ENVIRONMENTAL LAW INSTITUTE

ENVIRONMENTAL LAW INSTITUTE
RESEARCH REPORT

Emission Reduction Credit Trading Systems

An Overview of Recent Results and an Assessment of Best Practices

September 2002

Emission Reduction Credit Trading Systems

An Overview of Recent Results and
an Assessment of Best Practices

Submitted to
Environmental Protection Agency
Clean Air Markets Division
under Cooperative Agreement CR-822795-01

Environmental Law Institute®

September 2002

Acknowledgments

This report was prepared by the Environmental Law Institute under Cooperative Agreement CR-822795-01, with funding from the U.S. Environmental Protection Agency. This report was authored by Byron Swift of ELI and Erik Haites of Margaree Consultants; additional ELI staff contributing to this report include Sarah King, Samantha Klein, and Jessica Yarnall. The Environmental Law Institute would like to thank project officer Alan Carlin, and Melanie Dean, Joe Kruger and other staff of the Clean Air Markets Division for their assistance and guidance; and wishes to express particular appreciation to the state government representatives in Connecticut, Massachusetts, Michigan, New Hampshire, New Jersey, and Texas who generously provided data and advice for the content of this report. ELI also thanks the representatives of government, industry, and non-profit organizations who were interviewed in preparing this report.

Disclaimer

Emission Reduction Credit Trading Systems: an Overview of Recent Results and an Assessment of Best Practices

 ELI Project #981617
ISBN # 1-58576-030-7.

Executive Summary

This report assesses actual experience under the two principal forms of inter-firm emissions credit trading programs used today: emission reduction credit (ERC) trading used for new source offsets under the Clean Air Act (CAA), and discrete emissions reduction (DER) credit programs created in six states since 1995. The report makes a qualitative review of ERC offset programs, and a comprehensive review of state DER programs. It presents data on the actual generation and use of DER credits from 1995-2000, reviews the laws and practices of each state in implementing these programs, and identifies what the authors believe are the best practices for DER credit trading, taking into account both environmental and economic factors.

Offset Credit Trading Programs

Offset credits are governed by Clean Air Act rules for geographical areas that have not attained the national ambient air quality standard for one of the regulated criteria pollutants. The CAA requires any new source, or major modification of an existing source, within such a non-attainment area to more than offset its emissions by obtaining credits from reductions made by an existing source within that area. Therefore, demand for offset credits is driven by the needs of new or expanding sources within a non-attainment area, and offset credits do not function as a market mechanism that allows regulated sources to minimize compliance costs through trading.

This study finds that demand for offset credits is generally strong and credits are actively traded in a number of non-attainment areas. Most offset credits (80 percent, according to brokers) come from shutdowns of existing pollutant sources within the area. Because of the strict rules governing non-attainment areas, offset trades typically create significant environmental benefits, and may result in a net 30 or 40 percent pollution reduction from the emissions of the older source.

We find that offset credits function effectively to create environmental benefits, due to the combination of the CAA rules governing offset credit creation and use, and those governing non-attainment areas. Because any new or expanding source within a non-attainment area must go through the offset process, and because that process results in a 30-40 percent reduction in emissions, the trading system effectively helps to ratchet down emissions within the airshed.

Discrete Emission Reduction Credit Trading Programs

Discrete Emission Reduction (DER) programs can be used by states to provide flexibility to sources complying with federal emission standards that do not involve new sources or hazardous pollutants (such as "reasonably achievable control technology" or RACT standards) and with state emissions standards. This report assesses the DER programs that have been adopted by six states since 1995, makes a comprehensive review of actual credit generation and use, and analyzes and compares the different state laws and practices, making recommendations for best practices.

DER credits have considerably less environmental integrity than offsets, as they do not operate under similarly strict rules as those for non-attainment areas. However, DER credit trading systems can be used effectively as a market mechanism under CAA State Implementation Plans, provided that compensating reductions are achieved elsewhere in the state's plan.

Since DER credit trading programs depend for their environmental integrity on a strong regulatory framework that governs all sources in a region, great caution should be exercised before allowing credits created in such programs to be exchanged for allowances that are created in other, high-integrity programs, such as emissions cap and allowance trading programs.

A number of best practices described in this document also can improve the integrity of DER credit trading programs. Two especially important recommendations involve: a) limitations on the duration of the life of credit-generating projects; and b) strict protocols for measurement of emissions. We recommend that credit-generation projects be limited in duration by imposing a maximum number of years, or an advancing baseline approach, and that states use strict protocols and emission factors to reduce the number of credits generated by the use of estimation techniques. Both of these rules would significantly affect tradeable amounts.

Empirical Findings

Actual DER credit generation and use during 1995-2000 is shown in Table ES-1. The table reveals several important findings. First, there has been relatively little use of DER credits: seven times more credits have been generated than used, and average use of credits for permit purposes has been less than one percent of stationary NOx emissions. In addition, less than half the uses have been for permit compliance, the originally intended use for DER credits; the rest have been used for special circumstances and for penalties.

Table ES-1. Discrete Emissions Reduction Trading Programs – Total Tons Generated and Used

	Years	Generated	Used-Permit	Used-Total
Conn. NOx	1994-2000	13,679	6,286	8,990
Mass. NOx	1994-2000	21,227	<800	8,754
Mich. NOx	1995-2000	39,384	0	1,710
Mich. VOC	1995-2000	5,140	192	192
New Hamp. NOx	1996-2000	7,184	52	268
New Jersey NOx	1992-2000	33,472	1,305	1,460
New Jersey VOC	1992-2000	1,043	37	135
Texas NOx	1998-2000	41,720	520	736
Total Credits		162,849	9,192	22,245
Total NOx Credits		156,666	8,963	21,918

Several reasons help explain the relative lack of use of DER credits. For one, DER programs have often been adopted after major sources in the state have already complied with new regulatory initiatives, thereby reducing these sources' demand for the credits. In addition, national standards under the Clean Air Act are typically technology-based emission rate limits, which are relatively inflexible, and hence can be unfriendly to the use of trading systems, which contemplate different sources emitting above or below these limits and using credits for compliance. Finally, the transaction costs involved in the project-by-project process of generating and using credits may also be a factor.

Another finding is that credits have been generated in large quantities at a small number of large sources; in most states between 94 and 99 percent of NOx credits were generated at a few large power plants. On the other hand, credit uses have been of small amounts at many sources. As a result, trading of credits in the two states that had sufficiently detailed information showed that trading created a slight tendency to disperse emissions away from concentrations, thereby diminishing and not enhancing "hot spots."

Other empirical data presented included information on NOx DER prices and costs. The cost to develop a DER credit-generation project was generally between $15,000 and $20,000, regardless of the quantity of credits generated. Additional costs include fees charged by emissions brokers, which are typically 5 to 7 percent of the value of the transaction, and in some states registration fees as well. Market prices for NOx DERs in the year 2000 ranged between $300 and $1,300 per ton, and averaged around $800, as reported by the emissions brokerage firm Natsource. We note that the prices for DERs and ERCs in a given market are not related because regulations define different uses for the two kinds of credits.

Analysis of DER State Programs, with Recommendations for Best Practices

The report compares the state rules for DER trading under twenty criteria, and recommends best practices for DER programs. These practices can significantly affect tradeable amounts of credits: for example, 96 percent of all credits generated in New Jersey are from actions started by two major sources in 1992, years before the DER trading program was even created. In contrast, other states would not allow such retroactive certification, and the life of the generating project would have been ended after a number of years, greatly reducing the amount of credits generated.

Some of the most important issues are summarized below:

Retroactive application of the start date of DER programs. Several states authorized the approval of credits for actions taken prior to the official start of the program. This practice is not desirable, as it allows the certification of reductions that probably would have been made anyway. Some states have allowed the regulations to be retroactive to the date of the legislative or other formal act authorizing the trading program, in order to credit good-faith actions made by businesses in anticipation of the program. While this practice addresses a legitimate concern, the implementing legislation should clearly establish the baseline date to provide certainty.

Baselines. All state programs specify that the emissions baseline for determining DER credits is the lower of actual or allowable emission rates, generally for a two-year period within the past five years. Although the rules for determining baselines are relatively clear, baselines actually form one of the areas of uncertainty in DER credit trading systems. In the words of one experienced trader, "baselines are always a matter of negotiation." In determining baselines, regulators may be placed at a disadvantage, due to companies' more thorough understanding of their own operations. In addition, there is always the "adverse selection" problem, in which the past baseline may not actually be representative of the future actions the company would take at that site.

States such as Massachusetts have adopted an advancing baseline approach, in which the lowered emissions level from the DER credit-generating action becomes the new baseline level. We recommend this approach as a means of enhancing the environmental integrity of DER trading programs, as it significantly lowers the ability of the source to continue to generate DERs over time from a single credit-generation action. We further recommend that an appropriate term of years be selected that balances the economic incentives created by a longer adjustment period with the environmental benefits provided by a shorter period.

Credit for shutdowns. Several states do not allow DER credits to be generated through a permanent shutdown or other curtailment of operations. Other states allow credits for such shutdowns, in all cases specifying a term of between 5 and 10 years for the remaining life of the shutdown source, as well as requiring that credits be adjusted to account for any load shifting. We believe that shutdowns could be allowed to create DERs for a period of up to 5 years, provided that shutdown credits are provided for only one pollutant. However, the regulator must be confident that it also can account for any emissions due to load shifting, which has been difficult to accomplish in practice.

Quantification and monitoring protocols. Together with baselines, credit quantification and monitoring protocols are a source of uncertainty in DER programs. Generally, states establish a hierarchy and require the use of EPA-approved measurement, testing, and monitoring methods if available; otherwise**,** other accurate and reliable monitoring methods, or estimation methods such as emission factors. Environmental groups have criticized the use of estimation methods, or allowing companies to develop their own quantification protocols. Some states address such concerns by using compliance assurance factors to reduce the amount of credits by up to 50 percent according to the quality of measurement protocols.

We recommend that a hierarchy of acceptable quantification and monitoring methods be established, together with requiring the use of compliance assurance factors for each method to ensure that the environment is not harmed by the use of estimating methods.

Environmental deductions. States generally require the retirement of 10 percent of DER credits as an environmental benefit. Some states also require users or generators of DERs to deduct 5 to 10 percent of credits as a design margin to simulate command-and-control conditions (as sources typically emit at 5-10 percent under the applicable limits in order to ensure compliance). These deductions are important to ensuring the environmental integrity of the DER programs.

Verification. Verification of DER credits is handled differently by different states. Most states conduct a complete technical verification audit at the time of credit generation, to enhance the credibility of credits; one state performs this function upon credit use; and some review credits at both generation and use. In most states, the government agency conducts this review, but New Jersey relies on independent verification by a professional engineer or CPA. Michigan and New Hampshire have implemented a "buyer beware" system, in which the state conducts only a completeness certification, but retains the authority to investigate the generation or use activity and find the credits invalid at a later date. We find that a complete technical audit by the regulatory agency at the time of credit generation is preferred.

Reporting requirements. States impose as many as five distinct reporting requirements to determine compliance with regulatory requirements, and to provide openness. These include: a Notice of Credit Generation; Notice of Transfer; Notice of Verification; Notice of Intent to Use; and Notice of Use. Some states combine one or more of these reports. A reporting system that allows the regulatory authority to exercise sufficient oversight might fall anywhere in the range between New Jersey, which requires five reports, and New Hampshire, which requires three.

Emission registries. The larger states – Michigan, New Jersey, and Texas – as well as New Hampshire, each post all DER credit transactions on registries that are publicly accessible through the Internet, greatly increasing the transparency of the DER trading programs. In the remaining states, this information is publicly available by request to the program administrator.

A key issue with the different state registries is the lack of consistency of the data presented, making it difficult both to understand the data and to make comparisons between states. Also, the general lack of summary information about overall program activity means that major trends are often obscured by the detailed reporting of specific transactions.

We recommend that a consistent system for reporting DER transactions be achieved, either through negotiation of a common standard by the states affected or through establishment of a federal system. The information reported, especially on generation actions, should be enhanced in many registries. In addition, summary information on major program trends and the most significant credit-generation and use actions should be included in the registry or published annually in a manner that is readily available and understandable to the public.

Public participation. The DER credit trading programs have a number of public participation provisions that make these among the most transparent environmental programs in existence. There has generally been extensive public participation in the development or revision of the program rules, and a high degree of openness in information regarding specific trades.

The strong public participation and openness of DER programs should be maintained. An annual public summary of program activity, including total amounts generated and used and the major generators and users, would allow the public to more readily understand program impacts and trends. A periodic (3-5 year) audit of program performance, which is contemplated by several of the state programs, is also desirable.

Enforcement. States provide that violation of a provision of a DER program carries with it the same penalties and enforcement actions as a typical violation of their environmental regulations, including civil and criminal penalties. Several states explicitly restate the Clean Air Act rule that every day that the user is out of compliance is considered a separate violation.

We recommend the imposition of appropriate penalties, such as those imposed by the CAA, for violations of state DER programs, involving both financial and potentially criminal penalties as well as requiring the replacement of the invalid DERs to enhance environmental integrity. Merely requiring that invalid credits be replaced is not an adequate response or deterrent.

Administrative staffing. Because most monitoring and permitting functions for sources are already being carried out by states under the existing provisions of their clean air laws, implementing emissions trading programs generally involves relatively few additional staff -- typically one or two employees per state.

Conclusion

A major conclusion of this study is that credit trading programs by themselves have inherently weak environmental integrity. Because states have not found objective tests for additionality of credit-generating projects, emissions credit systems are "leaky," and hence may provide credit for reductions that sources would have made anyway. Credit trading programs depend on a strong regulatory program surrounding the subject sources, together with good rules for trading, to prevent them from increasing overall emissions to the airshed.

Both of the credit trading programs studied have had limited economic benefits. The DER trading programs have experienced relatively low use, and hence have not generated significant economic benefits. For ERC offset programs, the CAA precludes any economic benefits by requiring that sources entering non-attainment areas comply with relatively inflexible technology-based emissions limits as well as the offset requirements. Since these technology-based limits add no further emissions reduction to the airshed once offsets have been made, we believe that offset requirements could replace these limits, and so serve also to reduce costs.

Table of Contents

I. Introduction: Credit Trading Approaches 1

II. Emissions Reduction Credits (ERC) 3

A. Context of ERC Trading 3
B. Mechanics of Offset Trading 3
C. Environmental Benefits 5
D. Offset Prices 6
E. Potential for Offset Trading to Play a Larger Role in Achieving Air Quality 7
F. Conclusion 8

III. Discrete Emissions Reduction (DER) Programs 8

A. Introduction 8
B. Context of DER Trading -- State Implementation Plans 9
C. Mechanics of DER Generation, Trading and Use 9
D. Generation and Use of DERs 10
E. Environmental Effects 15
F. Price of DERs 18
G. Costs of DER Credit Generation, Verification and Sale 19
H. Issues in DER Trading and Best Practices 19

1. Integrity and additionality 20
2. Retroactivity in the starting date of DER programs. 22
3 Baselines 23
4. Shutdowns. 24
5. Quantification and monitoring protocols 25
6. Increases in emissions by other sources. 26
7 Projects generating continuous credit streams. 27
8. Life of DER credits. 27
9 Design margin in use 28
10. Restrictions on use 28
11. Verification. 29
12. Reporting by sources - notices 32
13 Emissions registries 33
14. Public participation. 35
15 Environmental deduction in DER trading. 36
16. Enforcement 36
17 Transforming DERs to ERCs (DERs as offsets). 37
18. Inter-pollutant trading 37
19 Inter-state trading 38
20. Staffing issues. 38

I. Conclusion 40

Appendix: State Experience with Credit Trading Systems 41

1. Connecticut 41

2. Massachusetts 42

3. Michigan 45

4. New Hampshire 47

5. New Jersey 48

6. Texas 50

7. Ontario 52

8. California Air Quality Investment Program 53

Emission Reduction Credit Trading Systems: an Overview of Recent Results and an Assessment of Best Practices

Abstract. This report examines the performance and use of emissions credit trading systems in recent years. They have particular relevance today, as states move toward stricter air pollution standards, and nations consider mechanisms to reduce greenhouse gases. This report concludes that it is difficult to create credit trading systems with high integrity, but that their use in the context of offset credits or state implementation plans under the Clean Air Act has provided adequate safeguards to protect air quality. The report provides quantitative data and describes best practices for discrete emission reduction credit systems from a survey of applicable states.

I. Introduction: Credit Trading Approaches

Emissions credit trading has been advocated as a policy tool to reduce the cost of environmental regulations and to improve air quality.[1] In theory, trading allows sources that have relatively high marginal costs of control to trade pollution reduction credits with sources that have relatively low marginal costs, lowering the total cost needed to achieve a given level of pollution reduction. By lowering cost, trading may increase the political feasibility of promulgating stringent pollutant standards, thereby benefitting the environment as well. However, writers have pointed out that a number of credit trading programs have remained little-used, and many have failed to live up to their potential.[2]

This report examines the performance and use of emissions credit trading systems, one of the two principal forms of emissions trading. Credit trading programs are "open-market" systems in which sources carry out specific projects that create emissions reductions, and obtain regulatory approval to trade the tons of reductions in the form of emission credits. This is to be contrasted with an allowance trading or "closed-market" system, which imposes a cap on total emissions, allocates the cap among all affected sources, and then allows sources to trade allowances.[3] Because of the emissions cap, allowance trading systems have very high environmental integrity, as trading can never raise total emissions; credit trading systems lack such integrity, and depend on the regulatory context and review of trading projects to assure environmental benefits.[4]

Open-market emissions trading programs in the United States have been established for criteria pollutants (carbon monoxide, lead, nitrogen oxides [NOx], sulfur dioxide [SO_2], volatile organic compounds [VOCs], and particulates) since the Clean Air Act Amendments of 1977. These programs are part of a suite of EPA market-incentive policies, including bubbles, netting, and offsets, which attempt to reduce the costs of compliance without sacrificing air quality.[5] More recently, discrete emission reductions credit trading programs have been adopted in six states. The Environmental Protection Agency (EPA) has established guidelines for the use of such programs as economic incentive mechanisms.[6]

The purpose of credit trading, or open-market, programs is primarily economic, to reduce the cost of compliance through increased flexibility without increasing overall emissions.

However, credit trading programs have generally failed to generate considerable trades or economic benefits.[7] Retrospective reviews have tended to blame their shortcomings on high transaction costs, the uncertainty and risk in obtaining the needed government approvals, the lack of clear legal authority and clearly specified objectives, and the timing of the credit trading programs.[8] Another reasons is that most Clean Air Act standards were not designed with the use of tradeable credits in mind, which tends to limit the use and effectiveness of credit trading programs. In addition, these programs have led to uncertain environmental impacts, creating criticism by environmental advocates.

This report will discuss the two principal forms of inter-firm credit trading programs: emission reduction credit (ERC) trading programs that are used for new source offsets, and discrete emissions reduction (DER) programs created in six states since 1995.[9] The first of these, offset credit trading programs, are part of the new source review process adopted in the Clean Air Act Amendments of 1977, and represent *permanent* reductions made at existing facilities. An ERC offset project reduces emissions, and upon approval by a regulatory body creates a perpetual stream of credits that are used to offset the emissions of new sources in degraded airsheds. In contrast, the DER programs provide retrospective credit for project-based reductions already made by stationary and mobile sources, which may be traded and used by regulated sources to comply with other regulatory standards. The different purposes of these two credit programs lead to differing protocols for their use, and different evaluative criteria.

There are a number of basic similarities in ERC and DER credit trading. They are both credits, which means that they are created through regulatory approval of specific emission reduction projects. Both require a source to demonstrate that a specific project creates emission reductions that are below the lower of actual or permitted emission levels. These reductions must be real, surplus to permit requirements, and quantifiable; if they are ERCs, they must also be permanent and enforceable, for example through a permanent permit modification. The kinds of actions that may generate emission reductions are generally similar under both types of programs, and may include:[10]

- Curtailment or shutdown of operations;
- Installation of more effective air pollution control equipment;
- Modification of process or process equipment;
- Application of greater operating efficiencies;
- Fuel switching;
- Reformulation of raw materials or products;
- Implementation of conservation measures to reduce demand for energy;
- Implementation of pollution prevention programs;
- Implementation of early emission reductions; and
- Implementation of area and mobile source controls.

II. Emission Reduction Credits (ERCs)

A. Context of ERC Trading

Emission reduction credits (ERCs) are identified by EPA as emission reductions that are surplus, enforceable, permanent, and quantifiable; they may be stored for later use in bubble, offset, or netting transactions, or sold or transferred to other firms to meet certain regulatory requirements.[11] Although states may adopt ERCs as an economic incentive mechanism under State Implementation Plans (SIPs), the principal use of ERCs in this country has been for emissions offsets under the new source provisions of the Clean Air Act Amendments of 1977.[12] The following text discusses ERCs in the context of offsets.

The offset provisions under the Clean Air Act apply to new sources, or major modifications of existing sources, within geographic areas that have not attained national ambient air quality standards. The CAA allows such major sources to enter the degraded airshed only if they both: (a) adopt "lowest achievable emission rate" (LAER) technology; and (b) offset their emissions with compensating reductions (ERCs) from another source in the area.[13] These offset ERCs are created through a shutdown or other permanent emission reduction at an existing plant.

Offsets are therefore a particular kind of ERC trading, which is defined strictly within the context of major sources entering or expanding within a non-attainment area. This affects a number of important aspects of the trading program. First, the purpose of offset trading is to ensure that the emissions from new sources do not further impair an already degraded airshed – not, as with most other trading programs, to provide cost savings to firms making reductions. Second, the opportunity for offset trading to create flexibility or cost reductions is lost, because new sources entering non-attainment areas must also install LAER technology in addition to obtaining offsets. LAER is an extremely stringent standard that defines the technology required, thus eliminating any flexibility in technology choice that would otherwise be possible through a trading system.[14]

B. Mechanics of Offset Trading

In an offset trade, a firm takes an action to shut down or achieve other permanent emissions reduction at a source. This generates a perpetual stream of credits, which can then be transferred to a major source that needs offsets credits because it is entering or expanding within the non-attainment area. In creating a perpetual stream of allowances, offset programs in effect transfer a "slice of the airshed" to the new source, instead of a discrete number of tons of reductions.

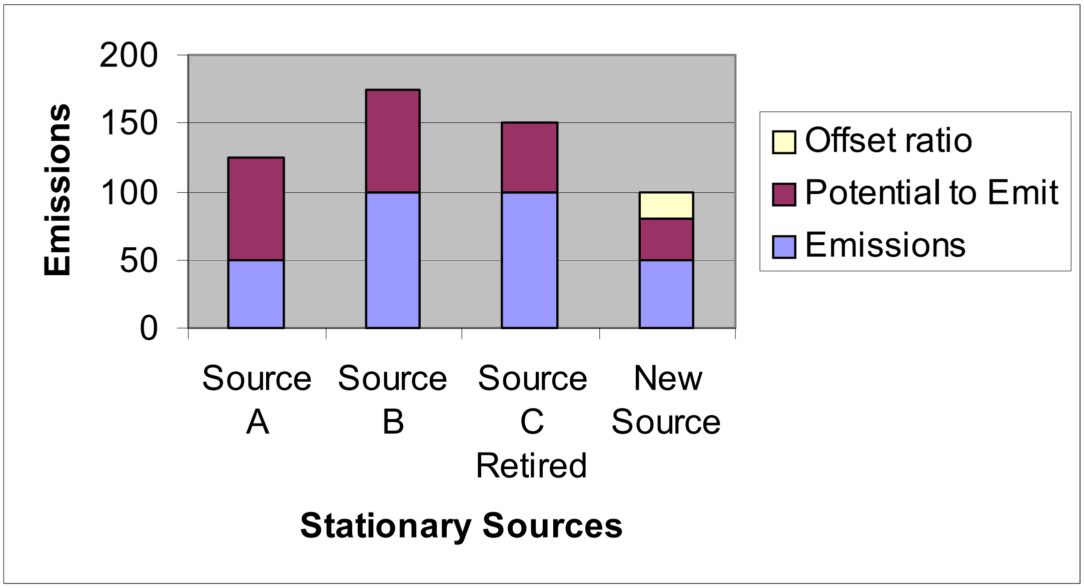
Rules for offset generation and use are strictly defined, and EPA guidance is contained in 40 CFR 51, Appendix S. Although this report does not undertake an extensive analysis of offset characteristics or practices, three salient items should be mentioned. First, one of the more significant rules is that offset credits generally must be traded within the same non-attainment area. However, different rules can be developed by the states, and interstate trading can also be allowed under strict rules.[15] Second, federal law requires that the credit stream be discounted by a defined ratio in order to provide a net air quality benefit.[16] The third point concerns credit life, which has two components. One is that states require that offsets must be used within ten years of their creation, or they are permanently retired.[17] Further, although perpetual, offsets are always subject to devaluation if the emissions rate standards are changed in the future in a way that would have affected the initial calculation of the offset generation action.[18] In both of these respects, offsets differ from DER credits, which are discussed in the next part.

Interviews with brokers reveal that about 80 percent of offsets are generated by shutdowns, often of an older facility owned by the same firm that is building the new one. Although no state makes an effort to determine the number of remaining years of life in the older facility, or to match those remaining years of life to the expected life of the new facility, offset trading has considerable environmental integrity due to the rules governing non-attainment areas. In such areas, all large sources must be permitted, and no new source may enter, or existing source expand within, the area without obtaining offsets from an existing source. As a consequence, the emissions from stationary sources are limited or partially capped in the non-attainment area, helping to assure the environmental integrity of the offset process.

The following figure describes the environmental consequences of an offset trade within a non-attainment area in a simplified way. Sources A, B, and C are the existing sources in the area, and together have actual emissions of 250 tons. However, because standards under the Clean Air Act are established by emission rates, all of these sources could increase their emissions by operating at full capacity or for longer hours. This creates a "potential to emit" for each source that is above their actual emissions, which in the example represents 200 added tons of total potential emissions for sources A, B and C. Therefore, the emissions from stationary sources in this non-attainment area are capped at a level somewhere between 250 tons (actual emissions) and 450 tons (the full potential to emit).

An offset trade is created when source C shuts down, or creates a permanent emissions reduction through a process change. In the case of a shutdown or complete elimination of emissions, this allows the source to create ERCs equal to its actual emissions – in the example, 100 tons. These tons are then reduced by the offset ratio, such as 1:1.2, which leaves 80 tons of ERCs that are then transferred to, or purchased by, the new source. The new source is required to purchase ERCs up to its full potential to emit or its permit limit,

Figure 2-1. Environmental Effect of an ERC Trade from a Shutdown Source in a Non-Attainment Area



which in the example is 80 tons, higher than its planned actual emissions of 50 tons. This process creates a significant net environmental benefit, as described below.

C. Environmental Benefits

Offset trades typically create significant environmental benefits, as they involve as many as four different pollutant reductions. State program managers estimate that offset trades typically result in a net 30 or 40 percent pollution reduction from the emissions of the older source:

a) The first benefit is to eliminate the potential to emit of the original source. In the above diagram, this eliminates 50 tons of potential emissions from the shutdown source C, which are permanently removed from the airshed.

b) Second, all such trades are subject to an offset ratio that requires a further 10 to 50 percent reduction, depending on the level of degradation of the airshed. In the example, the offset ratio is that of "serious" non-attainment status, and is set at 1 to 1.2 , providing a 20 percent benefit.

c) Third, the new source has to acquire ERCs up to its potential to emit or its permit limit, even if it is not going to operate at full capacity for 24 hours, 365 days of the year. If it operates at 80 or 90 percent of potential, there is another 10-20 percent benefit to the environment.

d) Fourth, some states, such as Massachusetts, withhold another 5 percent until such time as attainment is met, in addition to the federal amount.

In the example, the result is to eliminate significant potential to emit, and also to create a 50 ton reduction in actual emissions, 20 tons from the offset ratio of 1:1.2 for a seriously impaired airshed, and an additional 30 tons because the source does not emit up to its full potential. The story does not end here, however, as there may be a partially offsetting *increase* in emissions from Source A or B if they increase their production and therefore emissions as a consequence of the shutdown of source C. This is unlikely if the new source produces the same product, such as electricity, as the shutdown source C, but is possible if the new source produces a different products. The net result in this example is that the total potential to emit in this airshed is reduced from approximately 450 tons to 380 tons, and actual emissions from 250 to 200 tons.

State program managers note that another important environmental benefit of the offset process is that it allows the substitution of modern technology for an old source within the area. This can create significant ancillary benefits in reducing other pollutants, some unregulated. For example, shutting down an old coal-fired electric generating plant and building a modern natural gas turbine will require the new plant to obtain offset credits for its NOx emissions. However, in addition, the substitution creates many added benefits in eliminating emissions of sulfur dioxide and many air toxins by the older plant, and reducing emissions of carbon dioxide.[19]

D. Offset Prices

Offset prices in 2000 generally fluctuated between $2,000 and $6,000 per ton, as reported by Natsource, an emissions brokerage firm. However, as shown in the table below, prices in different states vary considerably, as they are strongly influenced by local supply and demand.

Figure 2-2. ERC prices as of November 30, 2000 (per ton per year)

State and Pollutant	Moderate airshed	Serious airshed	Severe airshed
Connecticut – NOx		$6,500	$6,500
– VOC		$3,200	$3,300
Massachusetts – NOx		$7,000	
– VOC		$2,400	
Maine – NOx	$6,000		
– VOC	$2,400		
New Jersey – NOx			$475
– VOC			$300

NY/Penn. – NOx	$1,800		$4,900
– VOC	$1,600		$2,400
Texas – NOx		$3,000	$1,700
– VOC			$6,000
Rhode Island – NOx			$6,200

Source: Natsource LLC, *Airtrends* p. 4 (December 2000)

E. Potential for Offset Trading to Play a Larger Role in Achieving Air Quality

1. *Potential for Offset Trading to Replace LAER requirements*

It may be possible for offset trading to play a larger role in achieving air quality standards in non-attainment areas by substituting for the LAER provision, although implementing such a change may require regulatory or legislative changes.[20] Major sources entering non-attainment areas face two independent requirements: to comply with technology-based LAER requirements and to offset their emissions. Concern has been expressed that the LAER requirement imposes such high costs on new sources for relatively small reductions, that they may actually create a perverse effect in discouraging clean new sources that provide multi-pollutant benefits.[21]

One option could be to eliminate LAER requirements for major sources subject to the offset requirements, as the non-attainment rules coupled with offset trading may achieve equivalent or superior environmental results.[22] Because of the inherent cap in non-attainment areas,[23] and the increasing accuracy of emissions inventories and monitoring technologies, offset trading today can assure emissions reductions, whereas the LAER rate-based technology requirements alone would actually allow slightly increased emissions. Eliminating the LAER requirement would not therefore affect the environmental results, but could significantly lower costs of compliance by allowing sources to achieve greater efficiency through offset trading.

2. *Creating a Cap-and-Trade Environment Through Loans Instead of Sales of Offset Credits*

A practice that has sprung up in some severely degraded California airsheds has been the loan instead of outright sale of offset credits. This addresses the problem that the offset process ratchets down emissions towards zero, and hence may place disproportionate requirements on stationary sources in highly degraded airsheds. In theory, the requirement to offset emissions will cease when the area comes into attainment, but this may never happen in a degraded airshed if there are growing emissions from vehicle or area sources. One solution would be to lend offsets instead of selling them, so that the offset ratio is not applied. In airsheds such as San Diego, where there are very few opportunities to create new credits, the number of tons of tradeable credits is more or less fixed, and so an offset loan system operates somewhat like an emissions cap and allowance trading system. However, this system would not be as precise as a government-established cap-and-trade system, and there would be significantly higher transaction costs in trading credits compared to trading allowances.[24]

F. Conclusion

The principle use of ERC trading in the U.S. has been for emissions offsets for new or expanding sources within non-attainment areas. Offsets are a way of allowing economic growth within such areas, while preventing emissions growth as a result of the new sources. The rules described above show that offset trading has achieved considerable integrity in this regard, due to the semi-capped environment created by the rules of non-attainment areas. In addition, offset trades result in considerable environmental benefits through the various emissions deductions. However, because of the limited focus of offset rules, and due to the requirement that all new sources install LAER technology, offset trading does not achieve significant economic benefits in allowing lower-cost compliance for affected sources.

III. Discrete Emissions Reduction (DER) Programs

A. Introduction

This chapter presents a comprehensive review of the discrete emissions reduction (DER) credit trading programs that have now operated for a number of years in the states of Connecticut, Massachusetts, Michigan, New Jersey, New Hampshire, and Texas.[25] New Jersey has, however, recently announced the termination of its program.[26] A detailed discussion of each states's data is provided in an Appendix. The sections below discuss the context and mechanics of DER trading, and provide information about the actual results of these programs, as well as DER prices, costs and potential emissions shifting. A final section reviews the rules and standards of the different state programs, and makes suggestions for best practices.

A primary purpose of DER trading programs is to provide companies with an alternative and potentially more economical means of regulatory compliance to meet federal standards such as RACT, and state permit limitations.[27] In addition to these purposes, states have used DERs as elements of penalties or consent decrees to improve air quality, and for special uses. However, DERs cannot be used to meet new source standards such as BACT or LAER, nor for hazardous pollutant standards such as MACT, as federal law imposes strict technology requirements to meet these standards.[28]

The concept of DER credits was initiated in a NESCAUM-MARAMA pilot program that tested discrete emissions reductions in Northeastern states from 1993-1995.[29] This pilot program resulted in 24 emission reduction creation strategies that generated approximately 10,000 tons of reductions, some of which were subsequently traded. Subsequently, the Administration promoted the DER approach at the urging of New Jersey Public Service Electric and Gas and the Clean Air Action Corporation, who had generated most of the credits in the pilot program,[30] and DER trading became the first priority of the 25 major initiatives for re-inventing federal environmental regulations that were announced on March 16, 1995.[31] The earliest state regulations implementing DER credit trading were created in 1995, in which year EPA also issued guidance and a model rule for the creation of DER programs.[32] These continue to be applicable EPA guidance for state DER programs, together with a more recently approved final guidance for economic incentive programs generally.[33]

B. Context of DER Trading – State Implementation Plans

DER credit trading takes place within the context of State Implementation Plans (SIPs) to achieve national ambient air quality standards under the Clean Air Act. DER programs are today evaluated by EPA on the basis of their inclusion in a states' SIP, although EPA guidance on the use of market incentive mechanisms is also taken into account. EPA has recently proposed the approval of the Michigan, New Hampshire, and New Jersey DER trading programs.[34]

Most states have regulations that govern their DER programs. The exception is Connecticut, where DER trades are made as source-specific SIP provisions via a "Trading Agreement and Order," which is then sent to EPA for approval and integrated into the state's SIP.

C. Mechanics of DER Generation, Trading, and Use

DER programs allow for certification of emission reductions that have *already been made* by a source. The source creates DERs by demonstrating that in a particular year its emissions were below the lower of its previous actual or permitted emissions level. This is generally done by defining an emission factor for the technology in question, or measuring an actual emission rate during a baseline period, and then multiplying this by utilization in the current year. Once such reductions are approved by the regulatory authority, typically a 10 percent deduction is taken for an environmental benefit, and the remaining credits can be traded to other sources, or banked for future use.

DERs can be generated by early compliance or over-compliance, so long as a source reduces its emissions below its historical actual or allowable emissions rate. Allowed credit-generating activities include installation or modification of control equipment, process or operational changes, reformulation of raw materials or products, energy conservation, pollution prevention programs, production curtailment or shutdown, early emissions reductions, and area and mobile source reductions. In all cases, a baseline must be established and quantification and monitoring methods determined. At the end of each year that the reduction was made, the generator submits the information necessary to register the DERs to the state regulatory body, which generally places them on an electronic registry that is available on the world wide web.

Since DERs are based on discrete one-year reductions, a source must reapply for the creation of DERs in subsequent years. In that year, the actual utilization and emissions of the source in that year are again compared with its baseline emissions rate to create DERs.

Once created, DER credits are permanent, and do not erode like ERCs if regulations are subsequently made more stringent. That is because the tons are discrete and were certified as being surplus (lower than permitted or actual past emissions) in the year of their creation. However, if a regulatory change makes the emissions limit more stringent in the future, that would affect the source's baseline, and the source may not be able to create new DERs from the same action as before.

D. Generation and Use of DERs

Although six states have adopted DER credit trading programs, the use of DERs is generally low, with between one and ten trades and uses per year in most states. In addition, generation has tended to far exceed use of DERs – it is twenty times greater than the core use of DERs for permit (RACT) compliance, and about eight times more than total uses. The following section discusses actual generation and use of DERs, and was developed through analysis of the state emission registries, and consultation with each state DER program manager. Not all data is entirely consistent however, due to different protocols used by different states; a more detailed explanation of the derivation of each state's data is given in the state summaries in the Appendix.

1. Generation of DERs

The data show that 162,849 tons of DERs were generated in six states over the past five years, almost all of NOx (Table 3-2). In most states, generation of NOx DERs is dominated by a few large power plants or other sources. For example, 96 percent of the DERs generated in New Jersey come from PSE&G's Mercer and Hudson power plants; in Massachusetts, six power plants generated 96 percent of all DERs; in New Hampshire, added controls at one power plant generated 99 percent of all tradeable DERs; and in Texas, 93 percent of all credits were generated by four firms. We note that large power plants in the Ozone Transport Region can no longer create DERs during the ozone season, as these plants became subject to an emissions cap and allowance trading system in 1999, but they can continue to create non-ozone season DERs.[35]

2. Use of DERs

The use of DERs was initially intended to lower the cost of compliance for sources subject to federal requirements such as RACT, or state requirements that differ from or are more stringent than federal standards. DERs cannot be used for basic compliance with federal new source standards such as BACT or LAER, which are statutorily defined to require a certain level of technology and do not permit the use of credits. Most states also potentially allow the use of DERs for offset requirements under federal new source review, but there are very few instances of this, as it is generally cheaper for firms to purchase offsets for each ton of emissions than to purchase DERs each year for the life of the plant. However, once the DER programs were initiated, states found there were other potential uses of DERs, such as for penalties or for special situations. These uses now marginally exceed permit uses.

Compliance with RACT or state laws that exceed federal limits. States allow use of DERs for RACT permit compliance, as contemplated under the original EPA economic incentive policy.[36] No state allows the use of DERs to meet BACT, MACT or LAER, which are statutorily defined standards that require specific technology determinations. State managers reported that DERs are typically used by sources that wish to delay or test controls for a period of time; to compensate for performance problems with new products, such as low-VOC coatings, while the problems were being worked out or improved; or to make up the difference if control technologies installed did not perform as well as expected, and resulted in emissions a bit above RACT levels.

Special uses. In a few cases, significant uses of DERs have been made in an effort by the states to protect air quality in special circumstances. Almost 4,000 tons were retired by electric generators in Massachusetts to satisfy special legislation enacted in response to outages of the Millstone and Seabrook nuclear units in the summers of 1997 and 1998. To help offset the expected increase in emissions from fossil generation sources, states worked with the utilities and passed an emergency regulation requiring them to use DERs to match their expected excess emissions.[37] Another special use was made by the owners of a new casino in Connecticut to offset expected increases in vehicle emissions due to increased traffic flow.

Settlements. DERs are also being used for settlements in enforcement proceedings by both state and federal authorities.

The following figure shows the uses of DERs by category. The data show that 22,245 tons of DERs were used in the six states during the five years reviewed, including 21,702 tons of NOx DERS equaling approximately 0.2 percent of stationary source NOx emissions (see Appendix). Also, it reveals that uses for permit compliance purposes were less than half of the total – other significant uses were for penalties or consent decrees, and for special or voluntary purposes. The figure also shows that roughly 311 DER uses were made over five years in six states, with the great preponderance made in Connecticut and New Jersey.[38]

Additional analysis was made of DER use in the two states with the most significant use, New Jersey and Connecticut. This analysis showed that the number of firms involved was much lower than the number of discrete uses: in Connecticut, 31 firms made 127 uses of DERs, and in New Jersey 16 firms made 110 uses. Also, uses tend to be of a relatively small number of DERs by a relatively large number of sources; in both states, the smallest use was of less than a single ton, and the largest was of less than 250 tons for any single facility. The average use was of 10-30 tons, a far smaller amount than the average credit-generating action, which tends to be by large sources.

Table 3-1. Cumulative Use of Discrete Emissions Reduction Credits by State (in tons, with number of uses in parentheses)

State and DER	Years	Permit	Consent/Pen	Special/Vol.	Total
Conn NOx	1994-2000	6,286 (127)	735 (1+)	1,969 (5)	8,990 (133)
Mass NOx	1995-2000	<800 (14)	1,327 (2)	6,627 (13)	<8,754 (29)
Mich NOx	1996-2000	0	1,310 (2)	400 (1)	1,710 (3)
Mich VOC	1996-2000	192 (23)	0	0	192 (23)
New Hampshire	1995-2000	52 (2)	90 (1)	126 (to MA)	268 (3)
New Jersey NOx	1995-2000	1,305 (110)	27 (1)	128 (2)	1,460 (113)
New JerseyVOC	1995-2000	37 (6)	98 (1)		135 (7)
Texas NOx	1998-2000	520	?	?	736
Total		9,192 (282)	3,587 (8)	9,250 (21)	22,245 (311)
Total NOx		8,963 (253)	3,489 (7)	9,250 (22)	21,702 (282)

Sources: Sources for the credit use data for each state are provided in the Appendix

The relatively low use of DER credit programs can be attributed to a number of problems.

First, there are limited opportunities to use DERs under our current clean air regulations. As stated, they cannot be used to meet the standards imposed on new sources (BACT and LAER), or hazardous air pollutant standards. Other standards, such as RACT standards or state standards that exceed federal limits, generally have not been designed with credit trading in mind. For example, many RACT standards for certain sources of categories require a specific emissions rate limit or reduction level, which cannot be met by the use of credits.[39]

A second problem has been that of timing in initiating DER programs. As state managers of DER programs point out, most RACT sources already had come into compliance in the mid-1990s, before most of the DER programs were initiated, significantly reducing the opportunities to use DERs for RACT compliance. In addition, for some sources RACT compliance was relatively inexpensive, making it more cost-effective to install controls than to buy credits.

Third, the transaction costs of DER trading are relatively high and can be complex, discouraging the generation and use of DERs, especially by small sources. The process for generating DERs requires the development and application of quantification protocols, which may require a consulting firm. Brokers, some of whom are active in developing credit generation projects, report that about $15,000-$20,000 is needed to hire a consulting firm to develop a credit generation project, precluding projects that generate only a small amount of credits. The use of facility shutdowns also is typically limited in DER projects. For credit users, transactions include the need to prepare three to five separate reports or regulatory determinations that are needed to ensure quality control. Typical requirements include notices of: (1) generation of DERs; (2) intent to use DER's for compliance purposes; (3) DER use; (4) transfer of DERs; and (5) DER verification.

Another problem, identified by Texas officials, is the lack of awareness of the DER program. A telephone survey conducted by that state indicated that about half of respondents said that industry overall is not familiar with the DER credit program, and one spokesperson stated that applies to consultants as well. Another industry representative said that those companies that have generated and banked a lot of credits are obviously familiar with the program, but small companies are not, even though it is a topic in newsletters and association meetings.[40]

A final issue is that none of the regulation-based DER trading programs are yet approved by EPA as part of a state's SIP, possibly making sources reluctant to rely on DERs to achieve RACT compliance. Connecticut's program, which relies upon approval of a source-specific Trading Order and Agreement, does incorporate SIP amendments for each specific trade. Recently, EPA has proposed the approval of several DER programs, which would resolve this issue.[41]

3. Comparisons of generation and use activity

The following table compares the number of DER credits generated with the number used, revealing that generation has tended to far exceed use of DERs. Credit generation is almost eighteen times greater than the core use of DERs for permit (RACT) compliance, and more than seven times greater than total uses. As described above, generation also tends to be of large amounts of credits at relatively few sources, whereas credits are used in significantly smaller amounts by a greater number of entities. This creates important implications for the environmental effects of DER programs, as discussed below.

Table 3-2. Discrete Emissions Reduction Programs – Cumulative Tons Generated and Used

	Years	Generated	Used-Permit	Used-Total
Conn. NOx	1994-2000	13,679	6,286	8,990
Mass. NOx	1994-2000	21,227	<800	8,754
Mich. NOx	1995-2000	39,384	0	1,710
Mich. VOC	1995-2000	5,140	192	192
New Hamp. NOx	1996-2000	7,184	52	268

	Years	Generated	Used-Permit	Used-Total
New Jersey NOx	1992-2000	33,472	1,305	1,460
New Jersey VOC	1992-2000	1,043	37	135
Texas NOx	1998-2000	41,720	520	736
Total		162,849	9,192	22,245

Sources: See Appendix.

In order to provide an overall context for the use of DERs, we compare the amounts of NOx DERs used and generated with the overall NOx emissions by stationary sources in each state, and provide a six-state average.[42] This gives a rough indicator of the usefulness of DERs compared to the NOx emissions in the state. Overall, the use of DERs for permit purposes, the main intended use for tradeable credits, is only one-tenth of one percent of annual stationary source NOx. If the use of DERs for penalties and special purposes are added, the use climbs to two tenths of one percent. Generation of DERs represents a higher fraction of total emissions, resulting in an overall average of nearly two percent of stationary source NOx emissions.

Table 3-3. Use and generation of DERs as percent of total stationary source NOx emissions

	Years	Average annual stationary source emissions (*)	DERs used for Permits (annual %)	Total DERs used (annual %)	DERs Generated (annual %)
Conn. NOx	1994-2000	25,524	4.1	6.53	8.90
Mass. NOx	1995-2000	60,579	0.26	2.19	7.00
Mich. NOx	1995-2000	364,427	0	0.08	1.80
Mich. VOC	1995-2000	93,316	0.03	0.03	0.92
NH NOx	1995-2000	22,790	0.04	0.23	3.66
NJ NOx	1995-2000	119,803	0.14	0.15	4.69
NJ VOC	1995-2000	100,485	0.01	0.03	0.20
Texas NOx	1998-2000	904,895	0.02	0.03	1.54
Total NOx 6-State VOC 2-State	6 years	1,691,819 1,490,018 193,801	0.10 0.12 0.02	0.20 0.25 0.03	1.60 1.75 0.53

(*) Annual emissions are multi-year averages based on figures from EPA, 1995-1998 NET Tier Reports. Annual figures for DER use and generation are derived by dividing the cumulative figures given in Table 3-2 by the number of years the program has operated.

E. Environmental Effects

1. Environmental Benefits of DER Trading

There are several potential environmental benefits from DER trading, although the potential lack of integrity of DER systems clouds the issue of environmental benefits. A principal benefit of DER trading programs is that states require 10 percent of DERs generated to be retired. This helps to address the integrity problem, as well as providing a clean-air benefit. Second, the use of DERs as components of penalties may help mitigate the environmental damages from permit exceedances. Third, DERs have allowed states to require DER retirements in special circumstances, again providing a clean-air benefit. Finally, by reducing the cost of compliance, a DER program may allow a state to set environmental standards at more stringent levels. However, this potential benefit can only come if the DER program is developed simultaneously with the regulatory standards, and few were. All of these potential benefits, however, depend on the integrity of the DER program, and there may be few, or even negative, actual environmental benefits if the program's integrity is weak. The integrity issue is discussed in part G below.

2. The Issue of Environmental Effects in Shifting Emissions

One of the concerns about emission trading programs is that they may lead to the shifting of emissions and the creation of "hot spots," or emissions concentrations. The available data for DER programs allow some limited conclusions to be made as to the occurrence of emissions shifting for NOx. In general, the data show that DER programs have led to the dispersal of emissions, rather than their concentration, helping to cool and not create hot spots. However, the most robust conclusions can only be made at the facility level, where there is a clear indication that DER trading programs have led the largest sources to reduce the most. The analysis is less robust as to the effect on ambient pollutant concentrations, although the available data in two states indicates some lessening of emissions concentrations when viewed at the county level.

We first note, however, that a concern about the effect of trading programs on emissions shifting is somewhat misplaced. Hot spots or emissions concentrations depend principally on the number, siting and size of sources, as well as on the total pollutant reduction required by environmental regulation, but not on the design of the regulatory system. In fact, traditional rate-based regulatory systems may be as likely or more likely to create variability in emissions concentrations, as they only require sources to reduce rates, leading to greater local emissions with greater utilization or number of sources. Trading systems, because they promote additional reductions at the larger sources, may generally be expected to reduce existing emissions concentrations, and not create them.

Before we assess the data on emissions shifting due to DER trading, we note that there are two problems in analyzing the effects of DER trading. The first is the uncertain integrity of DER programs, or whether generated credits actually represent additional emissions reductions. Were it not for this concern, the significant excess of the DER credits generated in comparison to credits used would itself represent an environmental benefit. Secondly, there has been relatively little use of DER credits, creating relatively sparse data with which to assess the shifting of emissions. However, certain conclusions can be made, which are described below.

Emission shifting at the facility level. The most concrete conclusion that can be made about emission shifting in DER credit trading programs for NOx is that they have promoted credit generation, or emission reductions, at the largest plants. In four states, the great preponderance of credits were generated by a few sources that are among the largest emitters in the states: 94 percent in Texas, 96 percent in New Jersey and Massachusetts, and 99 percent in New Hampshire. On the other hand, credit use was dispersed among a larger number of smaller sources, with typically 10-30 tons being used by a source in one year. These data confirm a general expectation about trading programs, that they will lead to emission reductions at the largest sources, where the cost of capital can be spread over the largest number of tons and hence lower the per-ton cost of generating a credit. Therefore, DER programs can be shown to have an inherent tendency at the facility level to disperse emissions, and hence to reduce emissions concentrations.

Emission shifting at the area level. A limited assessment of emission shifting at the area level can be made by examining data on county-level emissions trades in two states, New Jersey and Texas. These states' registries present credit generation and use data by county, which allows some indication of where emissions were generated and used, and hence allows some assessment of emission shifts.

The following tables show that DER programs have had tended to reduce emissions in the most polluted counties, and to the extent they have shifted emissions at all, it has been towards relatively less polluted counties. This pattern indicates that DER programs to a limited extent have cooled hot spots, and led to more evenly disbursed pollution in both states.

New Jersey. Emission shifts were evaluated in New Jersey in terms of whether generation and use of credits occurred in counties with differing levels of air pollution. The analysis was made in two ways: comparing the attainment status of counties, and also their relative emissions levels. The results of both analyses shows that credit generation actions (reducing emissions) were made disproportionally in more polluted counties than were credit uses, leading to a slight beneficial effect in reducing emissions concentrations.

The following figures show that in New Jersey, 99 percent of DER generation was made in counties with "severe" status for ozone attainment, but 28 percent of DER use was in counties with "moderate" status. This represents a slightly beneficial shift from heavily polluted counties to less polluted counties. A second analysis examines how DER credits shifted emissions between counties with relatively high, medium, and low emissions. This analysis showed a more significant shift away from more polluted counties towards relatively less polluted ones, again acting to reduce and not increase emissions concentrations.

Table 3-5. New Jersey – Profile of Generation and Use of NOx DERs by County Ozone Attainment Status

	Severe (18)	Moderate (2)	Marginal (1)
DERs generated	32,908 (99%)	295 (1%)	0
DERs used	1,056 (72%)	403 (28%)	0

Table 3-6. New Jersey – Generation and Use of NOx DERs by County NOx Emission Rank

	High Emissions (5 counties with >10,000 tons)	Medium Emissions (6 counties with 4,000-8,000 tons)	Low Emissions (10 counties with <3,000 tons)
DERs generated	32,377 (98%)	427 (1%)	399 (1%)
DERs used	51 (3%)	481 (33%)	927 (64%)

Sources: New Jersey OMET Registry for DER credit generation and use data by county (July 2001); EPA Air Data – Net Count Report (July 17, 2001) for county 1999 NOx emissions data. Note: Figures show cumulative DER generation and use over the years 1992 through 2000.

A third indication that credit trading did not contribute to hot spots was the simple one of dispersion. Ninety-eight percent of credits were generated in two counties, Hudson and Mercer, whereas credits were used in ten counties, none of which made use of more than 28 percent of the total credits used.

Texas. In Texas, primarily generation data can be examined, as there have been only 736 credits used. Again, DER generation, equivalent to emissions reductions, is disproportionally higher in severe non-attainment and high-emissions counties, where the environmental benefits are greatest, and the limited use occurred in both severe and moderate non-attainment counties, although both had high emissions. Again, DER trading appears to have reduced emissions disproportionately in severely polluted regions.

Table 3-7. Texas – Generation and Use of NOx DERs by County Ozone Attainment Status

	Severe (8 counties)	Serious (5 counties)	Moderate (3 counties)
DERs generated	38,527 (95%)	0	2,241 (5%)
DERs used	368 (50%)	368 (50%)	0

Table 3-8. Texas – Profile of Generation and Use of NOx DERs by County NOx Emissions

	High Emissions (5 counties with >28,000 tons)	Medium Emissions (5 counties with 5,000-20,000 tons)	Low Emissions (6 counties with <5,000 tons)
DERs generated	39,606 (97%)	1,162 (3%)	0
DERs used	736 (100%)	0	0

Sources: credit generation and data by county from Texas Registry (version of October 20, 2000); credit use data from Texas Natural Resource Conservation Commission, *Discrete Emission Credit Banking and Trading Program Audit* (draft, Austin, Texas 2001); county 1999 NOx emissions data from EPA Air Data – Net Count Report (July 17, 2001) (at www.oaspub.epa.gov).
Note: Figures show cumulative DER generation and use over the years 1997 through 2000.

F. Price of DERs

NOx DER prices in 2000 ranged between $300 and $1,300 per ton, and averaged around $800, as reported by the emissions brokerage firm Natsource. As shown in the table below, prices in different states vary considerably due to differences in local supply and demand.

Table 3-4. NOx DER prices as of November 30, 2000 ($/ton)

State	Ozone Season	Non-Ozone Season
Connecticut	$1,000	$ 750
Massachusetts	$ 750	$ 500
New Jersey	$1,300	$1,150
New Hampshire	$ 600	$ 300
Texas	$1,100	n/a

Source: Natsource LLC, *Airtrends,* p. 4 (December 2000)

Note that the price for NOx DERs could be considered expensive relative to NOx offsets. Offsets convey the right to emit a ton per year of NOx in perpetuity, and cost between $2,000 and $6,000, or only several times more than a DER, which provides only a single-year right. However, regulations define entirely different purposes for the use of offsets and DERs, and so the markets, and hence prices, for the two kinds of credits are distinct. The only instance in which one type of credit could be used for another is in states that allow DERs to be purchased each year in lieu of new source offsets. However, there are very few such uses in practice, as the use of DERs in such a case would be relatively more expensive.

G. Costs of DER Credit Generation, Verification, and Sale

There are a number of costs associated with the generation, verification, and sale of DERs.

DER generation cost. Interviews with emissions brokers indicate that the cost to develop a DER credit generation project is generally $15,000 to $20,000, and is relatively consistent regardless of the size of the project. However, the cost might rise by 25 percent if extensive monitoring data such as CEMs are involved, and may double for complex projects that involve 6-8 process sources in one plant. These costs are sufficiently high to discourage smaller projects that might create a limited number of tons of DERs.

Brokerage fees charged by emissions brokers vary from 5-8 percent of the total value of the transaction for both ERCs and DERs. The higher fees are charged if the broker provides more services, which may include limited credit quantification, verification, and other services relating to the transaction. In comparison, brokerage fees for allowance markets are much lower: brokers charge about $10 per NOx OTC allowance (about 1 percent of current prices) and ten cents (a small fraction of one percent) for SO_2 allowances in the national SO_2 market.

Registration fees are charged by some states. Massachusetts charges the highest fees, charging an administrative fee per application that ranges between $1,000 for projects of less than ten tons to $15,000 for those over 500 tons. Ontario's PERT program charges $7,000 for new applications. The registries in Michigan and New Jersey are handled by a private contractor, and there is a small fee charged for each separately posted transaction, such as notices of generation, verification, and transfer, in order to make the registry self-supporting. In New Jersey this charge is generally $10 plus 20 cents per DER. However, some states charge low fees or no fees for registration.

H. Issues in DER Trading and Best Practices

The following sections define different states' practices in their DER trading programs. Each section also provides suggestions as to best practices that would create the highest integrity for a DER trading program. In many cases, these best practices may be extrapolated beyond a DER trading program to apply to credit trading practices in general.

We note, however, that all DER programs involve criteria pollutants under the Clean Air Act, and so the context of State Implementation Plans allows a state considerable discretion in developing its DER program. A state might choose a less strict rule for DER credit generation or use in order to create greater flexibility and cost reductions, and make up any expected added emissions by creating stricter standards or protocols in another part of its SIP. Therefore, the best practices indicated below are those that we believe will create the greatest integrity in the trading process, but do not necessarily determine the rules that should be adopted by states for criteria pollutants in the context of an overall SIP process.

The issues we discuss are grouped under three broad headings: issues related to the overall integrity of DER trading systems, issues related to generation of DER credits, issues related to use of DER credits, public participation and reporting requirements, and special issues. With each individual issue, we include a discussion of best practices.

Overall Integrity of DER Trading Systems

1. *Integrity and additionality*

A critical environmental issue in any emissions trading program is that of integrity, or whether the trading of emissions reductions may allow more emissions to enter the atmosphere than would otherwise occur without the trading program.[43] We note that emissions cap and allowance trading systems, provided they have accurate emissions monitoring and effective enforcement, create 100 percent integrity due to the inviolate emissions cap. As described above, emissions reduction credits used for offsets also have a reasonable amount of integrity, due to the semi-capped regulatory regime for major sources in non-attainment areas. A great advantage of emissions caps is that they create high integrity without the need to make further findings, such as that of additionality, relating to individual trades. Therefore, an emissions cap (or even a semi-capped regime through offset rules) is one way to create high integrity for emissions trading programs.

DERs, however, are explicitly designed to be traded where there is no emissions cap. This creates several potential problems that may dilute the integrity of DER trading systems. One is that traditional rate-based standards create situations where sources may normally operate with emissions levels below the rate standard. Evidence from the CAA Title IV NOx Program shows that sources typically emit at a level 10 percent below a standard, and as many as a third of firms may operate well below applicable limits.[44] This is not a problem if DERs are created based on actual monitoring records, but DER programs allow the use of emissions factors or other estimating techniques, and so may allow credits to be created under such circumstances.[45] A second issue involves early compliance, as firms typically must install and test compliance equipment or process changes prior to the compliance date.[46] Thirdly, economic issues, community pressure, or other rationales may lead firms to change processes, install controls, or close plants. Normally, such over-control, early reductions, or lowered emissions would benefit the environment, but a DER trading system would allow firms to trade the tons created by such reductions to others, thereby raising the overall level of emissions from what would have existed without trading.

One indicator that DER programs may lack integrity is the significant over-supply of DER credits. Almost ten times more DERs are generated by sources than are used, despite the lack of any expected increase in demand.[47] Although DER trading is certainly one factor motivating firms to make the reductions in credited projects, the oversupply would indicate that other factors are also involved in firms' decisions to carry out these projects, and may even be primary.

An added degree of integrity for DER programs could be achieved in two ways. One would require a finding of *additionality* for each individual DER generation action, to assure that the action taken is in addition to what would have happened absent the credit trading program. However, it is in practice so difficult to make such a finding that no state credit trading program attempts to do so. Instead of an additionality requirement, states have simply required that the reductions be "surplus" to actual past emissions or permit requirements, and emphasized the need for DER credits to be real, enforceable, and quantifiable. To meet these requirements, states have developed the compliance assurance mechanisms that are described in the subsequent sections.

A second way to add integrity to a DER program is to develop the program contemporaneously with the overall set of standards, so that the regulatory authority can establish more stringent standards to compensate for the potential of the DER program to increase emissions. This compensation approach is readily achievable in the context of State Implementation Plans for criteria pollutants, in which states present an overall set of emission reduction standards and policies that are designed to meet federal ambient standards.[48] Within the SIP context, the key to integrity is the predictability and measurability of emissions under a DER approach. However, most of the DER programs currently in operation were created well after RACT rules were created for the subject sources, such as the OTC rules for RACT for power generation sources, which were to be implemented by May, 1995. Such a lack of integrity can, however, be made up for if future SIP revisions do take into account the DER program.[49]

Finally, we note two potential ways that were suggested to increase the integrity of emission credit trading programs through simplified baseline procedures:

A. An objective system could be created if rate standards were revised to a more stringent and uniform level, allowing a uniform baseline to be established at this new level. That would allow firms to automatically trade any reductions made below the baseline, significantly increasing both the objectivity and ease of baseline and credit determinations. However, a state would need to simultaneously lower emissions standards in order to compensate for the increased trading from this system, which may not be possible under the Clean Air Act.

B. It would also be possible to address additionality concerns through the use of a multi-project baseline approach that would use data from similar, recently-constructed plants to develop a baseline for the project being proposed. Additional reductions beyond the baseline in any year would then be creditable. This lends objectivity while reducing transaction costs by allowing multiple projects to be compared against a single baseline.

Best practices

A finding of additionality has not yet been attempted by any state DER program, due to its difficulty. Several persons interviewed reported that they served on working groups to identify how a state might implement an additionality requirement, but no state has done so, due to the problem of creating objective measures that could distinguish between the motivation to reduce emissions to create additional credits for trading, and economic and other rationales for such an action. Instead of an additionality requirement, states have simply required that reductions be "surplus" to a baseline that represents actual past emissions or permit requirements, and emphasize the need for DER credits to be real, enforceable, and quantifiable.

2. Retroactivity in the starting date of DER programs

Some DER programs, such as the one in Texas, require that the generation or use of DERs commence only after the effective date of the DER regulation. However, other state DER programs have allowed retroactive approval of credits generated before the effective date of the regulations. This practice has considerable potential for creating a lack of integrity, by allowing the certification of "anyway tons" – reductions made before a program's existence that could not have been made for purposes of the trading program, but would have been made anyway.

Some states allow retroactivity only back to the date of the original legislation implementing the DER program. New Hampshire allowed DERs to be generated up to 2 years before the date of the regulations, on the rationale that the law authorizing trading was adopted two years before the date of the implementing regulations in January 1997. The state therefore allowed credits for reductions made as far back to May 1995, assuming that some good-faith actions may have been taken by firms at that time.[50]

Both Massachusetts and Ontario, which implemented programs in 1995 and 1996, allowed DER activities to start as of 1990, although in practice the earliest generation activities took place only in 1994.[51] The 1990 date is significant in U.S. states for ERC trading, because it was the date of a comprehensive inventory of source emissions, which served as a benchmark for the state's ongoing ERC programs.

New Jersey allowed sources to create DERs for emission reductions generated after May 1, 1992, four years before the promulgation of the regulations in July 1996, provided a Notification of Generation had been submitted by October 31, 1996.[52] Ten projects were submitted within this time frame, several of which had previously been part of the NESCAUM-MARAMA demonstration trading program. Although an EPA review found specific deficiencies in each of the ten projects submitted, it allowed the retroactive inclusion of all of these projects in granting its conditional approval of the New Jersey OMET program. EPA confined its analysis to an assessment of the effect of this retroactive inclusion on New Jersey's SIP, and found that given New Jersey's program as a whole, and "the extra reductions inherent in New Jersey's reasonably achievable control technology

(RACT) program, the State will continue to meet the reasonable further progress and SIP attainment requirements."[53]

Best Practices

Retroactive application of the start date of DER programs is not desirable, as it creates a high potential for a lack of integrity by allowing the certification of reductions that would have been made anyway, without contemplation of the credit trading program. However, one possible exception is to allow the regulations to be retroactive to the date of the legislative or other formal act authorizing the trading program, as New Hampshire has done, to credit good-faith actions made by businesses that implemented early reductions in anticipation of the program. In such a case, it would be best if the implementing legislation were to establish an initial date, to provide clarity that credit will be given for reductions made thereafter.

Generation of DERs

3. Baselines

The calculation of DER credit-generation actions requires the determination of a baseline level of emissions and emission rates, to determine the amount of reductions that are creditable. Indeed, some articles refer to emissions credit trading programs as "baseline-and-credit programs," signifying the importance of the baseline determination. All state programs specify that the baseline is the lower of actual or allowable emission rates, and most provide that the baseline be measured over a two-year period within the past five calendar years before the reduction begins, which is chosen to be representative of normal source operation.[54] Typically, these are the two most recent years, but circumstances may allow the choice of other years. Exceptions include Connecticut, which allows more than five years, and Ontario's voluntary PERT program, in which the baseline period may be selected from within ten years preceding the initiation of the original emission reduction strategy.

Although the rules for determining baselines are relatively clear, baselines actually form one of the areas of uncertainly in DER credit trading systems. In the words of one experienced trader, "Baselines are always a matter of negotiation." In determining baselines, regulators may be placed at a disadvantage, due to companies' more thorough understanding of their own operations. In addition, there is always the "adverse selection" problem, in which the past baseline may not actually be representative of the future actions the company would take at that site.

Advancing baselines. One state, Massachusetts, has put into practice the concept of a moving baseline to guard against the potential lack of integrity in baseline calculations. This significantly lowers sources' ability to continue to generate DERs over time from the same action, as the lowered emissions level achieved by the DER-generating action becomes the new baseline level after a few years. Therefore, a source may be only able to generate DERs for as little as two years and a maximum of five years, at which point the lowered emissions amount becomes the new baseline, and no net DERs could be generated. Most other states allow the original baseline to stand for the life of each credit-generation project, which may be many years, and credit the emissions reductions achieved as DERs.[55]

Example: A source has emitted 1,000 tons of NOx for years 1 through 5. In year 6, it installs emissions control technology and its emissions fall to 400 tons per year. The resulting 600 tons of reductions are credited as DERs in year 6. However, in Massachusetts, by year 8, the baseline becomes 400 tons, as years 6 and 7 are now the most recent two years for purposes of the baseline calculation. No DERs are therefore awarded in years 8 onward, as a baseline of 400 tons less emissions of 400 tons equals zero. Most other states would continue to credit 600 tons, using the original baseline (as, for example, New Jersey did with the Mercer and Hudson units).

Best practices

Best practices would be represented by the current rule allowing the lower of allowable or actual emission rates, and choosing the most representative two of the past five years. In addition, best practices should include some form of the Massachusetts rule that allows the baseline to catch up with the reduction action over time. We might recommend that this take place over five years, as two years might be too little for the source to experience adequate regard for its reduction action.

4. Shutdowns

Unlike offsets, which are primarily generated through shutdowns, several of the DER programs do not allow credits to be generated through a permanent shutdown or other curtailment of operations. New Hampshire, New Jersey, and Ontario's PERT do not allow DERs to be generated from shutdowns.[56] EPA also recommends, in its model rule for DER programs, that states not allow credits for shutdowns.[57] The rationale is to achieve greater additionality in credit generation, since economic factors may be the primary cause of major actions such as shutdowns.

Several states do allow credit for shutdowns, in all cases specifying a term of years for the remaining life of the shutdown source. Michigan and Texas provide for a 5-year remaining life unless there is a showing that another term is appropriate, and Massachusetts a 10-year life.[58] Texas, interestingly, allows credit for shutdowns but not curtailments, and recently lowered the maximum term for DER generation from 10 years to 5 years in its rule revision of 2000.[59]

The states that allow credits from shutdowns generally provide that the baseline emission level for the shutdown has been adjusted to account for any "load shifting," as described below. We note that a similar situation exists in state rules that allow ERCs to be converted into DERs. In such cases, they must then convert the stream to a period of years; most states pick a default value of 5-10 years for project life, unless a more specific term can be identified.[60]

Best Practices

For criteria pollutants, shutdowns could be allowed to create DERs for a period of up to 5 years from a shutdown. We note that many state administrators think there are environmental benefits in allowing shutdowns, since the retirement of old plants and the shift to new plants may have significant multi-pollutant benefits, including reduction of non-target pollutants. However, the state must be confident that it can account for any emissions due to load shifting that result from the shutdown, which we note has been difficult in practice. We further recommend that shutdowns be allowed to produce DERs for no more than one pollutant.[61]

5. Quantification and monitoring protocols

Together with baselines, credit quantification and monitoring protocols are a source of uncertainty in DER programs. Each DER-generating project requires the identification of a set of protocols that measure the discrete number of tons of credits created and allowed to be traded. Generally, states require the use of EPA-approved measurement, testing and monitoring methods if they are available, and other appropriate, accurate, and reliable methods if not. Typically, states establish a hierarchy, in which EPA-approved methods come first, then other credible monitoring systems, and finally estimation methods such as emission factors.[62] EPA today requires that any such alternate protocols must be approved by EPA if they are to be made part of the SIP process.[63]

Notwithstanding such rules, there is unavoidably some room for subjective judgement in the application of any DER quantification method to a particular project. Typically, EPA methods are not available for all the elements needed for the specific protocols, which include identification of a baseline, the time period involved, the monitoring protocols to measure the reductions created, the methods for estimation of the design margins to be applied, an estimation of whether the credit generation or use action would result in an increase in emissions of that pollutant elsewhere, applicable laws, and any other factors relevant to the specific project and time period being evaluated.

Monitoring protocols. Monitoring protocols are one element of a quantification method. The New Jersey regulations establish a "Hierarch[y] of Quantification Techniques" for stationary sources,[64] which roughly parallels the hierarchy set forth in EPA's Economic Incentive Rules for emission quantification methods.[65] Although some stationary sources will be subject to strict monitoring provisions such as CEMS, emissions from others may be estimated using mass balance calculations, emission factors, or other less reliable methods. Measuring emission reductions from other source categories, such as motor vehicles or area sources, can also be expected to be less reliable.

Environmental groups have taken particular issue with quantification and monitoring protocols in opposing EPA's proposed approval of the New Jersey, New Hampshire, and Michigan DER programs. In commenting on these programs, environmentalists asserted that protocols would be allowed that had poor accuracy, such as emissions factors, and that companies are being allowed to develop their own quantification methods.[66]

Deductions for compliance assurance factors. Massachusetts uses compliance assurance factors that reduce the amount of DER credits according to the quality of emissions monitoring for sources that generate credits. Full 100 percent credit is given for irreversible process changes, and 90-100 percent credit to large sources using CEMS. Use of estimation techniques or emission factors receive 50-80 percent credit, depending on their quality. New Hampshire requires similar deductions, but through a case-by-case process rather than explicitly stated in the rule.[67] These deductions are based on EPA guidance on methods for developing emissions numbers for SIPs.

Table 3-5. Massachusetts Compliance Assurance Multiplier.

Irreversible process change: 1.0
Continuous Emission Monitoring System (CEMS) installed pursuant to 40 C.F.R. Part 75: 1.0
Mass Balance Reconciliation: 0.85- 0.99
CEMS other than 40 C.F.R. Part 75 (i.e. Part 60, with fewer samples per hour): 0.80 - 0.95
Periodic Stack Test/Emission Test: 0.80 - 0.90
Emission Determinations using estimates of capture and/or emission factors: 0.50 - 0.80

Source: 310 C.M.R. § 7.00, Appendix B(3)(c)(4).

Best Practices: Currently, best practices are represented by use of EPA-approved measurement, testing and monitoring methods if available, followed by a hierarchy of acceptable protocols, in which the most reliable protocols available are used. Best practices would also include safeguards such as the Massachusetts deduction for compliance assurance factors, to ensure that the environment is not harmed by the use of estimating methods.

6. *Increases in emissions by other sources*

Several states explicitly provide that if the action taken to reduce actual emissions at the subject source results in emission increases at other sources, the quantity of DERs generated shall be reduced by the amount of those emission increases. New Jersey applies this rule to all DER generation activities.[68] Michigan and Massachusetts limit the application of this provision to shutdowns or curtailments, and Michigan further limits consideration to emissions increases from sources in the "same source category and under common ownership or control."[69] Massachusetts explicitly requires the calculation of replacement electricity emissions in the case of shutdown of electric generators.[70]

Best Practices

DER programs should provide that if the action taken to reduce emissions at one source results in emission increases at other sources, the quantity of DERs generated shall be reduced by the amount of those emissions increases.

7. Projects generating continuous credit streams

Some emissions reduction projects are permanent, and can be expected to create continuous streams of credits indefinitely into the future. In such a situation, a source may choose to create ERC offset credits, and accept an enforceable and permanent permit modification. However, if the source does not want to take a permanent permit modification, it may annually measure the reductions achieved, leading to the annual creation of DER credits. In the latter case, the issue arises as to the permanence of the protocols through which the DER credits will be measured.

Connecticut addresses this issue by certifying the protocol to be used to define the baseline and to measure the reductions, and then following this protocol in subsequent years to determine the exact amount of DER credits generated in that year. In Connecticut, the first Trading Agreement and Order (TAO) sets up the protocol for the reduction strategy and gives retroactive approval for the DERs created prior to the TAO, and must be accompanied by a SIP protocol. The SIP protocol is sent to the EPA for approval and is integrated into the state's SIP. Subsequent trading order addenda allow the generator to obtain approval for all new DERs created under that reduction strategy. A similar practice is followed in Ontario's PERT and voluntary Greenhouse Gas Emissions Reductions Trading programs, in which the approval process guarantees the protocol for measuring emissions reductions, but the calculations are then made in each year.[71]

Best practices

The issue of best practices for the continuous creation of DERs is related to the issue of the crediting period, or the duration of the initial baseline for the DER generation activity. The best practice for baselines is to allow only a term of years, such as five years, for the duration of the initial baseline, which means that a stream of DERs can only be generated for that time period. However, if an advancing baseline is not used, the best practice would be to guarantee the permanence of the quantification protocol for a similar period of years, in order to provide some predictability to the entity carrying out the DER generation activity.

8. Life of DER credits

Once created, DERs have indefinite life under most state programs. The rationale is that DERs are discrete tons that are determined to be surplus reductions in a specific year, and so the gain to the environment is permanent.[72] Michigan, however, allows DERs to be used or traded only for a period of five calendar years from the year of generation, and if they were generated by early compliance the expiration date may be even earlier. Credits not used by the end of this period are retired to provide an air quality benefit.[73] The indefinite life most states give to DER credits, once they have been created, is unlike ERCs, which lose their value if the state in the future reduces its applicable standard that defined the original baseline in the ERC generation action.

Best practices

A permanent life for DERs is an acceptable best practice. A 10-year life would also be acceptable, on the grounds that this limits the accumulation of a large bank of credits that could be used when emissions need to be reduced; a 10-year life is also long enough to have minimal effect on the economic benefits to firms of creating DERs.

Use of DER Credits

9. Design margin in use

Texas requires users of DERs to purchase enough additional DERs to cover a design margin of 5 percent below the required rate.[74] New Jersey imposes a similar requirement on generators, and provides that if allowable emission limits are used to establish a baseline, a design margin must be deducted.[75] The purpose of these provisions is to simulate command-and-control conditions, in which sources typically emit at 5-10 percent under the applicable limits to ensure compliance.

Best practices

Best practices would require that if allowable emission limits are used to establish a baseline, a design margin be deducted that is equivalent to typical compliance under rate-based standards.

10. Restrictions on use

States limit DER credit use to distinguish between ozone and non-ozone seasons, and in the case of interstate trades, also impose constraints as to distance and directionality. All states require DERs used during the ozone season to be drawn only from those created during the ozone season. Connecticut also recommends that any credits obtained from out of state should be from sources located within 200 kilometers, which is based on a recommendation of EPA's proposed September 1998 Economic Incentive Policy. Finally, those state programs that allow interstate trading require that trades can only go in the direction of prevailing wind, as described below.

Other kinds of restrictions include the general prohibition followed by all states that reductions will not be certified if accompanied by an increase in the emissions of hazardous pollutant exceeding EPA's limits.[76] Some states also limit use of VOC credits to intra-facility trading, and do not allow them to be traded between facilities.

Best practices

Best practices would include the distinction between ozone and non-ozone season credits, and the prohibition against the uses of DERs that are accompanied by an increase in the emission of a hazardous pollutant exceeding EPA's limits. DER trading between states could also impose distance and directionality restrictions, although if there are a large number of sources in the program, it becomes statistically unlikely that there will be significant emissions shifts even without such restrictions.[77]

11. Verification

Verification or certification of credits is an important issue with DER programs, as both sellers and buyers of credits have an economic incentive to overestimate the number of credits created. Unlike allowance trading systems, all credit trading systems require some verification process to ensure that the privately sponsored emissions reduction projects are accurately quantified.[78]

The verification of the DER credits is handled quite differently by different states. There are three general systems: most states conduct a complete technical audit at the time of credit generation; one performs this task at credit use; and some states have a "buyer beware" system, in which the state conducts only a completeness certification, but retains the authority to investigate the generation or use activity and find the credits invalid at a later date.

A majority of states conduct a review and verification upon credit generation. Connecticut, Texas and Ontario's PERT program[79] all require verification at the generation stage. Massachusetts verifies credits upon both generation and use, and requires a state approval process with a public participation opportunity at both stages.[80] In Connecticut, both generators and end-users must have trading agreements and orders with the state. Texas recently switched from certifying credits at the time of use to certifying them upon generation. Under its new 2000 rules, the state team now does a "full technical review" within 90 days of the end of a generation period.[81] According to the head of the program, the former practice of certification at use was found to create a credibility problem, leading the agency to adopt instead a policy of certifying at generation. He felt this is principally a resource question, and that so far they have adequate resources.[82]

One of the more articulated processes is that of Ontario's voluntary PERT program. Here, the Executive Director makes a completeness evaluation, which generally lasts one month. If the application is deemed complete, a Review Team assesses the application. The Review Team must include participants from industry, NGOs, and government, and undertakes by conference calls a detailed technical review of the application. If revisions are necessary, the application must be modified and resubmitted, or withdrawn. Once all issues and concerns are addressed, the Executive Director prepares a Review Team Summary Report and presents it to the overall Working Group. This review process generally takes two to six months; minutes are kept regarding this process, which are available on the PERT Web site, along with the applications. This process will now take place under Clean Air Canada, and has been divided into two parts: the first is an examination of the methodology for the proposed protocols to be used for the generation of credits; the second reviews the quantification or the creation report of the credits created during a specific time period.[83]

One state, New Jersey, requires that DERs be certified upon use (not generation) and also requires verification by an independent third-party verifier before the credit use. New Jersey requires that DERs be verified by either an independent licensed professional engineer or by a CPA, who must complete a diligent inquiry that is not limited to reliance upon representations made by the generator that the credits are real, surplus, and quantifiable.[84] The only procedural safeguard is that such verifiers are subject to potential liability if there are errors in their work, although enforcement consequences are not precisely defined.[85]

The use of third-party verification has also begun recently under Ontario's PERT.[86] Here, the pilot project may require a credit generator or user to employ an independent third-party auditor to independently verify baselines, actual emissions, emission reductions, compliance with emission limits, banking, transfer, and use of the credits. The creator or user must pay for the cost of the audit.

New Hampshire[87] and Michigan[88] have "buyer beware" type programs, and conduct a completeness review of the applications, but do not require independent verification before generation or use. These states reserve the right to examine and bring an enforcement action, and if they do find a deficiency, the source would need to make up any shortfall.

Environmental groups have expressed concern about programs that allow use before verification, or in which the state is not responsible for the verification. Environmental Defense comments: "The New Jersey Program is designed for retrospective and selective auditing – a time-consuming and cumbersome process that could only address a limited number of the total DER pool."[89] In addition, an adequate review of generation activities may become difficult if the review is not conducted until a number of years after the generation action has taken place.

Although these systems are quite different, we note that an accurate assessment of verification requires a thorough evaluation of state capacity and practices. For example, New Hampshire operates a "buyer beware"-type program in which the state does not make a detailed examination of the credit generation protocols either upon generation or use.[90] However, due to the small number of sources in this state, we found that DEP personnel had a detailed knowledge of each emission source and reduction activity, and both worked with individual sources and used their regulatory power to attain emissions goals.[91] In addition, there was a formal verification process through RACT procedures for the major source that provided 99 percent of all tradeable credits.[92] Therefore, we believe that the DER generation activities were fairly carefully monitored by this relatively small state. On the other hand, it may be difficult in larger states to accurately assess all projects despite more detailed requirements and policies.

Best Practices

We believe that the best practice is to require verification upon credit generation. Connecticut, Massachusetts and Ontario's PERT emphasize this approach, and Texas has recently switched to this approach. The rationale is to enhance the credibility of the credits being traded, and to allow the certification process to be contemporaneous with the credit-generation activity, which should enhance the availability of data and overall reliability of the certification process.

A second-best alternative is to at least require verification prior to use. Given that use of DERs is far less than generation, this system reduces workload while still requiring some verification process. New Jersey explains its reason why requiring verification prior to use was preferred to a buyer-beware system that lacks any mandatory verification, as follows:

> However, in evaluating various ways in which liability could be structured, the Department determined that the advantages of having verification prior to use outweigh any disadvantages that may result by adding another party to the liability structure. The Department believes that the market is more likely to contain valid DERs as a result of the verification process. In the summary to the proposal of this rule, the Department outlined the difficulty of enforcing a buyer beware system where the verification of generation and use is left to the regulatory agency during or after the use period....Without verification prior to use, the Department was concerned that it would be unable to ensure the validity of DERs being used, especially if verification of the generation of DERs was left solely to the regulatory agency during or some time after the end of the use period. The Department maintains that a trading system lacking verification prior to use would do more to deter trading than a three-fold liability structure with a defined compliance responsibility structure for each participant.[93]

We note that requiring verification upon generation has the potential for increasing the workload on state regulatory authorities, as many more credits are generated than used. However, in most states, a few large DER-generation actions create the vast majority of DERs, and many of these actions are ongoing, creating tons of credits year after year. In New Jersey, 96 percent of DER credits are generated at two power plants; in Massachusetts, 96 percent of DERs were generated at six power plants; and in Texas, most of the credits generated also came from a small number of generation actions. Therefore, we believe it is not unduly burdensome to have verification upon generation as the best practice.[94]

The use of independent third-party auditors has not had sufficient experience to be evaluated. This system is used in New Jersey, and it is of concern that each of the ten trades submitted by New Jersey for EPA review were found to be deficient, even though each had been verified by an independent auditor.[95] It is possible that the lack of tested and defined protocols in the area of DER trading at present may render it too difficult for third-party auditors to objectively evaluate generation activities. In contrast, note the extraordinarily detailed rules needed to allow credible financial auditing. In this case, perhaps the best approach would be that taken by the PERT program, in which the regulatory agency conducts the review, but independent third-party auditors may be called in to address specific issues identified through the state approval process.

Public Participation and Reporting Requirements

12. Reporting by sources – notices

New Jersey's DERP program requires as many as five different notices for different types of actions affecting credit generation and use.[96] Each of these is to be recorded in the state's DER Registry. The notices are:

1. Notice of Generation by the source reducing its emissions, to be filed within 90 days of the generation.

2. Notice of Transfer, which is required whenever the DER is transferred. The Transfer Notice includes copies of the relevant Notice and Certification of DER generation and all supporting documentation.

3. Notice of DER Verification, which is required and represents an independent third-party assessment of the validity of the DER.

4. Notice of Intent to Use DERs, which must be filed 30 days before the intended use. The Notice of Intent to Use must describe the user source and owner, describe the use period, state the quantity of DERs to be used and when, identify the DERs to be used, identify the quantification protocol the user has applied, and estimate the quantity of increases and any hazardous emissions, together with all past notices. In addition, the user must certify that the information in the notice and the documents attached are true, accurate, and complete.

5. A Notice of Certification of DER Use, which must be filed with the Department and the Registry within 30 days after the end of the use period.

In addition, each notice must contain information about the source that generated the reductions, the method of generating the reductions, the amount of reductions, and the methods used to measure the reductions.[97] Generators and users must maintain their records for a period of five years, and must provide records upon the Department's request within 15 days.[98]

Other states have somewhat simpler procedures. Texas combines the Notice of Generation and Certification in one step, within 90 days of generation.[99] New Hampshire requires only a Notice and Certification of Generation for generation.[100] The source must then submit a Notice of Intent to Use at least 30 days before the use period, which serves as the notice that a trade has taken place, and a Notice and Certification of Use after the use.[101]

Best Practices

The purposes of a notification system are to provide openness and an accurate inventory of credits, and to allow the regulatory authority to ensure that any credits used have complied with all necessary requirements. Generally, stakeholders interviewed did not find the reporting requirements described above to be onerous, nor that they discouraged potential trades. Therefore, best practices would be a reporting system that allows the regulatory authority to exercise sufficient oversight, which might fall anywhere in a range between the New Jersey and the New Hampshire systems described above.

13. Emissions registries

Availability. The larger states – Michigan, New Jersey, and Texas – as well as New Hampshire, each post all DER credit transactions on registries that are publicly accessible through the Internet, greatly increasing the transparency of the DER trading programs.[102] In the remaining states, this information is publicly available by request to the program administrator.

Procedures. States that do not require verification upon generation allow credits to be posted on the registry once the Notice of Generation is complete; this can take as little as two business days in New Jersey.[103] At this point, DERs may be sold or transferred. States that require verification of generation allow the posting on the registry only after such verification.

Fees. Some states have implemented a fee-based system to support the expenses of the registry,[104] and in Michigan and New Jersey the registry is operated by a private contractor.

Consistency. A key issue with the registries is the lack of consistency of the data presented on each state's registry, making it difficult both to comprehend the data and to make comparisons between states. Also, the general lack of summary information about overall program activity means that major trends are being obscured by the detailed reporting of specific transactions.

Items of variability among registries were found to be:

1) Whether the registry was *on-line* or not: While many registries are available on-line, registry data for Massachusetts and Connecticut were available only by request to the state environmental agency.

2) Information on the *date of generation or use actions* was often lacking, and the meaning of dates that were given varied. In many registries, the dates given were of a regulatory action taken, not the actual dates of credit generation or use.

3) All registries included very little or no *description of the protocols* used for the information presented on their registry, making it difficult to fully understand and evaluate the data presented. ELI was able to collect the information presented in this report through repeated

queries to the program managers, who cooperated fully, but this method is generally not available to members of the interested public.

4) *Summary information* that allows an overall understanding of activity levels and trends is generally not available on the registries. Some registries present so much detailed information on specific trades that they fail to highlight such salient points as that there has been very little actual use of the DERs, or that twenty times more credits were generated than used. It is also very difficult to identify the major generation actions, due in part to the multiple reporting of single actions. In New Jersey, for instance, a very large number of credits were generated over many years at three power plant units, Mercer 1 and 2 and Hudson 2, but for each unit the generation actions are reported separately for each year, for ozone and non-ozone seasons, and whether the reduction was made by fuel switching or emission controls. This results in dozens of entries under different serial numbers for credits generated by one compliance action or at one source.

5) *Nomenclature*. Most states use the term "discrete emission reduction" program for DERs, and "emission reduction credits" (ERCs) for offset programs. However, Michigan uses ERCs to refer to its DER program, and Texas uses DERCs to refer to its DER program.

6) *Units of measure.* All registries report units in tons except New Jersey, which reports in units of 100 pounds, and PERT, which reports in metric tonnes.

7) The registries varied greatly in *what they report as the generation, trade, or use of credits*:

a) Most states report credits generated, but are not consistent in what is reported as a generation action. Some report on a transactional basis, in which several actions may be included in one transaction, whereas others report company totals for a year, which can then be searched to find the number of discrete generation actions involved. Only some registries provide qualitative information, such as the method of generation, (by shutdown, over-control, etc.), and all use different terminology and categorization, making comparisons difficult. Very few states report generation actions in sufficient detail to be able to fully understand what actually happened, or how important issues such as baselines were determined. Also, registries varied in whether they reported actions that involve tons generated and used by the same entity.

b) Many registries do not report trades at all, whereas others such as New Jersey provide information on all trades.

c) Most states report the use of credits, but in Texas, once credits are used they leave the registry completely. As with generation, the data presented on credit uses also varies: some states report each use action, others report a single number for all uses by a firm in one year, and some report separately each batch of generated credits involved in each use. It is also not clear how inter-state uses are reported in the registries, and some states also have had difficulty obtaining information on the use of DERs for penalties initiated by EPA in their state.

Best practices

A consistent system for reporting DER transactions is needed. Best practice could be either a federal system or common standards to create more consistent state reporting systems. This report does not make detailed recommendations on how registries should be designed, but we note that many registries do not include important qualitative information, especially on generation actions. Also, summary information on major program trends and the most significant credit generation and use actions is important, and should be included in the registry or published annually in a manner that is readily available to the public.

14. Public participation

The DER credit trading programs have a number of public participation provisions that make these among the most publicly transparent environmental programs in existence. There has generally been extensive public participation in development or revision of the program rules, and a high degree of openness in information regarding specific trades. Although public participation can extend the timelines for credit review and approval, most parties interviewed believed that public participation procedures are necessary components of the programs.

Public participation in program design. All states with regulations have provided for public participation in the design and revisions of their DER program through notice-and-comment rulemaking. Several supplemented this with public workshops and hearings.[105] EPA also provided for an extensive public advisory process in the development of its model open-market trading rule.

Many states have ongoing public participation in program design. After adopting the OMET program on July 1, 1996, New Jersey established a stakeholder workgroup which met every other month for a number of years. These meetings were open to the public and discussed implementation of the OMET program and ways to improve its environmental and economic effectiveness. A number of other states provide for periodic audits of their DER trading program, with opportunity for public review and comment.[106]

Registry and Trades. In general, states provide that all DER trading information submitted to the state regulatory department or the state's registry is a public record. Most states – including New Hampshire, New Jersey, Michigan, and Texas – post all transactions on registries that are publicly accessible through the World Wide Web. Some states further require generators or users to also make all documentation and supporting information available to any person who requests it.[107]

Connecticut is a special case, due to its handling of trades through SIP amendments, but it provides the opportunity for public participation during the thirty-day notice-and-comment period for such SIP revisions, before the TAOs are sent to the EPA. In addition, the public may access information from the yearly emission statements from sources, and may also obtain information on any use in trading activity by contacting the department. Ontario's PERT publishes some trades in a registry,[108] and has a unique system of multi-stakeholder committees that determine eligibility to be listed in the registry, and provide comments on the methodology for calculating baselines and other quantification protocols.[109]

Best practices

Best practices in this area are to maintain the strong public participation and openness of DER programs, including continuing the public outreach and involvement in program design, and the public accessibility of the information submitted and transaction registries. Best practices would also include making important details about the trading actions more available, such as is now done only in some programs. Another best practice would be to provide summary information, such as total amounts generated and used and the major generators and users, to allow the public to more readily understand key program aspects and trends. Best practices would also include a periodic (3-5 year) audit of program performance, which is contemplated by several of the state programs.

15. Environmental deductions in DER trading

All states require a 10 percent deduction from DERs, typically at the time of generation, for an air quality benefit.[110] Some states make further deductions, such as the up to 50 percent deduction for the reliability of monitoring methods made by Massachusetts, the 5 percent deduction for design margins to simulate command-and-control behavior; and added reductions for any determination of displaced emissions or for late filing.

Best practices

Although best practices would include a 10 percent or greater deduction for environmental quality, the most important environmental quality concern with DER programs is their overall integrity, which is potentially of much greater significance to the environment than a 10 percent deduction. There are important general integrity issues described in the first paragraph of this section, as well as specific issues that depend upon regulatory design. For example, Massachusetts would reduce the number of credits created in a DER generation project by 20-50 percent if the source uses emissions factors, whereas other states may not; this indicates the extent to which quantification protocols may affect the amount of DERs generated and hence the amount of tons that may enter the environment.

16. Enforcement

States provide that a violation of a provision of a DER program carries with it the same penalties and enforcement actions as a typical violation of their environmental regulations, including civil and potentially criminal penalties.[111] Several states explicitly re-state the Clean Air Act rule that every day that the user is out of compliance is considered a separate violation.[112]

Generally, the DER credits must also be restored if found to be invalid. In New Jersey, if the state or EPA determines at any time that the DER does not meet the program's requirements, they may declare the DER invalid.[113] In Connecticut, if a user is out of compliance with its TAO, it will be required to double the amount of credits needed to make up the difference between its emissions and the amount of credits on hand. In PERT, if a user does not own a sufficient number of credits at the time of use, it will be required to obtain and retire three times the number of credits necessary to cover its emissions. Note that simply retroactively restoring the tons is not an adequate response under the Clean Air Act, which requires further penalties if a violation is found.[114]

Best practices

Best practices are to provide that a violation of a provision of a DER program carries with it the same penalties and enforcement action as a typical violation of environmental regulations authorized under the Clean Air Act, including civil and potentially criminal penalties. In addition, violators should be required to restore any tons of DERs found to be invalid.

Special Issues

17. Transforming DERs to ERCs (DERs as offsets)

Most states provide that DERs may be used to comply with emission offset requirements as long as the credits comply with all applicable state and federal requirements. However, states vary as to the number of years of DERs that are needed to be kept in inventory to satisfy the requirement. Texas requires sources to maintain a continuous one-year supply,[115] New Hampshire a two-year supply, and Massachusetts a five-year supply,[116] whereas the federal minimum requirement is for one year. New Jersey also requires that the credits are generated at the same time they are used.[117]

In practice, hardly any sources have used DERs for offset purposes, as the cost is prohibitive in comparison to the one-time purchase of a ton-per-year ERC.[118] New Hampshire made creative use of both OTC NOx allowances and non-ozone season NOx DERs to satisfy offset requirements for two new power sources in the state, which created a clean air benefit and significantly reduced the allowances provided to coal-fired sources. Aside from this, only one or two minor uses have been made of DERs to fulfill potential offset requirements.

Best practices

This is a complex area that depends on the rules for non-attainment areas, and so is applicable only for criteria pollutants. Due to its complexity, we do not make a recommendation for best practices, but caution that any such use of DERs should be scrutinized by the regulatory authority to ensure its integrity and consistency with ERC and CAA program goals.

18. Inter-pollutant trading

Inter-pollutant trading is allowed by some states. New Hampshire allows limited inter-pollutant trading of DERs, so that NOx DERs may be used for VOC RACT compliance. Because man-made VOC emissions only account for 10 percent of all VOC emissions in

New Hampshire due to the many trees that produce VOCs in the state, there is little benefit in decreasing anthropogenic VOC emissions, and the state is more interested in decreasing NOx emissions. Therefore, the state allows the use of NOx DERS for VOC RACT compliance.

Best practices

Inter-pollutant trading should be assessed on a case-by-case basis to ensure an environmental benefit, as in the case of New Hampshire.

19. Inter-state trading

Some states allow inter-state trading, provided there is a valid Memorandum of Understanding between the two states. Such memoranda typically impose directionality requirements, such that traded credits only flow in one direction. Two MOUs that exist are New Jersey-Connecticut, with trades only able to go from New Jersey to Connecticut, and Maine-Massachusetts, with trades going from Massachusetts to Maine. We note there is a regional inter-state MOU for trading offset credits between the OTC states, mentioned in Part 2 above, but this only rarely would apply to DERs.

Massachusetts has developed regulations governing interstate trading, and requires that an interstate Memorandum of Understanding include:

- the requirement that creditable emission reductions be real, surplus, permanent, quantifiable, and federally enforceable;
- discounts as appropriate to make credits generated outside of the Commonwealth equivalent with credits generated in the Commonwealth;
- restrictions on allowable directionality of trades if necessary;
- state-specific notification or other requirements, as necessary;
- Credit lifetimes and expiration dates, if applicable;
- ozone season definition and restrictions; and
- averments of cooperation on enforcement and reporting.

Source: 310 C.M.R. § 7.00, App. B(3)(f).

Best practices

Interstate trading of criteria pollutants could be allowed, subject to directionality restrictions and other appropriate provisions to assure environmental integrity, such as those set out above.

20. Staffing issues

Generally, a relatively small number of state regulatory employees implement both DER and ERC credit trading programs. The number of full-time equivalent (FTE) staff in the period studied were as follows: Connecticut, 2 FTE plus another temporary person; Massachusetts, 2 FTE; Michigan, 1 FTE (with the registry run by a private contractor); NH, 1 FTE; New Jersey: 1.25 FTE (with the registry run by a private contractor); Ontario PERT, 1.5 FTE plus technical/volunteer committees; Texas, 2 FTE (expanded to 4 staff in 2000 to administer the new cap-and-trade program for Houston, in addition to the state's ERC and DER programs).[119]

Two observations should be made about staffing levels. The first is that the above low staff numbers are for the DER/ERC transaction process only, and do not include the large number of state and federal regulatory personnel required to carry out the emissions monitoring, permitting, compliance, and enforcement functions for the subject sources. The criteria pollutant programs for NOx and VOCs involve literally thousands of federal and state employees, whose functions are essential for the DER programs to operate.

The second is that although the absolute number of persons directly involved in the credit trading programs is low, when compared to the number of tons involved, relative efficiency has been well below that of an equivalent flexibility mechanism, an emissions cap and allowance trading program. Although the comparison is not precise, the Title IV SO_2 cap-and trade program uses extremely few staff for a program that regulates a major criteria pollutant on a national scale. Fewer than 100 federal and state employees are needed to administer both the Title IV compliance and trading program, far fewer than what would be required under traditional regulatory programs for a major pollutant.[120] Also, only about 3 employees operate the trading element of the program, under which 30 million allowances were traded in 2000, and over 1.2 million used by sources for compliance purposes.[121] Under the cap-and-trade program, the effectiveness of each government employee in terms of traded tons used for compliance purposes is about 1:400,000 tons, many orders of magnitude greater than the credit trading programs. While the comparison is a general one, the staffing levels per ton generated, traded, or used is far lower in cap-and-trade programs than in credit trading programs.

Table 3-9. Staffing levels for DER/ERC programs, in comparison to Title IV allowance program.

	Employees in trading	Tons generated (per year)	Tons generated (per employee)	Tons used (per year)	Tons used (per employee)
Title IV, Phase I	3	7,000,000	2,300,333	700,000	230,333
DER/ERC	11	31,808 DER ? ERC	2,892 DER	3,727 DER ? ERC	339 DER

Sources: Title IV: EPA Acid Rain Compliance Report, 2000 (tons used is the annual amount emitted by units in excess of allowance holdings); DER figures from the Tables above.

Best practices

Most states appear to be efficient in their allocation of staff to operate DER programs, and two have further reduced staffing needs by authorizing a private, self-supporting entity to operate their credit registries. We note that state efforts for DER systems can operate at low staffing levels because a large amount of effort is already expended to identify, permit, and monitor all potential emissions sources that could be part of a trading system. In this respect, it is important to note the relatively far greater efficiency of allowance trading programs, such as Title IV, in achieving an effective regulatory and emissions trading program.

I. Conclusion

This report concludes that it is difficult to create DER credit trading systems with high integrity, but that their use in the context of state implementation plans under the Clean Air Act can provide adequate safeguards to protect air quality. Key problems with DER programs include the difficulty of finding additionality, and of selecting appropriate baseline and monitoring and quantification protocols in credit generation. The disparity between credit generation and use indicates that flexibility systems such as DER programs are difficult to integrate into current Clean Air Act laws and practices.

Appendix: State Experience with Credit Trading Systems

1. Connecticut – DER program

Overview. In Connecticut, trades are executed as source-specific SIP provisions via a Trading Agreement and Order (TAO). Connecticut provides an opportunity for public participation during the thirty-day notice-and-comment period for such SIP revisions, before the TAOs are sent to EPA for approval. There are no other regulations governing the trading of credits (except for a specific regulation governing municipal waste combustors, at § 22A-174-38 of the Regulations of the Connecticut State Agencies). The Connecticut trading program is based on R.C.S.A. § 22A-174-22(j), which states that the Commissioner "may allow the use of emission reduction trading through the issuance of a permit" to an owner or operator for the purposes of NOx RACT compliance. Connecticut also maintains a database of DER generation, trade, and use, and has recently completed an audit of their NOx emissions trading program, from which the data below are derived[122]

DER Generation. A total of seven companies generated 12,738 DER credits in 36 actions from 1995 through 1999. These were Connecticut Light & Power (15), United Illuminating Co. (9), Connecticut Resource Recovery Authority (4), Ogden Martin Systems (4), Pfizer-Groton (2), Wisvest (1), and Algonquin Gas (1). Note that these generation numbers are net of the 10 percent deduction, and do not include 7,960 tons created in New Jersey in 1992, 1993, and 1994 by PSE&G at its Hudson and Mercer plants, and available to be used in Connecticut through a bi-state Memorandum of Agreement. Note also that DER credit generation dropped in 1999, as large power sources then became regulated under the OTC emissions cap for NOx, and so can no longer generate ozone-season DERs.

DER Use. The Connecticut DEP promotes the use of DER credits to resolve RACT compliance issues, and in the period studied, 127 uses of DERs for RACT were made by 37 firms. Each use represents the use of DERs in one year by one firm, so this number would be even larger if each use by a source were counted, since some firms used credits for multiple sources. The principal use for RACT was by Connecticut Light & Power for 20 peaking turbines and diesels, and constituted 2,031 tons, or 36 percent, of all credits used for RACT compliance. Note that Connecticut policy requires substantially greater than a 1:1 retirement of DERs for peaking power sources, as their emissions are likely to occur on days with high ozone potential.[123] An interesting special use was by the Monhegan Tribe of Indians, who voluntarily retired 1066 tons to offset emissions from transportation activity associated with a new casino. The principal use for penalty purposes was one penalty of 650 tons to Connecticut Light & Power in 1995; other minor penalties were mostly due to 10 percent penalties for late filing.

DER Retirement. A total of 6,364 tons of DERs were used in Connecticut from 1995-1999, and thus 10 percent, or 636 tons, of DERs would have been retired upon creation for environmental benefit.

Table 4-1. Connecticut Use and Generation of NOx DERs (1994-1999)

	1994/5	1996	1997	1998	1999	2000	Total
DERs used for RACT	1,223 tons	881 tons	1,094 tons	1,141 tons	1,291 tons	656 tons	6,286 tons 127 uses
DERs used for special	0	153 tons 1 use	1,300 tons 2 uses	206 tons 1 use	310 tons 1 use		1,969 tons 5 uses
DERs used for penalty	657	14	16	4	44		735 1+ firm
DERs generated	4,644	1,217	3,455	2,636	786	783	13,521 7 firms

Source: Connecticut DEP, 2nd NOX Trading Audit Report 1995-1999, Exhibit A (Jan. 19, 2001); preliminary data for 2000.

Notes: a) Generation figures include credits approved in 2000, 2001 by CRRA (236 in '98, and 287 in '99); by Wisvest (253 BERCs in '99); and by United Illuminating (269 in '98).

b) The Audit Report indicates that of the 6,364 tons of DERs used for RACT and penalty purposes, 4,332 tons were created in Connecticut and 2,032 in New Jersey. The Audit Report lists the 1,969 tons used for special purposes separately under State-only (non-RACT) use.

Contact Information

Wendy Jacobs, Connecticut DEP (wendy.jacobs@po.state.ct.us).

2. Massachusetts

A. ERC Program

NO_X ERC trading. Most NO_X ERC credits are fairly rapidly traded and used. Of the total 2,495 ERCs created in the time period studied, 2,180, or 87 percent, have been sold or transferred as of early 2001, and 1,340 actually used. Of these, 1,172 tons (87 percent) were generated from 8 shutdown sources (809 tons were generated by Nantucket Electric, which shut down old diesel boilers with high NO_X emissions) and 168 tons (13 percent) from 2 over-control sources (MIECO and MATEP).

NO_X ERC use. These uses of ERC credits have been for offsets, and consist of 8 uses in Massachusetts (1,109 tons), plus 2 interstate trades to Maine (231 tons).

Table 4-2. Massachusetts - NO_X ERCs generated and used (by tons and number of actions)

	1997	1998	1999	2000	Total
ERCs generated by shutdown	55 (2)	912 (1)	675 (4)	161 (2)	1,803 (9)
ERCs generated by over-control	-	-	-	692 (1)	692 (1)
ERCs used - NO_X	233 (2)	264 (2)	795 (5)	48 (1)	1,340 (10)

Source: Massachusetts DEP, Emissions Reduction Credit Registry (March 19, 2001)

VOC ERC generation. Relatively small sources generated 250 VOC ERCs in ten actions.

VOC ERC use. Both uses of ERCs were of credits generated by shutdown sources, in one case by the same company: Sithe Energy used 126 VOC ERCs generated by BASF (shutdown); Spalding Sports used 4 VOC ERCs generated by its own source in 1996.

Table 4-3. Massachusetts - VOC ERCs generated and used (by tons and number of actions)

	1996	1997	1998	1999	2000	Total
ERCs generated by shutdown	162 (3)	33 (2)	22 (1)	13 (2)	20 (2)	250 10)
ERCs generated by over-control		223 (3)?				223 (3)
ERCs used - VOCs		0	0	4 (1)	126 (1)	130 (2)

Source: Massachusetts DEP, Emissions Reduction Credit Registry (March 19, 2001)

B. DER Program

Massachusetts's discrete emission reduction credit trading program was adopted by the Department of Environmental Quality (DEQ), and is found at 310 M.R.C. 7.00 Appendix B. The program implements a voluntary statewide emission averaging and discrete emission reduction credit trading program designed to improve air quality.

DER generation. Reduction actions taken at six large power plants dominate the generation actions. The Massachusetts registry indicates that the 26 actions that created DERs were taken at 12 facilities, and that actions taken at the following six plants were responsible for 96 percent of all DERs generated over the five years: Brayton Point, 7,559 tons; Mount Tom, 4,673 tons;

New Boston 2,444 tons; Canal 2,313 tons; Mystic 1,861 tons; and Sithe General 1,514 tons. Note that the date of the generation action was taken from the date given in the project trading number (i.e. MBR-99-ERC-002) reported in the Massachusetts credit registry, and is not necessarily the date the action was taken.

Table 4-4. Massachusetts – NO_X DERs generated (by tons and number of actions)

	1994	1995	1996	1997	1998	1999	2000	Total
Generated By Over-control	770 (1)	744 (1)	2,267 (3)	6,878 (10)	197 (2)	2,847 (5)	10 (1)	13,663 (23)
Generated By Early Compliance	1,866 (1)	1,317 (1)	4,371 (1)					7,554 (3)
Generated By Shutdown		10 (1)						10 (1)

Source: Massachusetts DEP, Emissions Reduction Credit Registry (March 19, 2001)

DER use. A few relatively small DER uses have been made for RACT and other permit purposes in Massachusetts, but the major use was a special use due to action taken by the State to seek additional NO_X reductions for power generating units in 1997 and 1998. Owners of fossil pants were required to use DERs to compensate for projected increased fossil plant generation in those years due to two nuclear power plants undergoing planned outages during the summer months. DERs were retired to satisfy emergency regulation 310 C.M.R. 7.53 in one year, and by voluntary action in the subsequent year, which avoided the need for another emergency regulation. The 1,080 penalty tons in 1997 were used by the Ford Motor Co. to satisfy a federal consent decree, as were the 247 tons retired by Lloyd Manufacturing in 2000. The dates given in the table are estimated from project sequence and comments in registry.

Table 4-5. Massachusetts - NO_X DERs used (by tons and number of actions)

	1995	1996	1997	1998	1999	2000	Total
Use for RACT	68 (3) n/a (2)	476 (1)	28 (1)	120 (1) n/a (3)			<800 (11)
Use for Penalty			1080 (1)			247 (1)	1,327 (2)
Special Use			2,879	3,748			6,627
Total	68+	476	3,987	3,868+		247	8,754*

Source: Massachusetts DEP, Emissions Reduction Credit Registry (March 19, 2001)
* total includes estimates for five 1995 and 1998 small RACT uses

Contact Information

Contact Person: Edward Szumowski (edward.szumowski@state.ma.us)

3. Michigan – DER program

Michigan's discrete emission reduction credit trading program was adopted by the Department of Environmental Quality (DEQ) on March 16, 1996 and last amended on April 13, 1999. The program is a statewide emission averaging and discrete emission reduction credit (DERs, but called ERCs under the Michigan program) trading program designed to improve air quality, create market-based incentives for emission reductions, and encourage early emission reductions and technological innovations that reduce and quantify emissions. The program is also intended to provide operational flexibility and more cost-effective compliance with Michigan's current and future air quality regulations. (Michigan Administrative Code R.336.2202). Participation is open to stationary, mobile, and area sources that emit or reduce emissions of all criteria pollutants except ozone, together with NO_X, and VOCs, which are the precursors of ozone formation. (MAC R.336.2203; 336.2208(1)(a)).

Table 4-6. Michigan – NO_X DERs generated and used (by tons and number of actions)

	1995	1996	1997	1998	1999	2000	Total
DERs generated by shutdown		103	172	270	89	77	711
DERs generated by over-control	8309	16476	181	419	13138	150	38673
DERs used - NOX		400 (1)		1,310 (2)			1,710 (3)

Source: Michigan DEQ, Emissions Trading Registry at internet address below.

Table 4-7. Michigan – VOC DERs generated and used (by tons and number of actions)

	1995	1996	1997	1998	1999	2000	Total
DERs generated by shutdown	37	1064	1275	1235	535	176	4322
DERs generated by over-control	138	197	245	91	77	70	818
DERs used - VOCs		10 (1)	0	68 (7)	63 (9)	50(6)	192 (23)

Source: Michigan DEP, Emissions Trading Registry at internet address below; additional summary information on uses from *Michigan – VOC Summary* (sent by Lou Jager, Michigan DEP, 2001)

Notes: 1) Seven out of the 23 VOC uses, comprising 66 tons of VOC DERs, were uses made by the same company that generated the tons.

2) Michigan's registry presents each batch of generated credits made in each use as a separate transaction, making it difficult to determine the actual number of uses.

Contact Information

Contact person: Teresa R. Walker , Department of Environmental Quality (walkertr@state.mi.us)
Web site: http://www.deq.state.mi.us/aqd/eval/e_trade/etbank.html

4. New Hampshire

A. ERC Program

New Hampshire's ERC program for emissions offsets for new sources was promulgated in January, 1997, and is found in its code of regulations at ENV-A § 3000.

Offset generation. Only three sources have created small amounts of ERC offset credits in New Hampshire, in all cases through shutdowns. UNH shut down its on-campus incinerator, creating 33 NO_X ERCs; Nashua Corporation shut down a production line, generating 36 VOC ERCs; and Hutchisons Sealing Systems shut down a production line, generating 22 VOC ERCs. Under New Hampshire rules, ERCs created through shutdowns are not tradeable, and so remain available only for possible future use by these same sources.

Offset trading and use. There has been relatively little trading or use of ERCs in New Hampshire to date, due to the lack of new sources in New Hampshire large enough to trigger new source review standards. The only new sources subject to New Source Review provisions in New Hampshire are two new low-emitting gas-fired power plants totaling 1,245 megawatts that are scheduled to come online in 2002. Although they exceed in capacity the existing oil and coal-fired boilers in the state, they are far cleaner, emitting insignificant amounts of SO_2 or toxics, and less than 10 percent of the NO_X emissions. Instead of using ERCs, New Hampshire has integrated the use of allowances under the NO_X Budget Program with DERs to satisfy and possibly exceed new source offset requirements. This innovative approach creates high integrity of the environmental results while allowing the entry of new, low-emitting plants that could displace the emissions of the state's old, coal-fired plants.[124]

B. DER program

DER Generation. PSNH generated 7,157 tons of tradeable NO_X DERs from 1995 to 2000 (99 percent of the total inventory) through the installation of SCR at its Merrimack power station in 1995, which exceeded RACT requirements.[125] The state holds 1,250 of these pursuant to an agreement with PSNH, which it intends to use to facilitate economic development.[126] There were only three other generating sources, two that created 27 tons of NO_X DERs, and one that created 27 tons of VOC DERs.[127]

DER trading. There has been relatively little DER trading in New Hampshire. One reason was that RACT compliance standards were adopted in 1995, but the DER program did not go into effect until early 1997, at which point almost all sources had complied with the 1995 standards and did not require any additional DERs to maintain compliance. Total trading includes the 268 tons of NO_X DERs actually used, the 1,250 held by the state, and another 233 NO_X tons traded. In addition, 30 tons of NO_X DERs, or roughly 10 percent of the amount used, have been retired for environmental benefit.

DER use. The only three uses of credits for RACT compliance have been of 52 tons of NO_X DERs for VOC RACT. New Hampshire allows inter-pollutant trading of DERs, because in

New Hampshire human-caused VOC emissions only account for 10 percent of all VOC emissions due to the many trees that produce VOCs, so there is little environmental benefit in decreasing human-caused VOC emissions. The state is more concerned with decreasing NOX emissions, so the use of NO_X DERs is allowed for VOC RACT compliance. There has been no VOC DER trading or use.

Table 4-8. New Hampshire Use and Generation of NO_X DERs (1995-1999)

	1995	1996	1997	1998	1999	2000	Total (# uses)
DERs used for RACT				45	7		52 (3)
DERs used for special				126 to MA			126 (1)
DERs used for penalty				90			90 (1)
Tradeable DERs generated	303	473	1087	3520	886	915	7,157 (3)

Contact information:

Contact person: Joe Fontaine, New Hampshire DES (jfontaine@des.state.nh.us)

Web site: http://www.des.state.nh.us/ard/registry.pdf

5. New Jersey – DER program

New Jersey's Open Market Emissions Trading Program was initiated in legislation signed by Governor Whitman on August 2, 1995, which required the Department to establish an emissions trading and banking program in order to achieve New Jersey's air quality goals at less expense. New Jersey Administrative Code 7:27-30. The Open Market Trading program is one of three trading programs operating or planned for New Jersey, and was proposed on February 20, 1996 (28 New Jersey Register 1148) and finalized with an effective date of July 1, 1996. 28 N.J.R. 3414(a). Amendments were made on August 5, 1996, November 18, 1996, June 2, 1997 and April 7, 2000. In September of 2002, however, New Jersey announced the end of its DER trading program.[128]

The New Jersey program was one of the initial DER trading programs, and sprang from the original NESCAUM/MARAMA Emission Reductions Credit Demonstration Project, which developed the concept of discrete emissions reduction credits.[129] New Jersey sources, notably PSE&G, supplied 80 percent of the credits for this pilot project, mainly from fuel switching and installation of SNCR at its Mercer 1 and 2 units, and fuel switching at its Hudson 2 unit. The reduction actions taken at these two plants continue to dominate DER generation, and have provided over 32,000, or 96 percent, of the total 33,472 DER tons generated in New Jersey.

Table 4-9. New Jersey – DER Credits Generated and Used (tons)

	1992	1993	1994	1995	1996	1997	1998	1999	2000	Total
Generated–NO_X	4282	2873	7865	1643	1179	3445	3430	3215	5540	33472
Used–NO_X	-	-	-	93	184	217	385	519	62	1460
Generated–VOC	2	61	29	40	40	205	240	247	179	1043
Used–VOC	-	-	-	-	-	6	16	15	100	137

Source: OMET Registry Summary Report (July 2001)

Table 4-10. New Jersey – DER uses (1992-2000) (in tons, with number of uses in parentheses)

	Permit	Penalty	Special	Total Used	Retired
NO_X DER use	RACT- 479 Other - 826*	27 (1)	128 (2)	1,460 (113)	923
VOC DER Use	37 (6)	98 (1)		135 (7)	209

* It is difficult to find what "other" uses were for in the OMET registry, although one batch represents the use by Atlantic Energy/Conectiv of 291 tons in 1996 and 1999 for five sources.

Notes: 1) The total of 113 uses of NOx DERs was derived by querying the OMET registry under the query function for Notice Reports by Date, to find the total number of submissions of Notices of DER Credit Use, and subtracting the seven VOC uses. Each Notice of DER Credit Use generally represents one use of DER tons by one source in one year. The two special NOx DER uses were for MEG alerts.

2) It is difficult to identify the number of actual uses of DERs under the OMET registry for each use category. One can obtain information as to the total DERs used by category for different firms over the life of the program under the By Sector Analysis query function, which are the basis for the user category breakdowns. However, it would be laborious to find the number of discrete uses made, and to reconcile these figures with the total uses found under the Notice Reports by Date function.

3) The six uses of VOC DERs were of small amounts by two baking firms for each of the years 1997, 1998 and 1999.

Contact Information

Contact persons: Sandra Chen, Alan Willinger, New Jersey DEP

Web site: www.omet.com (1996 -2002); www.state.nj.us/dep/aqm/omet (2002).

6. Texas – DER program

The Texas DERC credit trading program was established by TNRCC rule on December 23, 1997, 30 T.A.C. § 101.29, and revised on December 6, 2000, 30 T.A.C. §§ 300 et seq.[130] The analysis in this report is of the original Texas rules in force from 1997 until 2000, although major changes made in the revised rules are also noted. According to Texas's draft three-year audit, the use of DERCs has been primarily for compliance with RACT requirements. DERCs are also used when temporary emission upsets result in permit exceedances, or industry needs operational flexibility to try new product formulations or processes to meet customer demands.[131]

Historical information from brokers show approximate DER costs have ranged from $750/ton to a high of $3,000/ton. Generally, the price has remained in approximately the $1,000 to $1,500 range. "Overall, industry views the DERC program as successful, they want it to continue, and want to be able to use the credits that have been generated and are in the bank awaiting trade or use within their companies. Industry representatives did state in the telephone survey that the registration and certification process are time consuming, and recommended that they be combined into one process."[132]

Generation and Use

Table 4-11. Texas - NOx DERs generated and used

	Generated	Traded between firms	Used RACT	Retired	Total Used
NOx DERs	41720	310	520	86	720 (approx.)
VOC DERs	1111	10	?	2	16 (approx.)

Source: Texas Natural Resource Conservation Commission, *Discrete Emission Credit Banking and Trading Program Audit* at 6-7 (draft, Austin, Texas, 2001). Note the Texas registry does not provide information on used DERs.

Use: Out of the 44,571 tons of DER's generated, 736 tons have been used by industry, leaving 43,835 tons remaining on the market for trade or use. 368 tons have been used in the Houston/Galveston non-attainment area, and 368 tons used in the Beaumont/Port Arthur non-attainment area. The majority of the use has been for NO_X RACT compliance (520 tons). The remaining DERC use was for compliance with 30 T.A.C. §115 regulations, permit compliance, a Justice Department Decree against a company, environmental contribution, and compliance margins. The amount retired for environmental contribution totals 88 tons, with 86 of them being NO_X DERCs (these do not exactly total 10 percent of use due to rounding).[133]

Generation. 44,571 tons of DERCs have been generated, of which 41,720 were of NO_X. The four largest generators of NO_X DERs shown on TNRCC's DER registry of October 20, 2000 accounted for 93 percent of all DERs, and were: Dow Chemical Co. (18,970 tons); Reliant Energy (12,465 tons); Houston Lighting and Power (4,686 tons); and DuPont (2,044 tons).

Approximately 19,000 NOX DERs were generated in 1998, 3,000 in 1999, and 19,000 in 2000. The decline of activity for 1999 may be attributed to new NO_X (RACT) rules that went into effect in 1999 and kept some industry sources from being able to claim emissions reductions. The sharp increase in 2000 may be due to the advent of new Houston area NO_X cap-and-trade rules. These allow industry to use DERs for emissions in lieu of allowances, which will drive demand for DERs and still maintain compliance with the cap-and-trade program. Thus, industry sources may have wanted to get as many DERs on the books as possible.[134]

Table 4-12. Texas – DER Generation Methods (1997-2000)

Criteria Pollutant	Generation Category	DERCs (tons)
NO_X	Controls	3,147
	Over Controls	13,054
	Early RACT	4,048
	Process Changes	660
	Shutdowns	20,811
VOC	Over Control	1,111
HAP	Over Control	923
CO	Over Control	212

Criteria Pollutant	Generation Category	DERCs (tons)
SOC	Shutdowns	605

Source: Texas Natural Resource Conservation Commission, Discrete Emission Credit Banking and Trading Program Audit, at 8 (table 4) (draft, Austin, Texas 2001).

Note: The trading activity for DERs has been very low, with only 10 tons of VOC and 310 tons of NO_X traded between companies. These trades were conducted in the Houston/Galveston area.

Contact information

Contact person: Matt Baker, Banking Coordinator, Texas Natural Resources Commission mabaker@tnrcc.state.tx.us
Web site: http://www.tnrcc.state.tx.us/permitting/airperm/banking/dercreg.htm

7. Ontario – Pilot Emissions Reduction Trading Project

Ontario's Pilot Emissions Reduction Trading Project (PERT) was established in 1996 as a multi-stakeholder environmental initiative intended to evaluate emission reduction trading as a tool to assist in the reduction of smog and other air pollutants in the Windsor-Quebec corridor. The objective of PERT has been to provide members and government with practical experience in creating trading rules and a system of emissions trading in Ontario. The PERT Working Group is made up of members from industry, government, and environmental and health groups, who participate voluntarily. This group, which conducts monthly meetings, is responsible for the overall design, development, and implementation of a voluntary emissions trading system. Member-led task teams develop specific plans and recommendations for key elements and aspects of the project, which are then presented to the Working Group, whose decisions are generally made by consensus. On April 1st, 2001, PERT was converted into Clean Air Canada, a not-for-profit corporation which will continue the project's work. While generators must have been members of PERT in order to submit any Notices, this is no longer the case under Clean Air Canada.

To have an application reviewed, a C$7000 fee is required for a new application, but there is then no fee for posting credits on the Registry. The Ontario Ministry of Environment signed a negotiated Letter of Understanding on July 8, 1998, which conveys to PERT member companies tangible benefits for reductions that go beyond the requirements of environmental regulations or voluntary agreements.

The following chart shows generation of credits under PERT. However, because this is a voluntary program, there have been no official uses of credits.

Table 4-13. PERT DER Generation data for NO_X

	1994	1995	1996	1997	1998	1999	1200	Total
NO_X (tonnes)	855	4516	23253	4692	13115	34998	2373	84000

Source: Robin James, PERT Coordinator, e-mail March 6, 2001.

Note: Multi-year projects were divided evenly by year.

Contact Information

Contact person: Robin James, Clean Air Canada Secretariat, rjames@cleanaircanada.org
Web site: www.pert.org, www.cleanaircanada.org

8. California Air Quality Investment Program

California's Air Quality Investment Program is not a trading program, but creates a government-sponsored fund that serves as an intermediary between firms that need emission reductions, and firms that implement projects to reduce emissions. Such a process creates some of the same issues as emission trading programs, such as determining the validity of emissions reduction projects and monitoring and assessment protocols.

The AQIP program allows employers to contribute to a special fund in lieu of implementing other emission reduction programs for employee commuters. Each employer pays $60 annually (or $125 triennially) for each employee that reports to the worksite during the peak commute time; the collected funds are placed in a restricted account to fund programs that will result in equivalent emission reductions. The government regulatory agency reviews and evaluates projects based on cost effectiveness and the ability to deliver emission reductions equal to or greater than the emission reduction target for that quarter.[135]

According to program managers, from the program's inception in December, 1995 through 2000, the AQIP program generated 846 tons VOC, 1,028 tons NO_X and 6,635 tons CO through the implementation of 31 projects that generated $8.8 million. Ninety-five percent of the activity in the AQIP program was related to mobile sources, which create reductions in all three pollutants. The AQIP has frequently funded old-vehicle scrapping projects: since its inception, AQIP-funded projects have resulted in scrapping over 12,000 pre-1981 vehicles, which has permanently retired 725 tons of VOC, 377 tons of NO_X, and 5,281 tons of CO.[136]

All projects that AQIP supports must meet three basic criteria to ensure they are "real, credible, quantifiable and enforceable." These require the project to: disclose who the other partners are, and whether they may have interests in the emissions reductions; meet all existing rules and standards; and finally present numbers that are defensible to the California

Air Resources Board and the Environmental Protection Agency.[137] As with DER trading programs, however, there are no "additionality" tests in addition to these more basic criteria.

Contact Information

Kathryn Higgins, Program Director, California Air Quality Investment Program, South Coast Air Quality Management District, khiggins@aqmd.gov
Web site: http://www.aqmd.gov/trans/aqip.html

ENDNOTES

[1] See, e.g., Tietenberg, T.H., *Emissions Trading: An Exercise in Reforming Pollution Policy*. (Resources for the Future, Washington, DC, 1985); Harrison, David, *Tradable Permits for Air Pollution Control*, in INTERNATIONAL YEARBOOK OF ENVIRONMENTAL AND RESOURCE ECONOMICS 2001 (2001); Haites, Erik F., *Review of Alternative Emissions Trading Options*, prepared for the Ontario Pilot Emissions Reduction Trading Project (Toronto, Ontario, 1998).

[2] Dudek, Daniel & John Palmisano, *Emissions Trading: Why Is This Thoroughbred Hobbled?,* 13 Colum. J. Envtl. L. 217 (1988); Hahn, Robert & Gordon Hester, *Where Did All the Markets Go? An Analysis of EPA's Emissions Trading Program*, 6 Yale J. on Reg. 109 (1989); Elman, Barry, et al., *Economic Incentives Under the Clean Air Act* (USEPA 92-176.05, May 1992); Anderson 1997.

[3] Since emissions credit trading systems are project-based, they may be grafted onto any appropriate environmental regulatory system, whereas allowances are always associated with an emissions cap program. The cap-and-trade approach differs markedly from credit trading because it combines a specific regulatory system – an emissions cap – with a trading system. Under a cap-and-trade system, trading system rules such as the definition of baselines and protocols are comprehensively defined at the outset; and all tradeable allowances are allocated at one time, instead of being created on a project-by-project basis. The allowance trading system combines very high environmental integrity with a major opportunity for trading with low transaction costs, but it can only be used when an emissions cap is created for a defined pollutant and set of sources.

[4] See generally National Academy of Public Administration, *Analysis of Volatile Organic Compound Air Pollution Trading Systems* (Washington, D.C., June 2000); Swift, Byron, Environmental Law Institute, *How Environmental Laws Work: An Analysis of the Utility Sector's Response to Regulation of Nitrogen Oxides and Sulfur Dioxide Under the Clean Air Act*, 14 Tulane Envt'l L.J. 309 (Summer 2001) [www.epa.gov/airmarkets/articles/index.html].

[5] These concepts are defined as follows: "EPA's bubble lets existing plants (or groups of plants) increase emission at one or more emission sources in exchange for compensating extra decreases in emissions at other emission sources....Netting may exempt 'modifications' of existing major sources from certain preconstruction permit requirements under New Source Review (NSR), so long as there is no net emission increase....In nonattainment areas, major new stationary sources and major modifications are subject to a preconstruction permit requirement that they secure sufficient surplus emission reductions to more than 'offset' their emissions." EPA, Emissions Trading Policy Statement, 51 Fed. Reg. 43,814 (Dec. 4, 1986).

[6] *See* U.S. Environmental Protection Agency, IMPROVING AIR QUALITY WITH ECONOMIC INCENTIVE PROGRAMS: FINAL GUIDANCE, EPA-452/R-01-001 (January 2001); U.S. EPA, Final Economic Incentive Rules: 59 Fed. Reg. 16690 (April 7, 1994); U.S. Environmental Protection Agency, Proposed Model Open Market Trading Rule for Ozone Smog Precursors, 60 Fed. Reg. 39668 (August 3, 1995); U.S. EPA, Emissions Trading Policy Statement, 51 Fed. Reg. 43,814 (Dec. 4, 1986) (pt. I).

[7] Hahn and Hester estimate that bubbles produced compliance cost savings of $435 million over 6 years (about $70 million per year), offsets yielded negligible savings, banking resulted in very small savings, and netting saved some $525 million to $12 billion over 6 years ($90 million to $2 billion per year). Hahn, Robert & Gordon Hester, *Where Did all the Markets Go? An Analysis of EPA's Emissions Trading Program*, 6 Yale J. on Reg. 109 (1989). *See also* Dudek, Daniel & John Palmisano, *Emissions Trading: Why Is This Thoroughbred Hobbled?* 13 Colum. J. Envtl. L. 217 (1988); Hahn, Robert & Gordon Hester, *Where Did All the Markets Go? An Analysis of EPA's Emissions Trading Program*, 6 Yale J. on Reg. 109 (1989).

[8] *See, e.g.,* Naughton, Michael, *Establishing Interstate Markets for Emission Trading of Ozone Precursors*, 3 N.Y.U. Envt'l L.J. 195, 211 (1994); Robert Hahn & Gordon Hester, *Marketable Permits: Lessons for Theory and Practice*, 16 Ecology L.Q. 361 (1989); James Tripp & Daniel Dudek, *Institutional Guidelines for Designing Successful Transferable Rights Programs*, 6 Yale J. on Reg. 381 (1989). Some writers attribute the lack of credit trading to a lack of timeliness in the rules for specific trading programs, arguing some programs have been delayed to the point that firms have had to choose and execute compliance options by the time the final guidance from EPA has become available. *See* Barry Elman et al., *Economic Incentives Under the Clean Air Act* (USEPA 92-176.05, May 1992) (re: timing of EPA's 1986 Emissions Trading Policy Statement).

[9] U.S. Environmental Protection Agency, Proposed Model Open Market Trading Rule for Ozone Smog Precursors, 60 Fed. Reg. 39,668 (August 3, 1995).

[10] It should be noted that the above list is not all-inclusive, as credit systems do not modify the underlying rate-based regulatory approach in the Clean Air Act. Therefore, certain process changes or shutdowns in some states would not be eligible for credits because under the Clean Air Act, shifting the base technologies would be expected to also shift the applicable rate limits. To some extent, therefore, crediting systems will favor reductions made by adding controls rather than through shifting to cleaner processes.

[11] EPA, Emissions Trading Policy Statement, 51 Fed. Reg. 43,814 (Dec.4, 1986) (pt. I); *see also* EPA, IMPROVING AIR QUALITY WITH ECONOMIC INCENTIVE PROGRAMS, *supra* note 8, at 93.

[12] See generally USEPA, rules for offsets at 40 C.F.R. §§ 51.165 (a)(3) and (b)(3), and 40 C.F.R. § 51 App. S, *Emission Offset Interpretive Ruling*; Final Economic Incentive Rules, 59 Fed. Reg. 16690 (April 7, 1994); Proposed Open Market Trading Rule, 60 Fed. Reg. 39668 (Aug. 3, 1995).

[13] Clean Air Act § 173(a), 42 U.S.C. § 7503(a); 40 C.F.R. § 51.165.

14. We note that if the offset requirements in the context of non-attainment rules were judged to independently assure offsetting emissions reductions in the non-attainment airshed, the LAER requirement should be eliminated, as it promotes extreme inflexibility and does not allow the trading program to achieve any cost reductions. See part II E, infra.

[15] The Ozone Transport Commission has developed a Memorandum of Understanding that defines the opportunities for interstate trading of offset credits. See Ozone Transport Commission, *Memorandum of Understanding 00-2: Amendment #1 (Regarding Interstate Trading) to the May 18, 1993, Memorandum of Understanding among the States of the Ozone Transport Commission on Intrastate NOx Emission Offset Trading Programs* (2000).

[16] Clean Air Act § 173(c), 42 USC § 7503(c); 40 C.F.R. § 51.

[17] In other words, once created, offset credits must be transferred to a new source and used within ten years. However, as long as their use commences within this time period, their life is perpetual.

[18] Therefore, if a source permanently reduced its emissions by half to create offsets, but later the applicable rate standard for that source is also reduced in half, these particular offsets are eliminated.

[19] See U.S. Environmental Protection Agency, 2000d, *Proposed Draft Guidance on BACT for dry low-NOx turbines*, 65 Fed. Reg. 50202 (August 17, 2000); Swift, Byron, *Grandfathering, New Source Review and NOx – Making Sense of a Flawed System*, 31 Environment Reporter (BNA) 1538-1546 (July 21, 2000).

[20] We note that the best option would be to impose a more structured trading program, such as an emissions cap and allowance trading system that places a limit on the overall emissions for the airshed. This has been done with RECLAIM in Los Angeles, and more recently in Houston. This allows the government to establish clearly defined targets, and assures the highest integrity to trading though an allowance system. In such a case, ideally the law should be amended to allow the cap-and-trade system to replace both the need for offset credits and LAER requirements.

[21] See, e.g. U.S. Environmental Protection Agency, Proposed Draft Guidance on BACT for Dry Low-NOx Turbines, 65 Fed. Reg. 50202 (August 17, 2000); Swift, Byron, *Grandfathering, New Source Review and NOx – Making Sense of a Flawed System,* 31 Environment Reporter (BNA) 1538-1546 (July 21, 2000). Note also that even if the New Source Review provisions such as LAER and BACT are eliminated, New Source Performance Standards still apply and require that new sources must be relatively clean. These NSPS standards, however, are not as stringent as, nor do they impose the very high economic costs of, the LAER requirements.

[22] In addition to the effect of the New Source Review provisions in attaining ambient air quality, it has been argued that the NSR standards, such as LAER and BACT, serve a second role in promoting innovation over time. However, one review of the role of such standards in forcing innovation in the energy generation sector found that the NSR standards promoted innovation in expensive, end-of-pipe hardware, and could in practice perversely interfere with the installation of cleaner and more efficient processes. See Byron Swift, Environmental Law Institute, *How Environmental Laws Work: An Analysis of the Utility Sector's Response to Regulation of Nitrogen Oxides and Sulfur Dioxide Under the Clean Air Act*, 14 Tulane Envt'l L.J. 312 (Summer 2001).

[23] In non-attainment areas, the "cap" is the number of tons of emissions from stationary sources in the non-attainment area. This is a somewhat imprecise number that is between actual emissions and the potential to emit of existing sources if they use all their permitted emissions. In the example, this "cap" was somewhere between 250 and 450 tons of emissions prior to the shutdown of source C, and between 200 and 380 tons after it.

[24] Under a cap-and-trade approach this reduction is done deliberately, by setting the cap at a level below historical emissions. Under the offset approach, the only way to reduce the number of tons of emissions is to deduct a portion of the credits from every trade, which is erratic as reductions depend on the number and extent of trades.

[25] See, e.g., 310 Code of Massachusetts Regulations 7.00, Appendix B (DER program); Michigan Administrative Code (MAC) R.336.2201 *et seq*.; New Hampshire Code Env-A 3100; New Jersey Administrative Code (NJAC) 7:27-30 (Emission Reduction Credit Trading Program), with background for proposed rules (28 NJ Register 1148, February 20, 1996) and final rules, 28 New Jersey Register 3414(a)7 (effective date of July 1, 1996); 30 Texas Administrative Code 101.29 (ERC and DER program rules). For Connecticut, information was obtained by interviews with the program administrator at Connecticut DEP, and from standard language in Connecticut Trading Orders and Agreements. See also USEPA, *Proposed Open Market Trading Rule*, 60 Fed. Reg. 39668 (Aug. 3, 1995).

[26] Mansnerus, L. *New Jersey Intends to End Incentive Plan on Pollution*, N. Y. Times, p. B8 (Sept. 18, 2002).

[27] See 40 C.F.R. § 51.493.

[28] See 42 U.S.C. § 7575(a)(4) ("best available control technology" (BACT) for new sources in attainment areas); 42 U.S.C. § 7503(a)(2) (lowest achievable emission reduction (LAER) technology for new sources in non-attainment areas); and 42 U.S.C. § 7412 (maximum achievable control technology (MACT) for hazardous pollutants). See, e.g. NJAC 7:27- 30.12(d)(a).

[29] NESCAUM, 1995. *Executive Summary: NESCAUM/MARAMA Emissions Trading Demonstration Project Phase III Report* (April 1995) (available at www.nescaum.org).

[30] Roughly 8,000 tons, or 80 percent of the tons in the pilot program, were generated by the Hudson and Mercer electricity generating plants owned by New Jersey Public Service Electric and Gas. NESCAUM 1995. Reductions at these plants were retroactively credited at the start of New Jersey's DER program in 1995, and have continued through 2000, accounting for roughly 96 percent of all tons generated in New Jersey's program.

[31] President William J. Clinton, "Reinventing Environmental Regulations," (March 16,1995), as quoted at 60 Fed. Reg. 39,668 (August 3, 1995).

[32] U.S. Environmental Protection Agency, *Proposed Policy on Open Market Trading Programs*, 60 Fed. Reg. 39,668 (August 3, 1995); U.S. Environmental Protection Agency, *Proposed Model Open Market Trading Rule for Ozone Smog Precursors*, 60 Fed. Reg. 44,290 (August 25, 1995).

[33] U.S. Environmental Protection Agency, IMPROVING AIR QUALITY WITH ECONOMIC INCENTIVE PROGRAMS: FINAL GUIDANCE, EPA-452/R-01-001 (January 2001).

[34] U.S. Environmental Protection Agency, *Proposed SIP Approval of New Hampshire's Open Market Emissions Trading Program*, 66 Fed. Reg. 9,278 (February 7, 2001); *Proposed SIP Approval of Michigan's Open Market Emissions Trading Program*, 66 Fed. Reg. 9,264 (February 7, 2001); *Proposed SIP Approval of New Jersey's Open Market Emissions Trading Program*, 66 Fed. Reg. 1,796 (January 9, 2001).

[35] U.S. Environmental Protection Agency, *1999 OTC NOx Budget Program Compliance Report* (March 27, 2000). See, e.g., New Jersey's OMET Registry, which shows that prior to 1999, NOx DERs were generated about 67 percent during the non-ozone season and 33 percent during the ozone season, but after 1999 are being generated 98 percent during the non-ozone season. The largest sources of generation are large power plants that are now subject to the OTC NOx emissions cap during the ozone season. Note also that some limited credit trading can take place during the ozone season. Connecticut allows budget sources to generate discrete credits, called budget emission reduction credits (BERCs), that can be used by other budget sources for RACT compliance. Information from Wendy Jacobs, Connecticut DEP (Nov. 2001).

[36] *See* 40 C.F.R. § 51.493(c); Economic Incentive Rules, 59 Fed. Reg. 16,690 (April 7, 1994). According to one state review, demand for DERs is driven by the need for temporary, interim measures that allow sources to exceed permit limits, such as Reasonably Achievable Compliance Technology (RACT), or other air quality regulations. They are also needed for temporary emission upsets, or for operational flexibility afforded by trading to allow a company to try alternative product formulations to meet customer demands. Texas Natural Resource Conservation Commission, *Discrete Emission Credit Banking and Trading Program Audit* at 10 (draft, Austin, Texas, 2001). In the most environmentally favorable situations, DERs could be used to allow a few years' grace period to allow a source to install more efficient and cleaner process technologies, or to allow a source to test an innovative technology.

[37] 310 CM 7.53. These outages meant that the Massachusetts utilities would utilize their fossil sources heavily in the summer, which would not cause a RACT violation since RACT is a rate standard, but would have led to higher overall emissions.

38. An important caveat to note with regard to the data for number of uses is that states were not consistent in what they reported as a discrete use action. To the extent possible, we use a definition of a use as one use by a single business entity or facility in one year. But not all states reported in this way, and so these figures on number of uses are indicative, and are not as reliable as those for tons used.

[39] Reasonably Achievable Control Technology (RACT) is defined at 42 U.S.C. § 7502(c)(1); 40 C.F.R. § 51.100(o). See also *Michigan vs. Thomas*, 805 F.2d 176, 180 (6th Cir. 1986) (interpreting RACT); U.S. EPA, 44 Fed. Reg. 53,762 (Sept. 17, 1979).

[40] Texas Natural Resource Conservation Commission, *Discrete Emission Credit Banking and Trading Program Audit,* at 11 (draft, Austin, Texas 2001).

[41] See, e.g., U.S. Environmental Protection Agency, 2001a, Proposed SIP Approval of New Hampshire's Open Market Emissions Trading Program, 66 Fed. Reg. 9,278 (February 7, 2001); U.S. Environmental Protection Agency, 2001b, Proposed SIP Approval of Michigan's Open Market Emissions Trading Program, 66 Fed. Reg. 9,264 (February 7, 2001); U.S. Environmental Protection Agency, 2001c, Proposed SIP Approval of New Jersey's Open Market Emissions Trading Program, 66 Fed. Reg. 1,796 (January 9, 2001).

[42] Note that a more appropriate comparison would not be total stationary source emissions, but the total emissions of the sources subject to RACT or similar requirements, which is the universe that the DER programs apply to. Existing sources subject to RACT requirements, however, would be expected to emit the majority of stationary source NOx emissions. For example, about 90 percent of the NOx emissions from the power generation sector (25 percent of all NOx emissions) are emitted by coal-fired plants, almost all of which were built before 1980 and not subject to NSR standards.

[43] For a skeptical view of the integrity of DER programs, see Public Employees For Environmental Responsibility, *Trading Thin Air, EPA's Plan to Allow Open Market Trading of Air Pollution Credits* (June 2000).

[44] The Acid Rain Program created rate-based standards for NOx emissions of utility units. 42 U.S.C. § 7651f. Annual results are published in U.S. Environmental Protection Agency, *1999 Compliance Report: Acid Rain Program* (EPA-430-R-00-007) (July 2000). Analysis of these results show that firms typically over-complied by 11 percent, and a third of Phase II firms were already below applicable limits as early as 1990. Swift, Byron, *How Environmental Laws Work: An Analysis of the Utility Sector's Response to Regulation of Nitrogen Oxides and Sulfur Dioxide Under the Clean Air Act.* 14 Tulane Envt'l. L.J. 309, 362-364 (Summer 2001).

[45] Some states impose a deduction for a design margin of 5 percent in such situations. However, sources may actually exceed 5 percent over-control during normal operations, as discussed in the prior note.

[46] Large power plants in northeastern states had to install reasonably available control technology (RACT) to control nitrogen oxides by May of 1995. Since large power plants have only two planned outages per year, firms had to install the equipment as much as 18 months prior to the compliance date. Once installed, many compliance technologies are not able to be turned on and off, but must be operated continuously, especially if they involve a process change. This was true of the OTC RACT rules, which generally required the installation of a low-NOx burner technology that permanently changed the operation and emissions of a boiler.

[47] One of the principal uses envisaged for DER programs was to allow firms flexibility in meeting RACT requirements. However, as indicated above, most large sources had already complied with RACT by the mid-1990s, thereby eliminating one of the principal potential sources of DER demand. However, Houston's new NOx emissions cap and allowance trading program allows DERs to be used in lieu of allowances, and so would be expected to promote the generation of DERs in that region. See 30 T.A.C. 101.356(f).

[48] Although adjusting standards to compensate for the potential negative effects of a DER program enhances the integrity of DER trading, it would result in more stringent standards, possibly making the overall program more expensive.

[49] The Houston area has just experienced such a tightening of its SIP program. There, the recent imposition of a stringent NOx emissions cap incorporating 75 percent reductions explicitly recognizes the role of the DER emission credit trading program by providing that any DERs created before 2005 would be discounted at a 10:1 ratio after that date. 30 T.A.C. 101.356(f)(3).

[50] The state believed that sources may have started to make reductions at the date the law was passed in 1994, and that the longer-than-expected time to promulgate regulations should not count against them. Interview with Joe Fontaine, New Hampshire DEP, March 5, 2001. However, for large power sources subject to the OTC RACT requirements, New Hampshire explicitly prohibits any pre-RACT (i.e., pre-5/31/95) start dates for DERs.

[51] 310 C.M.R. 7.00:Appendix B(3)(d)(4).

[52] N.J.A.C. 7:27-13.6(b); 28 N.J. Reg. 3414(a) (July 1, 1996).

[53] EPA noted that the "basis for evaluating New Jersey's OMET program, is whether it meets the SIP requirements," although EPA's review included consideration of its Economic Incentive Program Rules at 40 C.F.R. § 51, subpart U, its proposed policy on Open Market Trading Rules (Aug. 3, 1995 and Aug. 25, 1995) and the Proposed Action on the State of Michigan's Trading Rules (Sept. 18, 1997). Proposed SIP Approval of New Jersey's Open Market Emissions Trading Program, 66 Fed. Reg. 1796, 1799 (Jan. 9, 2001).

[54] See, e.g. New Jersey, N.J.A.C. 7:27-30.5(c), (e); Massachusetts, 310 C.M.R. 7.00: Appendix B(3)(c)(2); Michigan, M.A.C. R.336.2207(2)(b). EPA's economic incentive program guidance notes that baselines are to be set on the lower of actual or allowable emissions. 40 C.F.R. § 51.493(c)(2).

[55] Texas regulations explicitly state that "For reduction strategies that exceed 12 months, the baseline is established after the first year of generation and is fixed for the life of the strategy." 30 T.A.C. 101.29(a)(5).

[56] N.H. Code Env-A § 3103.07; N.J.A.C. § 7:27-30.6(a).

[57] U.S. Environmental Protection Agency, Proposed Model Open Market Trading Rule for Ozone Smog Precursors, 60 Fed. Reg. 39668 (Aug. 3, 1995).

[58] Michigan, M.A.C. R.336.2208(5); Massachusetts, 310 C.M.R. 7.00 Appendix B (2) (definition of Remaining Useful Life).

[59] 30 T.A.C. § 101.373 (c); 30 T.A.C. § 101.373(d)(1)(C).

[60] "In the event the owner of ERCs from a shutdown wishes to transfer the ERCs to the Mass ERC Bank [i.e. DERs], the Department will assign the ERCs from the shutdown a "remaining useful life" in years, which will be used to transfer the ERCs from the Rate ERC Bank to the Mass ERC Bank." 310 C.M.R. § 7.00, App. B(3)(c)(4)(d). In Massachusetts, the default amount is a ten-year life, unless the DEP judges that a lesser amount is appropriate, or the applicant shows a longer period can be allowed. The maximum is 20 years. This has been used one or two times for small amounts of credits.

[61] Since not all pollutants are regulated, allowing a shutdown to simultaneously generate DERs for several pollutants, NOx, SOx and VOCs for example, could lead to a situation where the NOx DERs are sold to one source which enables its multiple emissions to rise, the SOx DERs are sold to another source whose multiple emissions rise, etc. Thus, allowing DERs for multiple pollutants from a single action could allow increases in many pollutants, which is of particular concern for uncapped pollutants. Limiting DERs to a single pollutant provides a certain level of control on this effect.

[62] A typical provision is that of New Jersey's program: "If applicable EPA-approved measurement, testing and monitoring methods are available, the protocol shall specify that these methods shall be used" N.J.A.C. § 7:27-30.24(c).

[63] EPA 2001a, 2001b.

[64] N.J.A.C. § 7:27-30.24 (c)(3)(ii).

[65] 40 C.F.R. § 51.493(d).

[66] Environmental Defense, *Comments on the Proposed Rule: Approval and Promulgation of Implementation Plans, New Jersey Open Market Emissions Trading Program, Revised Interpretation of Operating Permit Requirements for Emissions Trades* (Mar. 12, 2001); Natural Resources Defense Council, *Comments on EPA's Proposed SIP Approval of the New Jersey Open Market Emissions Trading Program and Revised Interpretation of Operating Permit Requirements for Emissions Trades* (Mar. 12, 2001); Public Employees For Environmental Responsibility, *Trading Thin Air, EPA's Plan to Allow Open Market Trading of Air Pollution Credits* (June 2000).

[67] E-mail from Joseph Fontaine, New Hampshire DES (Nov. 7, 2001).

[68] N.J.A.C. § 7:27-30.5(d).

[69] M.A.C. R.336.2207(5).

[70] The Massachusetts regulations state that the applicant "must show that demand for the services or product will not or cannot shift to other similar sources in the State," and in the case of DERs from shutdown of electric generators, specifically requires that the NEPOOL marginal emissions rate or successor organization rate be deducted from the shutdown sources rate. C.M.R. 7.00:Appendix B(3)(c)(1)(f)(i).

[71] Interview with Judith Hull, Environment Canada, November 15, 2001.

[72] See, e.g., C.M.R. App. B(3)(f)(8).

[73] M.A.C. R.336.2212 (1),(2).

[74] T.A.C. § 101.29(d)(4)(E)(iv).

[75] N.J.A.C. § 7:27-30.5(b)(2).

[76] See, e.g., N.J.A.C. § 7:27- 30.6(a).

[77] An analysis of four years of trading in the national SO_2 allowance market, which imposes no directionality restrictions, indicated that only a very small net amount, equivalent to 3 percent of annual allowances, were traded inter-regionally, and that even these trades showed no particular directionality. U.S. General Accounting Office, Acid Rain: Emissions Trends and Effects in the Eastern United States, GAO/RCED-00-47 (March 2000); Swift, Byron, *Allowance Trading and SO_2 Hot Spots – Good News from the Acid Rain Program* 31 Env't Rep. (BNA) 954 (May 12, 2000).

[78] Allowance trading systems do not require verification because all allowances are issued by the government; the only issue therefore is authenticity of the allowance certificate, which is controlled through the use of serial numbers. Because of the emissions cap and the very accurate monitoring, allowance trading systems achieve virtually 100 percent integrity without a need for verification, dramatically lowering transaction costs in allowance transactions as well.

[79] PERT is presently a voluntary program and has no regulatory standing. At present there is no opportunity to use the credits for regulatory compliance, but if such opportunities are provided, the reductions would be subject to review and verification by the Ministry of the Environment, and they could be discounted or rejected.

[80] The Massachusetts regulations require the DEP to make a number of determinations to certify the validity of the generation action, C.M.R. 7.00, App. B(3)(d). Connecticut information is from interviews with Wendy Jacobs,

Connecticut DEP (March 13 and April 3, 2001).

[81] 30 T.A.C. §§ 101.372(h), 101. 373(e); TNRCC 2001, supra note 31, at 3.

[82] Interview with Matt Baker, TNRCC (March 16, 2001).

[83] Interview with Robin James, Secretariat of PERT (March 5, 2001).

[84] N.J.A.C. § 7:27- 30.10.

[85] New Jersey has established a shared liability system, where the generator is responsible for ensuring that it has generated DERs in accordance with the program rules, and that the DERs are real, surplus, and properly quantified. The verifier is responsible for making the notice of verification true, accurate, and complete, and for making a diligent inquiry to check that the generated credits are real, surplus, and properly quantified. The user is responsible for ensuring that its use of DERs complies with the regulations, including requirements on the geographic scope of trading and the prohibitions on use, and that all DERs used satisfy the requirements of N.J.A.C. § 7:27-30.8(a). See N.J.A.C. § 7:27-30.21. Finally, in any enforcement action, the generator, verifier, and user bear the burden of proof on each of their respective responsibilities. *Id*. For example, if a user had correctly used verified DERs, but the department determined that the DERs had been verified incorrectly, the user would be required only to replace valid DERs for the invalid ones, and the verifier would be liable. The enforcement provisions simply state that violators are subject to civil and criminal penalties. N.J.A.C. § 7:27-30.30.

[86] Clean Air Canada Incorporated, GUIDANCE MANUAL ON EMISSION REDUCTION REPORTING REQUIREMENTS, CACI/GM-01-D4 (draft of June 30, 2001). This Manual states in section 3.3: "A Verification Report is prepared by a qualified independent verifier and can be submitted separately or along with a creation report. The verification report confirms the reduction claims made for one or more years." The use of this third-party verification has only just begun, and only two submissions have included it to date. E-mail memorandum of Robin James, Clean Air Canada Secretariat (October 10, 2001).

[87] New Hampshire's enforcement rules states that "The DER user source shall be responsible for assuring that the generation and use of DERs comply with this rule." N.H. Code Env-A § 3110.01. However, EPA interprets the New Jersey statute to "divide[] compliance responsibilities between the generator and user of discrete credit. In general, the generator and user are responsible for actions within his or her control...." 66 Fed. Reg. at 9282.

[88] In Michigan, notices to generate or use are self-certified. The regulatory authority conducts a 30-day "completeness review," but does not approve such notices. M.A.C. R.336.2213(5). According to the program administrator, the completeness review actually covers quite a bit more than administrative completeness, and about 1/3 of all submittals are deemed "incomplete" the first time around, but the applicant is ultimately responsible for the accuracy and truth of information. Interview with Lou Jager, Michigan DEQ (Dec. 18, 2000).

[89] Environmental Defense, *Comments on the Proposed Rule: Approval and Promulgation of Implementation Plans, New Jersey Open Market Emissions Trading Program, Revised Interpretation of Operating Permit Requirements for Emissions Trades* (Ma. 12, 2001).

[90] N.H. Code Env-A § 3104.01. The source must only submit a Notice and Certification of Use, and the DES will modify the source's permit to reflect the use of the DERs during the next scheduled permit review.

[91] An example of this is that the largest power station in New Hampshire is Merrimac 2, of 320 MW capacity. New Hampshire's NOx RACT standards for utility boilers is specifically targeted to that plant, and states that any

wet bottom cyclone boiler equal to or greater than 320 MW must comply with a special ton-per-day limit N.H. Code

Env-A § 1211.

[92] Information from Joe Fontaine, N.H. DES, e-mail of Nov. 7, 2001.

[93] N.J. DEP, Adoption Document, Docket no. 03-96-01/580) (June 3, 1996) (response to comment 211). In another comment, the agency goes on to state: "The Department recognizes that the USEPA proposed a buyer beware system in part to address the difficulty that states may have in taking enforcement action against out of state generators. However, the Department believes that enforcement of a buyer beware system could be too problematic to be credible deterrent... .

"It would be technically difficult and resource intensive to enforce a pure buyer beware system. To determine whether a user is in compliance under any emissions trading system, a state agency would need to verify the DERs a user is holding to cover its compliance obligation are real, surplus and properly quantified. To do this, the enforcing agency would need to review all documentation relating to the generation of the DERs; determine whether that documentation is sufficient, accurate and complete; ... to determine whether the user has selected an appropriate quantification protocol; and determine whether the user has properly applied the protocol and correctly quantified the DERs. It is unlikely that the Agency would have the resources to inspect a reasonable number of user and generator facilities [which] would have the potential to encourage the generation of questionable DERs. In addition, these tasks are made especially difficult when the generator is likely to be in another state. . .

"A buyer beware system also creates problems that may discourage many potential users from participating in the market... [These difficulties] may discourage conscientious users from participating in a strictly buyer beware system.... For the reasons discussed above, the buyer beware approach, though open, may then discourage trading and thereby prevent the development of a robust market in DERs." 28 N.J.R. 1152.

[94] We note that DER programs could adopt a system of selective verification, with all large projects verified upon generation, and small ones upon use. This would reduce the administrative workload of the regulatory agency, but could discourage small projects, as users may prefer to use already verified credits.

[95] U.S. Environmental Protection Agency, Proposed SIP Approval of New Jersey's Open Market Emissions Trading Program, 66 Fed. Reg. 1796, 1803 (Jan. 9, 2001).

96. N.J.A.C. § 7:27-30.7 *et seq*.

[97] N.J.A.C. § 7:27- 13.16.

[98] N.J.A.C. § 7:27- 13.18.

[99] TNRCC 2001, supra note 31, at 3.

[100] N.H. Code § 3103.08.

[101] *Id*. §§ 3104.08, 3104.09.

[102] See websites noted at the state program discussion in the Appendix to this report. New Hampshire also publishes a notice of availability of its registry for public inspection twice yearly in a newspaper.

[103] N.J.A.C. § 7:27- 30.8(c).

[104] In New Jersey, fees are charged for every posting, and are generally $10 plus 20 cents per DER. See www.omet.com.

[105] New Jersey held an open discussion of the issues with interested parties on open-market trading on September 19, 1995, and held a public hearing on March 7, 1996, after the proposal of the DER system on February 20. The public could also submit comments by March 21, 1996. Also, on July 6, 1999, New Jersey proposed amendments to the OMET program and held a public hearing on August 5, 1999, and requested public comments by August 20, 1999. 66 Fed. Reg. at 1801.

[106] See, e.g. U.S. Environmental Protection Agency, 2001c, Proposed SIP Approval of New Jersey's Open Market Emissions Trading Program, 66 Fed. Reg. 1796, 1802 (Jan. 9, 2001); TNRCC 2001, supra note 31.

[107] See, e.g., N.J.A.C. § 7:27-30.19.

[108] The Ontario program uses Clean Air Action as its official registry, but this can only be searched for actions generating or using DERs in the province. This does not identify the many DER generation actions that have been made out of the province, but have been approved for use in Ontario.

[109] PERT's review process currently operates as a multi-stakeholder working group, which has reviewed 45 to 50 applications to date. Minutes are kept regarding all evaluations of trading applications, which are available on the Web site along with the applications. These reviews decide whether a proposed action meets PERT's criteria and hence can be listed in the registry. They also offer advice and comment on the baseline and method of calculating the emission reductions, but they do not approve the baseline or calculation method. The proponent is free to ignore the advice on those issues, but the comments are available to buyers and the public.

[110] See, e.g., N.J.A.C. § 7:27-30.12(b); N.H. Code Env-A § 3104.06. In addition, the number of credits are reduced in penalty provisions for late filing of any of the required notices.

[111] See, e.g., N.J.A.C. § 7:27-30.30.

[112] T.A.C. § 101.29(d)(4)(H)(ii); N.H. Code Env-A § 3110.02(a).

[113] N.J.A.C. § 7:27- 30.10(e).

[114] U.S. Environmental Protection Agency, 2001c, Proposed SIP Approval of New Jersey's Open Market Emissions Trading Program, 66 Fed. Reg. 1796 (Jan. 9, 2001).

[115] 30 T.A.C. § 101.29(d)(4)(C).

[116] 310 C.M.R. § 7.00, App. B(3)(f).

[117] N.J.A.C. § 7:27-30.13(c).

[118] Interview with Ed Szumowski, Massachusetts DEP (Dec. 7, 2000). Currently the price of a rate-based ERC is $6,500 per ton per year; DER prices vary from $500 to $750 per ton, so even after discounting the stream of DERs, it would not make sense to purchase DERs unless the new facility is expected to operated a relatively short time.

[119] In all cases, the number of employees in the state program was obtained from an interview or e-mail from the lead official in charge of the state credit trading program.

[120] McLean, Brian, *Lessons Learned Implementing Title IV of the Clean Air Act*, EPA 95-RA 12004 (1995).

[121] Information on employees from EPA, Clean Air Markets Division (e-mail of Sept. 28, 2001); information on allowances traded from EPA, Acid Rain Program: Annual Progress Report, 2000, EPA-430-R-01-008, at 12 (August

2001). At least 1.2 million allowances were used for compliance purposes because collectively all 2,262 covered units emitted 1.2 million tons over the allowance allocation. However, the total number of tons of allowances that were used by individual units in order to emit over their allocation amount will be higher than this number.

122 Connecticut Dept. of Environmental Protection, *2nd NOx Emissions Trading Audit Report* (Jan. 19, 2001).

123 Connecticut Dept. of Environmental Protection, *Credit Trading Policy for Sources with Irregular NOx Emissions* (updated Jan. 12, 2001).

124 During the ozone season, the state requires the use of OTC NOx allowances by the two plants to cover all emissions, ensuring that total emissions fit under the budget cap and so cannot grow. In 2002, the state will provide allowances to these gas plants from the state's budget set-aside for new sources, less a 100-ton deduction for the environment. Starting in 2003 and in subsequent years, these plants will receive a growing number of allowances from the state's regular budget, but the allowances allocated to these new plants will slowly reduce the amount allocated to PSNH's six existing fossil-fuel fired boilers, until in 2007 all plants will be allocated allowances on an output basis. During the non-ozone season and to cover the offset ratio requiring an extra 20 percent reduction, the state will require the new plants to use NOx DERs to compensate for their emissions.

125 See N.H. Code of Administrative Rules Env-A § 1211.03(c)(1)(b).

126 See, e.g., N.H. Code of Administrative Rules Env-A § 3006.12.

127 Note that these figures do not include 4,724 tons of NOx DERs generated by PSNH at two power stations, which are not tradeable pursuant to a RACT order, but may be used by PSNH for its future operations.

128 *See*, Mansnerus, L. *New Jersey Intends to End Incentive Plan on Pollution*, N. Y. Times, p. B8 (Sept. 18, 2002). (Reporting that the major generator had forfeited its credts, and the State Commissioner of Environmental Protection Bradley Campbell "said that the state would not prosecute any companies that had bought credits in good faith, but that enviromental officials did not know of any compaines still relying on the program.")

129 NESCAUM, 1995, *Executive Summary: NESCAUM/MARAMA Emissions Trading Demonstration Project Phase III Report* (April 1995) (available at www.nescaum.org).

130 TNRCC 2001, Appendix A, supra note 31, lists the major changes in the new rules. One interesting provision allows DERs to be used as allowances in the very strict new Houston NOx cap-and-trade program at a 10:1 ratio after Jan 1, 2005. 30 T.A.C. § 101.356(f).

131 TNRCC 2001, supra note 31, at 10.

132 "Industries were asked in a telephone survey to rate their experience with TNRCC in getting approvals, to which they responded they were very satisfied. This was not the case in the early years of the emission credits program, as one industry spokesperson said, but it has been good to excellent in recent years, with very knowledgeable staff who will return calls and provide answers to questions. The lack of agency response to industry in the early years could have affected economic benefits to the industry, but is not the case now. In fact, industry respondents unanimously stated the DERC program is of economic importance to their business when asked that specific question, and all stated that the benefits of trading and using the program outweighed the cost." TNRCC 2001, supra note 31, at 9, 11.

133 Texas Natural Resource Conservation Commission, *Discrete Emission Credit Banking and Trading Program Audit,* at 7 (draft, Austin, Texas 2001).

134 *Id.*

[135] Rule 2202 – On-Road Motor Vehicle Mitigation Options was adopted on December 8, 1995. One of the compliance strategies under Rule 2202 allows employers to invest in the AQIP. Monies received are placed in a restricted account to fund programs that result in equivalent emission reductions that would otherwise have been achieved by the participating employers.

[136] Interviews with Kathryn Higgins, program manager for AQIP, and Shashi Singeetham of AQIP staff (June 2001). *See also* South Coast Air Quality Management District, *Rule 2202 - On-Road Motor Vehicle Mitigation Options Status Report* (Aug. 18, 2000) (1999 data).

[137] Interview with Kathryn Higgins, program manager for AQIP (June 2001).