will be applied to ships coming from the Suez channel to seek a specific harbour in Denmark, The distance will be calculated in advance. Route 2 is an example of a standardised distance for transit traffic, at C the ship enters EU waters and at D it crosses the EU border for calculating reductions.

5 Emissions trading in the context of existing EU regulation

In order to implement emissions trading schemes for NO_X and SO_2 on an EU level or a member state level, interaction with existing pollution prevention legislation needs to be considered.

Among the most important EU framework regimes for the control of polluting emissions from major industrial sources is the Directive concerning integrated pollution prevention and control (also known as the IPPC Directive). This framework is complemented by various measures dealing with specific sectors, such as the Large Combustion Plants (LCP) Directive, the Waste Incineration (WI) Directive, the Solvent Emissions (SE) Directive 1999/13/EC4 and the Landfill Directive, and by other pieces of EU legislation, such as the Greenhouse Gas Emissions Trading Directive.

On a national level the National Emission Ceilings Directive (NEC Directive)[85] and the 1999 Gothenburg Protocol of the Convention on Long-range Transboundary Air Pollution (CLRTAP)[86] sets national emission ceilings for 2010 for sulphur and NO_X.

In general, the Directives for NO_X and SO_2 are designed for a more conventional command and control regulation. However, some Directives (e.g. LCP Directives) can also be implemented in national legislation through emission trading schemes. Many of the relevant Directives (IPPC, LCP; NEC) are under review, especially as regards the enabling of emissions trading for NO_X and SO_2. It is, therefore, reasonable to believe that future amendments of these Directives will be made to create greater opportunities for emissions trading.

5.1 The IPPC directive

The IPPC Directive could, in some cases, result in a lack of space for efficient trade for the included installations and, consequently, in difficulties in planning the emission reduction strategies over a longer period. The objective in the Directive for Best Available Techniques (BAT) will probably imply that the emissions limits will decrease over time. However, there are several options to create opportunities for emissions

[85] COMMON POSITION (EC) No 51/2000 adopted by the Council on 7 November 2000 with a view to adopting Directive 2000/.../EC of the European Parliament and of the Council of ... on national emission ceilings for certain atmospheric pollutants (2000/C 375/01)

[86] United Nations Economic Commission for Europe's (UNECE) Convention on Long-Range Transboundary Air Pollution. The eight protocol of the convention is the "The 1999 Gothenburg Protocol to Abate Acidification, Eutrophication and Ground-level Ozone". The Protocol sets national emission ceilings for 2010 for four pollutants: sulphur, NOx, VOCs and ammonia. More than 30 countries are included in the protocol, for example, Canada, USA and the countries of the EC.

trading of NO_X and SO_2 alongside the IPPC Directive. One is to define strict emission limits (on each installation or on sector level through allocation of allowances) based on national or sector targets and BAT and combine these limits with a weaker interpretation of BAT when the BAT objective is applied in practice. In this manner the environmental integrity is safeguarded at the same time as a scope for emissions trading and flexible solutions for the industry can be created. Already today, this option is utilised for installations in the Dutch NO_X emission trading scheme which operates alongside the IPPC Directive covering partly the same installations.

Another means of creating opportunities for EU level emissions trading of NO_X and SO_2 alongside the IPPC Directive is to continue with BAT-based permitting, but make the appropriate amendments in the IPPC Directive, as is already the case with the EU Greenhouse Gas emissions trading scheme (EU ETS). When the EU ETS Directive was implemented, carbon dioxide emissions (CO_2) was lifted out from the IPPC Directive. A similar procedure could be used for NO_X and SO_2 when implementing an EU level trading scheme for these emissions.

The European Commission has recently launched a review process[87] of the IPPC Directive and related legislation on industrial emissions. The IPPC Review will proceed through 2006 and will be concluded in 2007. The review includes an analysis of the interaction between the IPPC Directive and possible emission trading schemes for NO_X and SO_2.

The Swedish Shipowners' Association is very positive to the review of the IPPC Directive and proposes amendments that will enable an implementation of the proposed emissions trading scheme in place of the IPPC requirements on NO_X and SO_2 emissions. Through this amendment important issues for the industry can be secured, e.g. emission limits set on longer time horizons and the use of general binding rules, instead of individually permitted conditions. Such an amendment will provide the land-based installations the possibility to plan and make strategies for their emissions development more efficiently.

5.2 The Large Combustion Plants Directive and other relevant legislation

The Directive 2001/80/EC on the limitation of emissions of certain pollutants into the air from large combustion plants (the LCP Directive) has the overall aim to reduce emissions of acidifying pollutants, particles, and ozone precursors. In the review process of the LCP Directive, the feasibility and desirability of emission trading schemes for SO2 and NOx

[87] The IPPC Review Homepage, http://europa.eu.int/comm/environment/ippc/ippc_review_process.htm

in the EU LCP sector was assessed. A general conclusion[88] was that emission trading has a number of advantages over conventional command and control regulations, especially in respect of the potential cost-efficiency for the industry and continuous technological change.

The Directive 2000/76/EC on the incineration of waste (the WI Directive) has the aim of reducing negative environmental effects caused by the incineration and co-incineration of waste. The interaction of the WI, LCP and IPPC Directives is currently being examined as part of the Commissions' review of the IPPC Directive and related legislation.

The Swedish Shipowners' Association wants to stress that emission trading is an option for implementing these directives and that the use of emission reductions credits from shipping should be applied in this trading.

5.3 The NEC Directive and CLRTAP

Directive 2001/81/EC on National Emission Ceilings (NEC Directive)[89] sets national emission targets for 2010 for NO_X and SO_2. Emissions from international maritime traffic are not included in the national targets and should not be included in the future either, as these emissions, e.g. emissions emitted from the transit traffic to and from Russia, cannot be assigned to any separate member state. The current national targets could limit the trade of allowances between sources in different EU countries and the selling of credits from sources not included in the NEC's. We see a feasible solution to this problem, i.e a change in the NEC Directive so that allowances and credits from other countries and sectors can be used to comply with the national NEC target. A review of the NEC Directive is ongoing and the assessment of emission trading schemes for NO_X and SO_2 and the issue of market-based instruments are included in the review. A new proposal is expected in 2007.

The 1999 Gothenburg Protocol of the Convention on Long-range Transboundary Air Pollution (CLRTAP)[90] also sets national emission ceilings for 2010. Analogous with the considerations regarding the 1999 Gothenburg Protocol of the CLRTAP, the national emission ceilings for 2010 could limit the trade of allowances and credits between

[88] "Preparation of the review relating to the Large Combustion Plant Directive - A Report for European Commission, Environment Directorate General", Entec UK Limited, July 2005

[89] Directive 2001/81/EC of the European Parliament and of the Council of 23 October 2001 on national emission ceilings for certain atmospheric pollutants

[90] United Nations Economic Commission for Europe's (UNECE) Convention on Long-Range Transboundary Air Pollution. The eight protocol of the convention is the "The 1999 Gothenburg Protocol to Abate Acidification, Eutrophication and Ground-level Ozone". The Protocol sets national emission ceilings for 2010 for four pollutants: sulphur, NOx, VOCs and ammonia. More than 30 countries are included in the protocol, for example, Canada, USA and the countries of the EC.

sources in different EU countries. However, in CLRTAP emission trading between the countries is considered as one option to comply with the convention.

The Swedish Shipowners' Association wants to stress that emission trading has a clear potential for reaching these targets in a more cost-efficient manner, and that possible amendments to the agreements should be made to achieve full benefit of this potential.

6 Conclusions

To conclude, we would first like to emphasize the huge potential for cost-efficient reductions existing in an emission trading scheme for NO_X and SO_2 in which shipping is included as a provider of emission credits. We also want to emphasize the great opportunities for cost-efficient solutions and enhanced competitiveness that exist for each company operating land-based energy or industry installations and for the ship owners having ships in the European waters.

In order to put these opportunities into practice, the interested land-based companies and ship owners must make an effort in order to influence policy developers to work in the right direction and with an enhanced speed. Interested companies and ship owners should also, e.g. by demonstrating the economic advantages of the proposed scheme, make their industry organisations lift this issue onto the "internal list of priorities". As a great deal of the legislation regulating air emissions in EU is under review, with regards to emission trading, we now have a window of opportunity for establishing optimised market-based system, i.e. a system that would improve the European business' ability to compete without jeopardising environmental targets. The interested companies and ship-owners should, consequently, act now in order to put the proposed trading scheme into practise.

We also see several other developments and results that clearly reveal the great opportunities embedded in our proposal. The most important of these developments and results are:

- that the European Commission, European Union and the member states have a much better understanding of emissions trading and a genuine positive approach to this instrument of control than just a few years ago, mainly due to the launch of the largest emissions trading of the world, the EU ETS,
- the implementation of the EU ETS, which has demonstrated that the technical aspects, e.g. allocation, trading, monitoring, verification, cancellation, etc, of a scheme covering many European installations will work,
- that the evaluation conducted on behalf of the European Commission shows that our proposed scheme is the most promising instrument to reduce ship emissions of NO_X (and SO_2) in a cost-efficient manner,
- that the emissions trading of SO_2 and NO_x in North America has been successful, i.e. these schemes have proven to be highly efficient regarding environmental targets, as well as regards cost efficiency, and that our proposal is partly based on the same structure,
- that the finalised DEMO project, which was launched on request from the European Commission after the Commission had being presented the previous

version of this paper, proves that NO_X and SO_2 emission reductions from sea-going ships can be monitored, reported and verified and,

- that market players have shown great interest in emission trading, e.g. the exchanges and the OTC-market dealing with the EU ETS market have grown significantly and the continue to grow steadily.

All of the details in the proposal are, for obvious reasons, not yet fully developed; there are a few areas which have to be further investigated, e.g. the possibilities to optimise trading within the EU Directives concerning land-based emitters but as mentioned above, the Commission is currently carrying out these investigations.

We believe that our proposal is a fruitful input to companies operating land-based installations and ship owners, and that it will serve as a basis for a strategy to influence future regulation in order to comply with necessary environmental targets in a cost-efficient manner.

The Swedish Shipowners' Association is absolutely convinced that the market-driven solution presented in this paper is a better option than taxes or regulation. We, therefore, encourage a prompt decision regarding the implementation of an emissions trading scheme for NO_X and SO_2 in the EU in combination with further studies, in order to determine the specific details of the emissions trading scheme.