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Confidence through Compliance in Emissions Trading Markets

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Introduction

Emissions trading is a market-based mechanism designed to allow firms to choose the most cost-effective strategy to meet environmental standards. The success of SO_2 and NOx emissions trading systems in the United States and the launch of the ambitious European Union Emissions Trading System (EU ETS) underscore the value of emissions trading as a tool for environmental policy.

As more and more countries accept the need to address climate change on a priority basis, emissions trading will play an increasingly significant role as a governance strategy that not only creates incentives for firms to cut greenhouse gas (GHG) emissions but also spurs technological innovation that ensures this is done at the lowest cost. But only with high levels of compliance will emissions trading systems achieve reductions in GHG emissions efficiently, effectively and equitably. Achievement of high levels of compliance hinges on robust and effective strategies for monitoring, reporting, and verification, where confidence in the system relies on timely and accurate information on emissions levels, allowance holdings and trades. Without such reliable data, the system fails to meet its environmental objectives.

The central focus of the workshop on Confidence through Compliance in Emissions Trading Markets, which took place in November 2005 in Washington, D.C., was on the monitoring, reporting and verification (MRV) of emissions trading and associated cross-border strategies and issues, as these are the main elements of any effective compliance and enforcement strategy.[1] The International Network for Environmental Compliance & Enforcement (INECE), in cooperation with its partners, The Netherlands Ministry for Housing, Spatial Planning and the Environment (VROM), The Environment Agency (England and Wales), the European Commission, the US Environmental Protection Agency, the Washington College of Law at the American University, and Resources for the Future, organised the workshop as a follow-up to the international conference on Compliance and Enforcement of Trading Schemes in Environmental Protection, hosted by the US Environmental Protection Agency (EPA) and INECE in March 2004 at Oxford University.[2]

The workshop explored the role of compliance and enforcement (C&E) strategies in emissions trading

[1] See generally Zaelke et al. (2005).

[2] For more information, see http://www.inece.org/emissions/workshop.html.

systems as essential elements in maintaining a trading system's environmental effectiveness and economic efficiency. Specifically, the goals of the Workshop were to:

- develop a set of best practices for achieving C&E in emissions trading programmes;
- raise awareness of the value and importance of trading programmes and emphasising the role that C&E play in achieving environmental objectives and ensuring market credibility and investor confidence;
- identify key requirements of effective emissions trading systems; and
- assess available information and define additional needs for creating an operational 'common currency' and a network allowing (inter)national trading among different trading systems.

This policy brief examines MRV strategies of the EU ETS, the US Environmental Protection Agency's SO_2 and NOx trading programmes, and, to the extent applicable, the new Dutch NOx trading system. This paper also compares regulatory cultures and MRV models in the EU and the US and highlights key challenges to achieving high levels of compliance.

Introduction to Key Concepts

The use of emissions trading systems as an alternative to more traditional forms of regulation requires a fresh look at the relationship between the regulator and the regulated community, as well as other key regulatory concepts.[3] This section explores the different responsibilities and risks of emissions trading systems for both the regulator and the regulated community.

Monitoring, Reporting and Verification

Under traditional command-and-control regimes, firms must follow a relatively strict set of procedures to meet environmental standards and are sanctioned when they fail to do so. By comparison, under emissions trading systems, firms are free to choose their own compliance strategy – including how much to emit and how many allowances to trade. For the regulator, this choice presents a new set of responsibilities. To be able to sanction firms for whose emissions exceed their allowance holdings and provide market participants with timely and accurate information, the regulator must track both the emissions levels and the number of allowances each firm possesses at a given time. As many systems involve self-reported data, the regulator must consider penalties for firms that falsify information.

Consequently, the regulator's role is "no longer that of grandly deciding what is best for firms and individuals, entertaining equitable appeals, and enforcing the results".[4] Rather, the regulator acts more like an accountant or a bank's credit department.[5] This results in an emissions trading system whose market efficiency and investor confidence hinge on the MRV strategies the regulator chooses to implement and enforce in the pursuit of adequate levels of compliance.

Common Interests in Compliance

Unlike command-and-control regimes, participation in an emissions trading system allows for both the regulator and the regulated community to share a common interest in pursuing high levels of compliance. Because allowances are an intangible asset,[6] a firm that invests in allowances to cover some of its emissions has the same concerns as the regulator over market integrity and the need for fraud-proof MRV in order to avoid cheating and other risks that would decrease the value of allowances and possibly undermine the system altogether.

Originally, the EU's interest in market-based systems was at least in part driven by the EU's mixed record on uniform implementation.[7] The European Commission and the European Court of Justice[8] could not always ensure adequate implementation, enforcement and, by extension, compliance. This is partly why the European Commission initially preferred a carbon/energy tax to tackle climate change. It was thought that member states had an interest in improving on implementation and enforcement to collect the revenues associated with tax. But the tax proposal was eventually abandoned due to lack of support among EU governments.

Transparency and Public Perception

Transparent regulatory regimes and markets provide the public with timely and accurate information based on MRV data as a means to instil trust and

[3] See Stranlund et al. (2002).

[4] See Ellerman (1998).

[5] See Kruger (2005).

[6] That is, they behave like property rights in a market.

[7] The compliance gap between EU member states was identified as early as the 1990s.

[8] The European Commission as the 'guardian of the treaty' has responsibility to ensure that EU legislation is properly transposed into national law and to supervise implementation. The latter task requires close cooperation with member states.

confidence in the market with evidence of high compliance. Given the importance and sensitivity of MRV data, it follows that the market participants and the public in general are more likely to trust its veracity if the process by which it is collected and verified is perceived as open and accountable.

Transparency also helps counter some of the negative misconceptions about emissions trading systems, such as that they provide polluters with the right to pollute.[9] In fact, emissions trading systems, consistent with the polluter pays principle, help pass some of the cost of pollution control to the consumer of pollution-intensive products by imposing the costs of environmental harm on those who cause it and those who benefit from it.[10]

Comparing Regulatory Cultures

The following section describes the regulatory cultures for the United States and the EU. The description of the EU regulatory culture will concentrate on the EU layer of government and reference the differences among EU member states when necessary. When comparing the two cultures, it is important to keep in mind two fundamental differences between the United States and EU. First, the US system has been up and running for the past decade while the EU ETS began this year and must still be considered a 'work in progress'. Second, the US programmes operate within a single jurisdiction, while the EU ETS is subject to a multi-jurisdictional political environment.

US Regulatory Culture

The United States has more than a decade of experience of operating 'cap and trade' programmes, and there are well-established procedures for compliance and enforcement. In general, these programmes are operated centrally by the US Environmental Protection Agency (EPA).[11] MRV for the US SO_2 and NOx programmes is characterised by detailed rules, electronic reporting and auditing, and a variety of quality assurance and quality control requirements. Although continuous emissions monitors (CEMs) play an important role in US programmes, many sources are permitted to use alternative methods to measure emissions, such as approaches using fuel metres and emission factors.[12] Finally, although the MRV system used in US trading programmes has not been used to implement a CO_2 trading system, it *has* been used to collect and verify CO_2 emissions data from the electric power sector.[13] This section will focus largely on the regulatory culture and approach of the US SO_2 and NOx programmes. Later in the article, there will be a brief discussion of the issues that would arise if the United States were to develop a compliance system for a greenhouse gas programme.

In US SO_2 and NOx programs, approximately 75 percent of staff resources (75 people, including personnel in regional EPA offices and state agencies) are focused on the measurement, verification and tracking of emissions data. Government administrators also provide policy guidance on measurement issues, develop and operate the information systems that track emissions and allowances, certify monitoring equipment, verify reported emissions data, and audit facilities.[14] However, the US SO_2 and NOx programmes are much smaller than the EU ETS. Combined, the two US schemes cover considerably less than half of the EU ETS installations. More importantly, an EU installation could contain multiple sources of emissions, while a US 'unit' is just one boiler.

Although the main organising principle of programme administrators is maintaining accountability for the system, an important secondary goal is providing administrative certainty. Programme administrators have tried to create administrative certainty by making programme operations routine and not subject to discretion. The routine nature and lack of regulatory discretion of the US trading programmes manifests itself in several ways. First, the rules for emissions monitoring are detailed and prescriptive, leaving little discretion for either companies or regulators. Second, there is heavy reliance on information technologies to operate the programme and to automate routine procedures. Finally, excess emissions penalties are non-discretionary and automatic. The following section

[9] See, e.g. Kruger (2005) who cites the example of an opinion piece in *USA Today*, arguing that as a result of allowance trading people would die. For a long period there have been claims by some EU policy makers that Europeans do not like a situation where people make money with pollution. During the discussions and negotiations, such opposition was also heard from some parts of the non-governmental organisation communities and occasionally from parliamentarians.)

[10] See Costanza et al. (1997).

[11] However, some states participate in monitoring activities in both the SO_2 and NOx programmes, and State governments have the lead in enforcement actions in the NOx programme.

[12] For example, although 96% of emissions in the US SO_2 programme are monitored with continuous emissions monitors (CEMs), only 36% of regulated 'units' are required to use CEMs.

[13] Approximately 40% of units that report carbon dioxide (CO_2) emissions to US Environmental Protection Agency use CEMs and 60% use alternative methods.

[14] Environmental Protection Agency (2003).

describes these aspects of the US model as well as discusses the compliance promotion role played by public access to emissions and allowance data.

Monitoring, Reporting and Verification

The MRV process begins with facilities choosing their monitoring equipment and sending a monitoring plan to EPA. Under some circumstances, participants may apply for alternative monitoring methods (e.g. in the SO_2 programme, gas-fired units may use fuel flow metres and emissions factors), which must be approved by EPA. Government authorities review monitoring plans and provide feedback to industry. Industry must then conduct a series of certification tests of their monitoring equipment and provide these test results to government authorities in the form of a certification application. After certification, facilities begin to monitor emissions and conduct the required ongoing quality assurance and quality control (QA/QC) tests.

Participants in the programmes must report emissions to EPA electronically every quarter in a standard format. Many participants use software developed by EPA or others pre-screen their electronic reports before sending them to EPA. This software runs many of the same checks as EPA's computers and is designed to minimise the numbers of errors in submitted reports.

EPA computers receive the electronic reports, review the data, and provide feedback to company officials. This electronic feedback is generally of three types. Officials at facilities are informed that either: 1) their data have been accepted and will be stored in EPA's database for the purpose of compliance determinations and public data dissemination; 2) their data have been rejected because of specified critical errors; or 3) their data have been accepted, but EPA has identified errors that must be corrected in later data submissions. If there are problems with the data, company officials are able to follow up with EPA monitoring specialists who are assigned to their facilities.

In addition to this first round of electronic review and processing, EPA uses software to audit the data and identify potential discrepancies or issues to investigate. These audits review emissions or measured fuel data as well as the results of quality assurance and quality control tests performed on the measurement equipment. EPA uses these electronic 'desk' audits to target more in-depth field audits. Such field audits may include observing quality assurance tests, reviewing on-site records, inspecting measurement equipment, and/or comparing installed measurement equipment to independent reference methods. Field audits are usually done in teams together with state and local environmental agencies. Where possible, regulatory officials (usually from local agencies) observe QA/QC testing of emissions measurement equipment. The purpose of the audit is to verify that the testing is completed according to standard procedures and accurately represented in the reports to EPA. Field audits are performed on both random samples of all sources and on sources identified with potential measurement or data problems during the electronic desk audits.

Detailed Rules for Emissions Monitoring and Reporting

Monitoring rules are highly detailed in the US SO_2 and NOx programmes. The regulations for monitoring cover almost 300 pages and provide thorough standards for installation and certification of monitors, quality assurance and testing, handling of missing data, recordkeeping and other features. Most of these rules are now incorporated into software systems at both the companies and EPA so that the reporting and review of emissions reports are highly standardised.

To a certain extent, the use of CEMs in the US trading system has required this more prescriptive approach. However, even when units use alternative emissions monitoring methods, the requirements are quite detailed. For example, there are 30 pages of regulations for a monitoring method used by gas-fired units that uses fuel metering and emissions factors.

To provide certainty and ensure consistency, EPA devotes extensive resources to answering and documenting questions that arise about monitoring requirements. EPA has an online policy manual that is largely in a question-and-answer format. It has been updated more than a dozen times over the life of the programme and is now nearly 500 pages long. These detailed monitoring and reporting requirements, though complex, have provided companies with considerable certainty that, if they follow the procedures, their emissions reports will be accepted in a timely manner.

Extensive Use of Information Technology

The routine nature of the decisions that regulators make and the vast amounts of emissions and allowance data that must be handled have allowed regulators to build the operation of the trading programme largely around information technology.[15] For example, companies are required to report emissions data to EPA in a standardised electronic format. Once the data are received, EPA computers run quality assurance tests and give electronic feedback to companies. Additional software is used

[15] Kruger et al. (2000) and Perez Henriquez (2004).

to run electronic audits on emissions reports. Emissions data are maintained in a database that is accessible via the internet.[16]

EPA's allowance registry is similar to an online banking system, with companies able to manage their allowance accounts and make transfers without submitting paper forms. Approximately 80% of all transfers of allowances are now done over the internet by the sources themselves. Similarly, EPA has implemented a new application that allows companies to log onto a secure website and perform functions that were previously done with paper forms. These include changing information about company officials who are authorised to act for an allowance account, submitting data about new or retired emissions sources, and determining whether a source is required to participate in the programme.[17]

Electronic reporting and processing of data have been critical in meeting the tight timeframes for the annual compliance true-up period. Companies submit their final quarter's emissions data by January 31st and have until March 1st to transfer allowances and submit final compliance certification forms. EPA then completes verification of the annual emissions data and compares them electronically with allowances within the accounts of each unit. Typically, this process is completed by June.

Finally, through the development of standardised reporting formats and protocols, EPA and companies have meshed their data systems. Early in the programme, EPA developed and distributed software to help companies develop their emissions reporting systems.[18] Software used by companies to track allowances and emissions incorporates standardised EPA electronic reporting formats and allows companies to compare their own records of allowance holdings with those in the EPA registry.

Compliance interactions between regulators and companies mainly involve resolving discrepancies over emissions data that arise in the quality assurance process. As discussed earlier, quarterly electronic reporting and feedback give companies adequate notice of data problems and time to correct these problems before the annual reconciliation of allowances and emissions data. Compliance is a largely routine process – allowances are electronically compared with emissions at each utility unit.

Penalties and Enforcement Action for Non-Compliance

The certainty that a penalty will be imposed is a critical element in providing the correct incentives in an emissions trading programme. The automatic nature of excess emissions penalties in US trading programmes contrasts with the traditional regulatory approach in the United States, in which sources in violation negotiate for a regulatory exemption.[19] Administrators of the US trading programme argue that the automatic nature of penalties and the certainty of other compliance-related provisions focus corporate resources and attention on low-cost compliance strategies rather than on lobbying or litigating to reduce costs.[20] In addition to the automatic excess emissions penalties, there is the authority to assess both civil and criminal penalties in US trading programmes. With an automatic penalty that is significantly higher than the market price for allowances and with a liquid market for allowances, there has been nearly one hundred percent compliance with the SO_2 and NOx trading programmes.[21]

Public Access to Data

In the United States, emissions data from the SO_2 and NOx trading programmes are available to the public and may be accessed via the internet. There are no confidentiality requirements for this data. The public can also access data on allowance transfers among different accounts in EPA's registry. Information technology has been the key to providing this transparency in the US emissions trading programmes, with all emissions and allowance data available online.[22] Some commentators note that public access to emissions and trading data builds confidence in the environmental results of the programme and provides an additional safeguard or incentive for compliance.[23] Environmental non-governmental organisations (NGOs) in the United States have used emissions and allowance data for a variety of purposes, such as assessing the net environmental impact of emissions trades and analysing and comparing emissions profiles of companies. EPA facilitates transparency of emissions and allowance data by providing it in user-friendly

[16] Husk & DeSantis (2002).

[17] Ibid.

[18] McLean (1997).

[19] Ellerman, Joskow & Harrison (2003).

[20] Kruger (2005).

[21] In 10 years of operation, there have been 21 excess emissions penalties, ranging from $2,682 to $1,580,000. There have been nine additional civil penalties for other violations, such as failures to monitor and report emissions. See Kruger & Pizer (2004.

[22] Kruger et al. (2000).

[23] Environmental Protection Agency (2003) and Tietenberg (2003).

web-based formats. For example, tools on EPA's website allow users to make customised queries of the data that are of the most interest.[24]

The EU Regulatory Culture

While there is little doubt that the EU ETS has strongly been influenced by the US SO_2 trading programme and the NOx Budget Trading Programme,[25] it differs in several important aspects. The principal difference is the high level of decentralisation and the significant degree of discretion for member states in the implementation phase, even if compared to the NOx Budget Trading Programme. For example, under the EU ETS, it is up to the member states to set policy on compliance and enforcement strategies as well as allocation, which includes the level of the cap and the exact methodology to be applied. The European Commission provides a broad set of guidelines for compliance and enforcement strategies, which give considerable flexibility to installations and to member states to develop specific monitoring procedures without imposing uniform, mandatory standards for emissions verification. The EU ETS also delegates responsibility for emissions verification to member states; however, the EU ETS requires this to be verified by a third party. Normally, this would be an independent third-party verifier and only in exceptional cases the government itself. Additionally, the member states are responsible for defining competence requirements and the rules and procedures for verifier accreditation. Initially, the EU ETS Directive foresees that each member state will have its own registry,[26] although joint registries between member states are permitted. Consequently, this decentralised approach leaves the European Commission Monitoring and Reporting Guidelines (MRG) about one-fourth the size of respective guidelines in the United States and much less detailed.

A decentralised approach is consistent with the make-up of the EU political system, based on sovereign member states with their own legal systems, traditions, and languages, where the EU layer of governance (Council of Ministers and the European Parliament) agrees on the framework, and member states enjoy a high level of discretion in implementing in their respective jurisdictions.[27] As there are as many jurisdictions as member states, one-size-fits-all policies seldom are an option.[28] Consistency across member states is sought by so-called comitology committees, consisting of European Commission and member state officials who are responsible for the harmonisation of implementation provisions. The mandate (and hence the limit) of comitology committees are set both by the relevant provisions in the Directive and EU primary, secondary and case law such as EC internal and competition law.[29] Despite the fact that the EU exhibits elements of a federal system, one would miss the very essence of the diversity within the EU if one would perceive it as a federation.

The high degree of decentralisation is – at least partly – also the result of consensual decision-making in the EU.[30] As the EU is made up of sovereign states, effective implementation of EU laws by member states is best ensured if legitimate member states' concerns are taken into account during the negotiations in the Council of Ministers when the laws are formulated. As a result, initially the EU tends to choose decentralised options, followed by steps to establish and coordinate a common approach among member states. In the EU ETS framework, a common approach relies on using best practices to address issues jointly and share experiences among

[24] Husk & DeSantis (2002).

[25] See e.g. the 1999 study by the Center for Clean Air Policy (CCAP) commissioned by the Directorate General of Environment of the European Commission. Similarities include particularly the choice of a cap-and-trade model, grandfathering, emphasis on monitoring, reporting and verification, transparency and public involvement. See also Kruger & Pizer (2004 a & b).

[26] Registries are a precondition to track allowance account information, allowance holdings, and transfers of allowances among trading participants, as well as government administrative functions such as setting up allowance accounts, issuing, or retiring of allowances.

[27] Law that is adopted by the EU needs to be implemented and enforced by member states. This is among other parts of the principle of Community loyalty in Art. 10 of the European Community Treaty that guides the EU.

[28] In some cases, implementation of an EU law goes even beyond EU member states and may include non-EU countries grouped in the so-called European Economic Area (EEA). The concept of the EEA has been developed for those countries that do not wish to share the political objectives of the EU, such as progressive political integration, but want to benefit from economic integration. It allows for the full (and legally binding) integration of countries into the EU internal market without being a member. This approach is currently being applied to Iceland, Liechtenstein and Norway. See e.g. Emerson et al. (2002).

[29] The European Commission and the European Court of Justice have the right to control implementation and enforcement. However, this always requires cooperation of member states.

[30] Although the EU ETS, as almost all other internal market-related legislation, can be adopted by a qualified majority, voting is used only in exceptional cases. This holds even truer for important laws. The EU ETS was adopted unanimously by the Council of Ministers and by a large majority in the European Parliament.

member states. But initial experiences usually feed into a formal review, which in many cases – including for the EU ETS – is built into the legislation.[31] Market solutions have in many instances proven easier than harmonisation across 25 or more national jurisdictions, which display major differences in legal systems, enforcement cultures, and administrative capacities. In many cases, EU legislation is initiated by national legislation, reinforcing the tendency towards decentralisation.[32]

The EU MRV Model: Third-Party Verification

Because the EU ETS began this year, it has not yet completed its first Reporting and Monitoring cycle. The following section therefore only describes the basics of the EU MRV process as designed by the Directive and implementation provisions.

Each installation covered by the EU ETS needs to apply for a GHG emission permit,[33] which *inter alia* requires monitoring and reporting of emissions. Art. 14 in the EU ETS Directive requires the European Commission to adopt legally binding Guidelines for Monitoring and Reporting (MRG)[34] of emissions based on Annex IV of the Directive, which include accuracy, timeliness and integrity. The framework on monitoring and reporting is completed by verification and a registry.

Each installation develops a monitoring methodology based on their interpretation of the MRG; the methodology must be approved by the competent authority in each member state. These methodologies are principally based on a combination of emissions factors, fuel use and production data.[35] The MRG sets different 'tiers' of monitoring methodologies, with the top tier the most accurate (and usually the most expensive). Installations are required to use the top 'tier' unless they can show it is impractical or will result in disproportionate costs. In these cases, the Competent Authority (CA), or responsible agency in each member state, can waive this obligation and drop the installation's methodology to a lower tier.[36]

With the exception of Germany, member states have agreed that the installation-specific monitoring methodology should be part of the permitting procedure.[37] Installation-specific methodologies are submitted for approval to the CA. The underlying philosophy is to reduce the possibility of error and instil confidence for both participants and regulators.

Operators at each installation report their emissions according to the methodology specified in its permit. Although operators must ensure their reports comply with the applicable methodology, an independent third party must verify all self-reported emissions. This third party is usually a non-governmental independent entity. However, in exceptional and justified cases verification can be done by a government body.[38] The verifier determines whether emissions have been monitored and reported in accordance with the validated methodology in the permit. In some countries (e.g. UK, Germany and Portugal) verifiers have also checked baseline emissions.

Government supervision is generally carried out throughout the accreditation process.[39] In order to prove suitability (e.g. technical qualification, independence from the installation being verified), verifiers must be accredited in member states. In most cases, member states use existing accreditation bodies. Once accredited, verifiers in principle have the final word on an installation's report. Currently, there is coordination at EU level to promote consistency in the accreditation process for verifiers. But there is not yet a harmonised approach, as competence requirements for verifiers are still being defined. Because the verifier has the final say on an installation's report, particular importance is attached to ensure that verifiers perform their tasks accurately. Accordingly, the CA must ensure that those

[31] The EU ETS review is mandated to start in mid-2006 at the latest.

[32] For the case of the EU ETS, see Zapfel & Vainio (2002).

[33] Different member states use different terminology *(*e.g., the plan in the UK or protocol in the Netherlands).

[34] European Commission Decision establishing guidelines for the reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council, 2004 O.J. (L 59) *1-74.*

[35] MRG defines "monitoring methodology" as "the methodology used for the determination of emissions, including the choice between calculation or measurement and the choice of tiers", i.e. a hierarchy of different ambition levels.

[36] US-style CEMs are possible but are not expected to be used. There is a difference in opinion between European and US officials about the benefits of CEMs. In Europe, there are doubts about the value from both a cost and accuracy point of view. In the US, CEMs are viewed as highly accurate and cost effective for monitoring of SO_2 and NOx at certain types of sources.

[37] Germany set out its monitoring and reporting requirements in the permits by reference to general rules.

[38] The Directive requires verified data in accordance with a number of criteria set out in Annex V of the Directive, such as the quality and accuracy of the measuring equipment, effective data management systems, transparency of processes and public access to data.

[39] Should the need arise, member states have supervisory powers such as inspections and sample controls in parallel with verification.

accredited as verifiers are qualified and supervised via regular inspections and sample controls.

Although verifiers' tasks are similar to an auditor reviewing a firm's financial accounts, their work is distinct from financial auditors. For example, a verifier's areas of expertise include a technical background. Thus, qualified engineers who are familiar with the technical issues of emissions measurement can be employed as a verifier.

Similar to the United States, EU member states try to create administrative certainty by making programme operations routine. For example, the Netherlands has developed a standard validation protocol aimed at ensuring that the monitoring protocols proposed by the operators in their request for a permit would be approved ('validated') in a uniform way. This was to limit discretion in the validation process. A second protocol, on guidance for accreditation of verifiers was developed in early 2004. This protocol has been developed in cooperation with members of states, industry and the International Emissions Trading Association (IETA) for use by the European Co-operation for Accreditation (EA), a voluntary cooperative effort of European Accreditation bodies, to develop its Guidance on Verification (EA 6/03). A number of member states have made the use of EA 6/03 obligatory in their national legislation. Some member states concentrate on improving national verification procedures, while other member states are as yet undecided. In the future, it is likely that the European Commission will provide more guidance in order to achieve a higher degree of standardisation of procedures. Although there is far less reliance on information technologies to operate the programme and automate routine procedures in comparison to the United States, some member states, such as Finland, the Netherlands and the UK, have started to progressively standardise electronic formats to make better use of information technology.

There is an important similarity between the United States and the EU in that excess emissions penalties are non-discretionary and automatic.[40] To further strengthen compliance, operators are not only subject to penalties but also must surrender allowances in the following period (the importance of non-discriminatory and automatic penalties in the United States is discussed above). But in line with the far more decentralised political environment of the EU, administrative and criminal penalties are to date entirely the responsibility of member states, as the EU has no competence in this area. However, relevant member states provisions need to be communicated to the European Commission. Additionally, a ruling last year by the European Court of Justice asserted that the EU has the power to require member states to lay down criminal penalties for the purpose of protecting the environment.[41]

Reported emissions data is collected in a registry that can be used to measure compliance by comparing the verified emissions of an installation with the number of allowances the installation holds, which is also known as the tracking of allowances. The registry amounts to a hub and spoke system consisting of one European hub in the form of the EU transaction log and 25 different member states registries, which communicate through standardised protocols and the EU. In the future, it is anticipated that member states will develop joint registries (see below). It is interesting to note that the Dutch NOx trading system initially had no automated registry, but the government decided to make maximum use of the procedures and structures as defined in the EU-ETS, thus seeking the maximum synergy possible between the two schemes

Public Access to Data

Emissions data will be publicly available as of the completion of the first Monitoring and Reporting Cycle (31 March 2006). Under Art. 17 of the EU ETS Directive, a full emissions report for every single installation needs to be published. Modalities for this are under discussion by member states, where making the data available online through a web page for each national registry has been discussed. Access to information and transparency in general depend on the degree of user-friendliness of the published data. Therefore, verified emissions of installations will be entered into a Verified Emissions Table of a member state registry. On May 15th of each year, the Central Administrator and each member state registry will display on their public website the verified emissions figure for each installation as well as the allowances surrendered for that installation and whether or not that installation is in compliance with its obligations. The emissions figure for every single installation can be accessed through the Community Independent Transaction Log (CITL) website. This process should be made largely routine.

Participant Perspectives on Compliance

With emissions trading systems, it is not just the regulator who is concerned about compliance. The regulated community and other participants and

[40] The EU example shows that governments faced barriers within national administrations to design and apply non-discretionary and automatic penalties. The reason was that such penalties have not been foreseen in existing administrative, legal, and procedural requirements. In some cases, law-making instructions would even prevent them.

[41] European Court of Justice of the European Communities (2005).

investors all share a common interest with regulators in achieving high levels of compliance. Otherwise, cheating or even the perception of cheating can risk devaluing allowances, thereby reducing or eliminating the economic incentive to cut emissions. To underscore this common interest in compliance, it is worth examining the different perspectives of participants in emissions trading systems.

Participants in the emissions market require a stable and predictable environment. At the same time, governments, citizens and environmental NGOs demand that environmental objectives are met. By and large, these two priorities, i.e. stability and efficacy, are compatible and even mutually dependent. Even if emitters, governments and environmental NGOs are likely to hold different views on the severity of the targets, the 'market' prefers credible targets that not only increase liquidity, but also reassure governments and society that the trading process will lead to credible reductions in GHG emissions. Consistent and fraud-proof monitoring and verification procedures therefore have moved to the centre of emissions trading schemes. While this debate initially focused on accuracy and credibility, with progressive implementation the spotlight turns to costs, notably how to reduce them.

EU Governments' Perspectives

Interest in emissions trading in the EU has been triggered by a number of different reasons. First were its potential economic merits. Emissions trading promises least-cost abatement and allows industry a high degree of flexibility in how to meet the environmental objectives. Second, emissions trading was seen as particularly well suited to climate change policy as a means of translating absolute national targets into sector- and installation-specific targets. Third, governments were attracted by the cap, which gives assurance that the environmental objective is met. It was thought that emissions trading could be a means to address implementation and enforcement deficits that were increasingly becoming apparent within the EU and were expected to widen with enlargement. Finally, after aborted attempts by the EC to introduce a carbon tax and by industry to reach voluntary agreements to cut emissions, a market-based system became the most attractive option for tackling climate change, especially when compared to the largely unworkable command-and-control alternatives.

Success with the EU ETS, both in terms of reducing emissions and establishing mandatory trading systems as a useful regulatory strategy to address climate change, is essential for the EU to maintain its credibility in international climate negotiations. While success for the EU ETS depends on a variety of factors, its MRV strategies will play a large role in its environmental effectiveness, economic efficiency (including establishing a level playing field for businesses throughout the EU and the world) and political acceptability.

US Government Perspective

Emissions trading has become the policy of choice for legislators and programme administrators in the United States to address regional air pollution. This is both because the programmes have proven effective and because they have satisfied a variety of competing interests.

Without a doubt, the existence of stringent monitoring and enforcement provisions in the 1990 Clean Air Act gave policy makers the confidence to experiment with the flexibility of the 'cap and trade' approach. Most recently, all of the major legislative proposals in Congress for further reductions of multiple pollutants featured a cap and trade structure. Finally, although there is still controversy in the United States about the adoption of a cap on greenhouse gases, emissions trading is generally viewed as the inevitable approach if the United States adopts a mandatory policy.

Regulated Firms, Market Participants and Investors

Business and industry have supported the introduction of emissions trading largely because they are identical to government's motives although the weighting of motivations varies. While business and industry may value least-cost abatement and flexibility the most, they also can see the additional advantage of a management focus on cost-effective abatement possibilities. Managers will try to exploit opportunities through better carbon management and participation in the trading market. Turning such opportunities into reality requires efficient and effective MRV.

A majority of firms operating in the EU have made emissions trading and the EU ETS their instrument of choice, given perceived economic advantages. But the future of the EU ETS depends on its credibility. Effective MRV strategies play a key role here by boosting its credibility as well as helping firms identify overlooked reduction opportunities, as the experience of BP and others suggest.[42]

[42] BP calculated that reducing GHG emissions by 10% below its 1990 level had a net benefit of $650 million. Reductions were a direct consequence of the internal BP cap-and-trade scheme. The associated MRV enabled the company to identify reduction sources. See Browne (2004).

Other participants in the system have a somewhat different perspective. Industry participants are most interested in establishing and maintaining a level playing field – that is, that firms believe their competitors are in compliance and, if not, will be identified and sanctioned.

In addition, investors and traders are generally most interested in determining the degree to which allowances are sheltered from the risk of devaluation. In other words: they don't want to lose money investing in carbon. The two main sources of risk of devaluation are widespread cheating and uncertainty brought on by ineffective MRV strategies and a wholesale change in regulatory policy.

The perspectives of industry and market participants in the United States are similar to those in Europe. Svendsen (1998) found that the flexibility of the 'cap and trade' approach, coupled with increased competition in the electric power sector, is one of the main reasons the US electric power industry prefers a grandfathered tradable permits market over other regulatory approaches. One industry representative notes that US trading programmes have worked well because the role of regulators is to "to get the system up and working, to ensure compliance and to report on progress".[43] Swift (2001) argues that this focus on emissions results rather than on compliance choices creates less friction between regulators and companies because it reduces transaction costs and avoids delays inherent in the review of industry strategies. This represents a considerable improvement over earlier emissions trading programmes, in which case-by-case reviews of trades contributed to delays and uncertainties.[44] Similarly, brokers and traders have also supported strong compliance provisions as a prerequisite for the development of the market. For example, one broker has noted in testimony before the US Congress:

> There is no "natural benefit" for owning a tradable emissions right. Their only value is compliance with the law. Consequently, there must be a fate worse than trading if trading is to succeed. Accordingly, penalties for non-compliance must be severe when compared to the costs of trading (including the time and effort to execute the trades). And, just as importantly, penalties must be enforced.[45]

While industry generally supports monitoring and verification provisions in the SO_2 and NOx programmes, some companies have expressed concerns about the high monitoring costs and complexity related to continuous emissions monitors. A. Denny Ellerman et al. (2000) found that these costs were as much as 7% of overall compliance costs during the first phase of the SO_2 programme. However, they also note elsewhere that "regulated firms seem to be unanimous in expressing their preference for this type of regulation, presumably because the gains in reduced direct compliance costs more than offset whatever compliance costs are involved in monitoring…"[46]

Non-Governmental Organisations and the Public

In both the United States and Europe, the main attraction for NGOs has been the environmental certainty as a result of an absolute cap.[47] Such certainty however depends on the credibility of MRV. Environmental NGOs demand that environmental objectives are met. Hence, there is convergence between emitters and NGOs, although the devil is in the details.

Compliance Challenges

Effective implementation of MRV rules is central to providing trust in the system as well as to offerinf a major potential for efficiency improvements by bringing down costs associated with MRV and emissions trading in general. This has notably been demonstrated for US trading schemes such as the SO_2 trading and the NOx Budget Trading Programmes.[48] Arguably, for the US acid rain programmes and the NOx Budget Trading Programme, measuring and monitoring have been the most complex and costly element components of the trading scheme. The EU ETS is somewhat different as GHG emissions are not actually measured, but calculated based on energy use or other proxies. However, this does not automatically mean that one of the methods is superior to the other.

Similar experiences were reported by Entergy, Toyota, and Rio Tinto.

[43] Kruger (2005); see also Hart (2000); Chartier (1997); Kosobud (2001) and White (2003a) (reviewing industry views on the SO2 trading programme).

[44] Hahn & Hester (1989).

[45] Bartels, Fitzgerald (1997).

[46] Ellerman et al. (2003).

[47] Early opposition to SO_2 trading by much of the environmental community in the United States has faded as the programme has shown significant environmental results and emission 'hot spots' have not emerged (See Kruger & Dean, 1997). However, there is still opposition to emissions trading of conventional pollution by some environmental groups. Most recently, much of this opposition has focused on mercury trading.

[48] See, e.g. Mangis (1998) and Holmstead (2002).

The United States: Future Cap and Trade Compliance Issues and Challenges

Although compliance procedures for US SO_2 and NOx programmes are well established, there is much uncertainty about the design of any future mandatory programme for greenhouse gases in the United States. There are a number of factors that could shape the MRV procedures of such a programme. Key questions, which are discussed below, include:

- What will be the scope and point of regulation of such a programme?
- What role will continuous emissions monitors play?
- How will state and regional 'cap and trade' programmes affect a potential national programme?
- What will be the impact of voluntary protocols and registries?

Scope and Point of Regulation

Ultimately, the scope and point of regulation of a potential trading programme could have an impact on the types of MRV systems developed. To the extent that a programme might just cover the electric power sector, it is likely that the MRV system would build upon the existing model used in the SO_2 and NOx programmes. As noted, most electric power sources already report their CO_2 emissions to EPA.

The details of a potential MRV system are less certain in legislative proposals that address sectors beyond electric power. Specifically, two legislative proposals – the McCain-Lieberman bill and a proposal by Senator Bingaman – are for economy-wide programmes that would cover multiple sectors. In the case of McCain-Lieberman, emissions from the electric power and industrial sectors are regulated 'downstream' (i.e. at the smokestack) while emissions from the transport sector are regulated 'upstream' based on the emissions potential of fuels processed by oil refineries. In contrast, under the Bingaman proposal, the point of regulation is entirely upstream at fuel producers, processors or transporters (e.g. natural gas pipelines). Thus, new protocols for monitoring, verifying, and reporting the emissions potential from upstream sources and the emissions from some downstream industrial sectors might be necessary.[49]

Use of CEMs

CEMs are a cornerstone of the emissions monitoring system in conventional US pollution trading programmes. But what factors and considerations will determine their use in a potential greenhouse gas trading programme? First, as the discussion above notes, one important factor will be the point of regulation. For example, if the point of regulation is entirely upstream, CEMs will not be used at all. CEMs would only be an option in trading programmes where some or all of the point of regulation is downstream. Second, it is important to note that the existing CO_2 reporting requirement for electric power facilities does not *require* CEMs and allows facilities to choose alternative methods. Approximately 40% of units that report CO_2 emissions to EPA use CEMs and 60% use alternative methods. This represents about 87% of CO_2 emissions that are measured with CEMs. Most of the units that use CO_2 CEMs are coal-fired units, while oil and gas-fired units generally use alternative methods. Third, to the extent that sources already use CEMs (i.e. in the power sector), there may be a strong incentive to continue to use those existing systems. For example, Regional Greenhouse Gas Initiative (RGGI) states have proposed using the existing reporting system for CO_2 (i.e. CEMs for some units and alternative methods for others). This proposal has received support from industry stakeholders, who presumably do not want to develop a new or additional monitoring and reporting system (See Northeast Greenhouse Gas Coalition, 2004). In contrast, the motivation to use CEMs may not be as strong for facilities outside the power sector, since they are not currently reporting CO_2 to EPA. In addition, for some sectors with process or fugitive emissions, using CEMs may not be feasible or practical.

Impacts of State and Regional Programmes

A further uncertainty about the design of future US GHG trading programmes is the impact of state and regional programmes that are now under development. The most advanced of these efforts is the RGGI, a cap and trade programme under development by nine states in the northeastern and mid-Atlantic United States. Initially, the programme will address CO_2 emissions from the electric power sector. However, the programme may be expanded to include additional sectors and GHGs. In general, the RGGI programme has proposed to use compliance and enforcement structures similar to those used in the US NOx trading programme. In addition, as noted

[49] Because of the jurisdictions of the Senate committees responsible for these bills, there are different administrative agencies involved in developing guidelines or operating the programmes. Under the McCain-Lieberman proposal, the programme would be administered by EPA, but emissions monitoring guidelines would be developed by the Department of Commerce. Under the Bingaman proposal, the US Department of Energy would have overall responsibility for the programme, including the development of MRV guidelines.

above, the programme has proposed using CO_2 data currently reported to EPA.

West Coast states may develop a different model for a 'cap and trade' programme. Concerns about addressing imports of power from outside the state have led some stakeholders to advocate design approaches that focus on the distribution of electric power rather than generation. For example, an advisory group to the Governor of Oregon has recommended a tradable carbon content standard for power consumed in the state, which would take power imports into account. (Governors Advisory Group, 2004). California is considering a proposal to allocate allowances to load-serving entities, which would be required to hold allowances to cover the emissions of the electric power they distribute (CCAP, 2005). Such a programme might require some sort of programme for monitoring or estimating emissions associated with power imported from outside the state. How these programmes might address MRV and other compliance and enforcement issues has not yet been determined.

Impacts of Voluntary Efforts

A final uncertainty is the impact of voluntary greenhouse gas reporting protocols and registries on a potential mandatory US weighting national system. For example, more than ten states have adopted or are in the process of adopting voluntary registries for greenhouse gas emissions (PPI, 2003). Most notable is the California Climate Action Registry Programme, which uses a greenhouse gas reporting protocol based on the reporting protocol of the World Resources Institute (WRI) and World Business Council for Sustainable Development (WBCSD). There are also federal greenhouse gas reporting and registry programmes. Under the EPA Climate Leaders Programmes, companies develop comprehensive greenhouse gas inventories, set corporate emission reduction targets and report annually their emissions and progress towards reaching their targets. The programme's reporting protocol is based on the WRI/WBCSD protocol, and it requires entity-wide reporting. Under the Voluntary Reporting of Greenhouse Gases Programme, established by Section 1605(b) of the Energy Policy Act of 1992, organisations and individuals who have reduced their emissions may record their accomplishments and publicise their actions. This programme encourages entity-wide reporting but provides also flexibility in defining the reporting entity.

Voluntary reporting schemes and registries have a number of benefits, including helping corporations understand the scope of their emissions and the possible mitigation measures that they might take. Voluntary reporting programmes may also raise awareness of the climate change issue and highlight the actions of companies who are leaders in reducing their emissions. Ultimately, voluntary reporting schemes and registries are made for different purposes than compliance rules of mandatory programmes.

Several aspects of voluntary protocols may require revision or further development to be suitable for mandatory trading programmes. This is because there is an inherent tension in voluntary protocols, which must balance the desire to encourage participation with the costs associated with a rigorous emissions reporting programme. If measurement and reporting requirements are too rigorous and costly, there will be few participants. Conversely, if programme reporting restrictions are too lenient, the resulting emissions data may not be an appropriate foundation for a future mandatory programme. In addition, some voluntary registries and protocols require reporting at the company-wide level rather than the facility level. While this is appropriate for a voluntary programme that tracks a corporate emissions goal, it is less useful for a sector-wide or economy-wide mandatory trading programme, where it is important to carefully track emissions at the facility level. Existing conventional air pollution control programmes require emissions reporting at the unit or facility level, in part because of the complexity of tracking shifts in corporate structure.

Nevertheless, experimentation with voluntary protocols by industry may lead to the development of better emissions estimation methodologies. This may be particularly true for sectors such as iron and steel, where emissions monitoring or estimation is less than straightforward. This experience would certainly inform the development of future US mandatory guidelines for emissions monitoring. Gradual alignment of voluntary reporting schemes and registries with compliance rules of mandatory programmes could facilitate transition to a regulated programme.

Compliance Challenges for the EU

Implementation of important new EU legislation is typically approached in a 'learning by doing' mode in which various member states experiment with different national responses to EU framework legislation. In the absence of a central federal enforcement agency, the European Commission provides guidance while at the same time ensuring compliance with laws. Non-compliance will result in member states being taken to the European courts. Additionally, member states supported by the European Commission share experiences and eventually identify best practices. Thus, there are numerous multi-stakeholder initiatives that attempt to

incrementally harmonise procedures ('soft harmonisation').[50]

The challenge for the EU and its member states is to transpose the MRV provisions into national legislation, taking into account the local institutional landscape and legal circumstances (including established practices), while at the same time ensuring an adequate degree of harmonisation across member states. Additionally, although the EU has looked to the US NOx budget trading programme, which is more decentralised than the SO_2 programme, the EU is largely on its own in developing a decentralised model.

Principal Challenges

Within the EU ETS, the major challenge is to ensure consistent implementation of MRV across member states. Effective implementation of MRV is an integral part of enforcement and deterrence, which are preconditions for compliance. Achieving consistency – a permanent challenge for the EU – requires creating similar procedures across member states. This offers considerable efficiency gains and ensures a level playing field (i.e. allows for undistorted competition within the EU internal market).

Consistency starts with the quality of the member state permit, which includes the incorporation of MRG. Member states' rules will differ depending on the nature, frequency, and depth of inspections to be carried out. It is also likely that member states will vary in how rigorously they enforce national and EU law. A great number of differences between member states could affect the level playing field of competing companies and, at the extreme, may lead to gaming. There is also a risk that, if flexibility leads to inconsistencies within or between member states, national regulators may extend their intervention.

Another challenge for the EU is to clarify institutional responsibilities. Currently, responsibilities for MRV in the EU and its member states lie with the EC, 25 member states, more than 150 Competent Authorities,[51] around 11,500 installations and an uncertain number of verifiers and accreditation bodies. While the EU ETS Directive and subsequent legislation in principle have assigned responsibilities, in practice the boundaries might sometimes be blurred. The critical intersections are European Commission and member states, Competent Authorities and companies, verifiers and accreditation bodies.

The final challenge relates to verification, and notably to ensuring harmonised rules for accreditation. Major diversity in stringency of accreditation is likely to affect the credibility of the EU ETS. To date, there are a number of differences in the competence requirements between various member states. These differences are partly fuelled by the member state's fears of lacking the necessary verifiers. Member states are trying to find the right balance between qualification requirements and ensuring the availability of sufficient verifiers.

Initial Responses

Some of the challenges, such as the initial competence assessment of verifiers and jurisdiction issues for different institutions, are typical issues for a new and ambitious scheme that is breaking new ground. They will be addressed during the first round of compliance through different processes. The Working Group III sub-committee on the comitology address some of these issues, but its mandate is not to achieve full harmonisation. Rather, it is to ensure that member state implementation is in line with EU law. There are also complementary initiatives aiming at voluntary harmonisation by member states. Such voluntary harmonisation initiatives in many cases seek the active involvement of stakeholders.

There has already been progress on further harmonisation of verification and accreditation standards and procedures. This includes the application of the European Co-operation for Accreditation's (EA) *Guidance for Recognition of Verification Bodies under EU ETS Directive*.[52] Many member states – particularly those that have Accreditation Bodies that are members of the EA – are looking to use this document as the basis for setting up accreditation schemes for verification bodies. In addition, member states are currently developing a common Verification Reference Model, which covers all elements for an effective control of monitoring, reporting, verification and accreditation. The Verification Reference Model can be used as a model for both GHG verification procedures and the principal elements of the verification framework by outlining the respective responsibilities of the CAs and accreditation bodies. This includes the responsibilities as set out in the Directive, MRG, and EA 6/03. Additionally, CAs are encouraged to use it to self-assess their situation. An EU-wide Verification Resource Centre will assist the authorities in their verification exercise focusing on processes, the verification statement, and the qualification profile of verifiers. Also, focus groups with interested representatives from member states and CAs are about to be launched on the following

[50] See Egenhofer & Fujiwara (2005).

[51] Federal EU member states such as Belgium, Spain or Germany typically have more than one Competent Authority.

[52] European Co-Operation for Accreditation (EA) (2005).

issues: mutual recognition of verifiers; exchange of best practices in running ETS verification; and risk analysis.

Theoretically, the EU could establish a common, or at least regional, accreditation body that is responsible for accreditation of verifiers on an EU-wide basis. This would have obvious advantages related to consistency and uniformity of accreditation within the EU. The feasibility of creating a common EU accreditation body as a real political option is unclear but remains unlikely unless the European Commission takes a lead on this. The creation of regional accreditation bodies appears to be more likely. Another alternative option is that accreditation bodies in all EU member states follow similar rules for accreditation. Some member states are already allowing mutual recognition,[53] but may require that accreditation bodies (e.g. UKAS) carry out some form of supervision or surveillance of verification bodies when they work in another member state for the first time.

Cost Considerations

While the initial focus of MRV will remain on implementation and capacity-building, more recently cost considerations have risen on the agenda. As one of the promises of the EU ETS has been cost-effectiveness, the EU, member states and stakeholders monitor costs and identify areas where excessive costs can be avoided. Potential areas for attention are verification and small installations.

As was pointed out above, there are differences in verification and accreditation of verifiers not only between the 25 member states but within some member states. This can increase costs for international companies wishing to apply uniform monitoring and reporting procedures for one verifier throughout the EU.[54] Annual costs for verification are generally estimated to range between €25 and $30 million dollars per annum.[55]

It can be argued that the inclusion of small installations in the EU ETS can lead to high administrative costs for both governments and the covered sources. For small installations with emissions of less than 25,000 tonnes of CO_2, additional costs for establishing, monitoring and reporting can be disproportional to the environmental benefit.[56] Therefore, one of the principal priorities of the revision of the ETS MRG is cost-efficiency – specifically, to lighten the administrative burden for small installations.[57] This will be part of the MRG review that is planned to be formalised by spring 2006.

The Role of Performance Management: Measuring Success

As governments continue to experiment with emissions trading systems, evaluation of the results of these systems will be increasingly important.[58] There has been little explicit research on how best to measure the success and performance of enforcement and compliance systems in emissions trading programmes. However, there has been an effort by INECE, OECD and several governments to develop compliance and enforcement indicators for environmental programmes in general.[59] Work by

[53] 'Mutual recognition' is a central element of the EU's internal market for goods. It describes that fact that EU member states are required to recognise marketing authorisation issued in another member state as long as the product complies with EU minimum health and safety standards ('essential requirements'). In services, the validity of the mutual recognition principle remains controversial.

[54] For international verifiers wishing to serve their international customers, it can mean between 40 and 50 accreditations to different schemes with increased costs and reduced availability of verifiers in the market.

[55] This assumes a cost range for verification per installation from €1,000 and €20,000 for big installations.

[56] See Egenhofer & Fujiwara (2005). While costs can be important, emissions from small installations may not be. For example, excluding installations with emissions lower than 10,000 tonnes CO_2/year would mean to reduce the number of participants in the EU by 32% (or about 3,400 participants), but decrease emissions coverage in the ETS by only 1%. Excluding installations under 25,000 tonnes CO_2/year would reduce the total number of participants dramatically (-55%), while reducing the included emissions by only 2.4%. Worrel & Woosen (2005).

[57] Practically speaking, the following points are under discussion: 1) establishing a list of exemptions from requirements of MRG for small installations; 2) reducing and simplifying requirements for the monitoring of biomass fuels; 3) widening the scope for simplified approaches for minor sources; 4) simplifying approaches for standardised commercial fuels; 5) creating differentiated requirements for the accreditation of laboratory analyses; 6) including several existing commercially relevant practices to determine production and stock data; and 7) considering the optional use of differentiated oxidation factors.

[58] See Markowitz et al. (2005).

[59] The Organisation for Economic Co-operation and Development (OECD) defines 'enforcement indicators' as "those measurable pieces of information that inform about compliance promotion, compliance monitoring, and non-compliance response." Environmental compliance and enforcement indicators are sometimes divided into two categories: output based indicators and outcome based indicators. Output based indicators are activities or services performed by a government programme during a specific time period. These could include the number of inspections performed or the number of penalties assessed. Outcome indicators are tied to the environmental effects of a

these organisations and governments has pointed to several benefits of using performance indicators, including helping programme managers understand the effectiveness of their programmes and help improve environmental programmes over time.[60]

Traditionally, environmental programme administrators have used output-based indicators such as the number of enforcement cases initiated or penalties assessed because these indicators are easy to measure and are directly tied to compliance and enforcement efforts. However, these types of metrics pose a dilemma. In an ideal environmental programme, one would expect high compliance and few penalties assessed. The question is whether this outcome is the result of good compliance or poor enforcement. Moreover, these types of measurements are often not a good gauge of the overall success of an environmental programme. Because of the shortcomings of these types of indicators, the literature suggests more sophisticated measures are necessary to address the multiple audiences for information on programme performance. For example, Stahl notes, "A combination of measures – outputs and outcomes, quantitative and quantitative, statistical and narrative, aggregated and disaggregated, national and local – is necessary . . ."[61]

In US trading programmes, both output and outcome data are used to evaluate the performance of compliance and enforcement decisions. For example, examples of indicators include:

- Percentage of sources subjected to environmental audits;
- Percentage availability of emissions monitors;
- Results of relative accuracy tests for monitors;
- Number of enforcement actions taken and penalties assessed; and
- Overall compliance rate of affected sources.

The programmes also use a variety of outcome indicators to measure the overall effectiveness of the programmes, including emissions and deposition reduced, as well as changes in the environment attributable to emission reductions. For the most part, compliance and enforcement measures are viewed as a component of the overall system, including the overall environmental results, costs and market function. A number of studies have looked at the compliance results of these programmes in the context of the overall performance of the programmes.[62]

Conclusion: Towards a Common Currency

The preceding sections have highlighted the differences and similarities between the United States and EU approaches to MRV in emissions trading systems. Ultimately, there may be additional variations on these models, as Canada, Japan and other countries begin to adopt domestic emissions trading systems. Given these differences in approach, what will be the best way to proceed towards a common currency?

The first step to answering this question is to understand the extent to which different approaches might lead to different results. For example, would reported emissions from a facility be significantly different with US methodologies than EU methodologies? To what extent are differences procedural rather than substantive? A more technical analysis of monitoring methodologies will be necessary to answer these questions.

A second consideration will be a more general need to understand the MRV issues that arise when different national trading programmes are linked.[63] The ultimate laboratory for understanding these linkage issues will be the first year(s) of implementation of the EU ETS. As discussed, there is flexibility among EU member states in how they implement MRV guidelines. Understanding the proper balance between flexibility and consistency in the EU ETS will be very useful as a test case for linking domestic systems.

Finally, further dialogue between experts is necessary to build on understanding of the unique features of the EU and US models. US observers may need more information on how third-party verification actually works in an emissions trading programme. For example, what will be the impacts of third party verification on the administrative efficiency of the verification process? EU and member state officials

programme, including interim effects such as tons of emissions reduced. See Stahl (2004).

[60] Other benefits of performance indicators may include: helping programme managers understand the relationships between programme activities, such as inspections and audits, and the change in behaviour or performance by the regulated community; enhancing the accountability and credibility of environmental programmes with outside stakeholders; and monitoring internal operations and maximising the efficient use of government resources. See Stahl (2003).

[61] Ibid.

[62] Burtraw & Palmer (2003); Ellerman et al. (2000) (providing recent assessments of the SO_2 programme); Farrell (2001) and Burtraw & Evans (2003) (providing an assessment of the nine state NOx OTC programmes).

[63] In addition to MR&V issues, there are a number of additional issues that come into play when different emissions trading systems are linked, including: relative cap stringency; trading and banking rules and other design elements.

may need more information on whether the information technology-based system used in the United States for reporting and verification will be flexible enough to meet the needs of diverse member states. In addition, there may be questions about whether this type of approach could be applied to the wider universe of sectors and installations in the EU ETS. Ultimately, sharing detailed information about different MRV systems will lead to better understanding of the costs and benefits of different approaches. This may be the best first step towards a common currency for emissions trading.

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