

# Enforcing Cap-and-Trade: A Tale of Two Programs

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## I. INTRODUCTION

The ease of enforcement is often cited as a benefit of the cap-and-trade regulatory approach. Cap-and-trade programs have been credited with having a “far simpler enforcement system” than traditional air pollution regulation, with 100% compliance achievable “with virtually no enforcement effort.”<sup>1</sup> It has been said that all an environmental agency needed to do once a cap-and-trade program is legislated into existence, is to “set up the reporting and accounting system needed to ensure adequate enforcement”—a task that is “much less demanding and time-consuming” than writing regulations for traditional environmental regulation.<sup>2</sup> Governmental administration costs for cap-and-trade are reportedly lower than for traditional regulation, and the relationship between regulators and regulated entities is less conflict-ridden.<sup>3</sup>

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1. Byron Swift, *U.S. Emissions Trading: Myths, Realities, and Opportunities*, NAT. RES. & ENVTL., May-Aug. 2005, at 5.

2. Denny Ellerman, *Are Cap and Trade Programs More Environmentally Effective than Conventional Regulation?*, in *MOVING TO MARKETS IN ENVIRONMENTAL REGULATION: LESSONS FROM TWENTY YEARS OF EXPERIENCE* 52 (Jody Freeman & Charles D. Kolstad, eds., 2007).

3. Swift, *supra* note 2, at 5, 7. See also Sam Napolitano et al., *The U.S. Acid Rain Program: Key Insights from the Design, Operation, and Assessment of a Cap-and-Trade Program*, 20 *ELECTRICITY J.* 47, 51 (2007) (stating that the flexibility of cap-and-trade regulation “minimizes the administrative costs”); *id.* at 57 (discussing how regulators can create a cooperative relationship with industry in a cap-and-trade program).

Many of these assertions have been made in the context of discussions about the Acid Rain Program (ARP), a cap-and-trade program that began in the mid-1990s to reduce the sulfur dioxide (SO<sub>2</sub>) emissions from the nation's power plants.<sup>4</sup> However, another cap-and-trade program established at about the same time with enforcement provisions modeled after the ARP tells a very different story. In the Regional Clean Air Incentives Market (RECLAIM) program, designed to reduce the emissions of precursors to smog in Los Angeles, enforcement turned out to be very burdensome for the government. From the point of view of the environmental agency that administered the program, "an unanticipated consequence of RECLAIM was the enormous amount of resources it takes to adequately monitor and enforce compliance."<sup>5</sup>

This Article uses the histories of the ARP and RECLAIM to show that even when monitoring and enforcement provisions for cap-and-trade programs are designed in a similar way,<sup>6</sup> the resulting enforcement systems and enforcement outcomes may be very different. Part I of the article tells the enforcement story of the ARP. It appears to be a story of regulatory efficiency and success. Part II tells the enforcement story of RECLAIM. While not a failure, RECLAIM enforcement seems to have been full of difficulties that necessitated large amounts of administrative time and resources. This part presents the results of an empirical analysis of RECLAIM enforcement actions from 1994 through 2006. The analysis shows that RECLAIM had many more enforcement actions than the ARP, despite the fact that the ARP was a much larger cap-and-trade program in terms of the volume of pollution regulated. Similarly, the amount of monetary penalties assessed in RECLAIM for non-compliance was much larger than the amount assessed in the ARP.

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4. See, e.g., Ellerman, *supra* note 3; Swift, *supra* note 1; Dallas Burtraw & Byron Swift, *A New Standard of Performance: An Analysis of the Clean Air Act's Acid Rain Program*, 26 ENVTL. L. REP. 10,411, at 10,421–22 (1996) (stating that that the program's "compliance mechanism is open and straightforward, and together with the Act's penalty provisions, create an almost self-executing enforcement system," and further stating that "there has been virtually 100 percent compliance . . . with little need for enforcement action").

5. S. COAST AIR QUALITY MGMT. DIST., OVER A DOZEN YEARS OF RECLAIM IMPLEMENTATION: KEY LESSONS LEARNED IN CALIFORNIA'S FIRST AIR POLLUTION CAP-AND-TRADE PROGRAM I-3-6 (2007) [hereinafter OVER A DOZEN YEARS OF RECLAIM], available at [http://www.aqmd.gov/reclaim/docs/Policy\\_Paper\\_Part1.pdf](http://www.aqmd.gov/reclaim/docs/Policy_Paper_Part1.pdf).

6. Cf. John K. Stranlund, Carlos A. Chávez & Barry C. Field, *Enforcing Emissions Trading Programs: Theory, Practice, and Performance*, 30 POL'Y STUD. J. 343, 348 (2002) (stating that "the monitoring strategies of the SO<sub>2</sub> and RECLAIM programs are quite similar").

## II. THE ENFORCEMENT STORY OF THE ARP

The ARP is viewed as a very successful environmental regulatory program.<sup>7</sup> It was created by the Clean Air Act Amendments of 1990, and it is administered by the US Environmental Protection Agency (EPA). The program began in 1995 by regulating the emissions of the country's largest coal-fired combustion units, and it expanded significantly in 2000 to include gas- and oil-fired combustion units.<sup>8</sup> Commentators have particularly lauded the program's achievements in compliance and enforcement: the program has achieved almost 100% compliance and it did so using sophisticated technology that facilitated the collection, transmission, and verification of compliance.<sup>9</sup> Like the story of the program itself, the ARP's enforcement story is one of success and efficiency.

### A. Continuous Electronic Verification

In the ARP, the EPA forged a system of self-monitoring and enforcement that relied heavily on technology. The EPA required many of the regulated sources to install costly emissions monitoring technologies that provide continuous data.<sup>10</sup> The EPA then developed sophisticated information technology systems through which the data could be transmitted and analyzed.<sup>11</sup> The result was an "electronic verification"

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7. See, e.g., Napolitano et al., *supra* note 4, at 47 David Harrison et al., *Using Emissions Trading to Combat Climate Change: Programs and Key Issues*, 38 ENVTL. L. REP. NEWS & ANALYSIS 10,367, 10,370 (2008); Swift, *supra* note 1, at 3.

8. The EPA defines a "unit" as a fossil fuel-fired combustor that serves a generator that provides electricity for sale. See ENVTL. PROT. AGENCY, ACID RAIN PROGRAM 2004 PROGRESS REPORT, EPA 430-R-05-012 5 (2005), available at <http://www.epa.gov/airmarkets/progress/docs/2004report.pdf> [hereinafter ACID RAIN PROGRAM REPORT 2004]. The original 263 units included in Phase I of the program were located in 110 electricity generation facilities. A. DENNY ELLERMAN ET AL., MARKETS FOR CLEAN AIR: THE U.S. ACID RAIN PROGRAM 6 (2000), available at <http://catdir.loc.gov/catdir/samples/cam032/99016913.pdf>. Phase I also included a number of "substitution units," bringing the total number of units participating in the first year of the program to 445 (see Table 1 *infra* p. ). Cf. Lesley K. McAllister, *The Overallocation Problem in Cap-and-Trade: Moving Toward Stringency*, 34 COLUM. J. ENVTL. L. 396, 434 (2009). See *infra* Table 1 for the number of units participating in the program in the years 1995 through 2007.

9. Swift, *supra* note 1, at 4.

10. Blas Pérez Henríquez, *Information Technology: The Unsung Hero of Market-Based Environmental Policies*, RESOURCES, Fall/Winter 2004, at 11 (citing an average annual cost of about \$124,000 per unit).

11. Joe Kruger & Christian Egenhofer, *Confidence Through Compliance in Emissions Trading Markets*, 6 SUSTAINABLE DEV. L & POL'Y 2, 5 (2006) (on "Extensive Use of Information Technology").

system that largely avoided the need for the agency to conduct field inspections to verify self-reported data.

The ARP featured very detailed monitoring and reporting rules. The “Part 75” rules number several hundred pages, setting forth the requirements about how a unit subject to the program must register with the EPA, select a monitoring technology, install and certify monitoring systems, monitor and record emissions data, conduct quality assurance/quality control procedures, maintain records, and report emissions.<sup>12</sup> EPA has also developed an online policy manual about ARP monitoring and reporting requirements that is about five-hundred pages long and is continually updated.<sup>13</sup>

The program’s largest polluters, namely the coal-fired power plants, were required to install Continuous Emissions Monitoring Systems (CEMS).<sup>14</sup> CEMS are “electromechanical instruments that sample, analyze, measure, and record” emissions information that are installed in the smoke stack through which emissions pass.<sup>15</sup> A “data acquisition and handling system” records all data from the monitoring systems, translates it into the required units of measure, and stores the data. Overall, about 36% of regulated units were required to use CEMS, covering about 96% of emissions.<sup>16</sup>

Gas- and oil-fired plants are allowed to use alternative methods based on measurements of their fuel usage.<sup>17</sup> For most such units, the rules require that there be continuous monitoring of the fuel flow rate and periodic sampling of the fuel characteristics, such as sulfur content and

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12. Joseph Kruger, *Companies and Regulators in Emissions Trading Programs*, in EMISSIONS TRADING: INSTITUTIONAL DESIGN, DECISION MAKING AND CORPORATE STRATEGIES 3, 12 (Ralf Antes, Bernd Hansjürgens, Peter Letmathe, eds., 2008), available at <http://www.rff.org/documents/RFF-DP-05-03.pdf>. See also CLEAN AIR MARKETS DIV., U.S. ENVTL. PROT. AGENCY, PLAIN ENGLISH GUIDE TO THE PART 75 RULE 8–17 (2009), available at [http://www.epa.gov/airmarkets/emissions/docs/plain\\_english\\_guide\\_par75\\_final\\_rule.pdf](http://www.epa.gov/airmarkets/emissions/docs/plain_english_guide_par75_final_rule.pdf).

13. Kruger, *supra* note 12, at 11.

14. 42 U.S.C.A. § 7651k (2000) (current version at 42 U.S.C.A. § 7651 (2010)).

15. Arnold W. Reitze, Jr. & Steven D. Schell, *Self-monitoring and Self-reporting of Routine Air Pollution Releases*, 24 COLUM. J. ENVTL. L. 63, 107 (1999).

16. Kruger & Egenhofer, *supra* note 13, at 15 n.12.

17. John Schakenbach, Robert Vollaro & Reynaldo Forte, *Fundamentals of Successful Monitoring, Reporting, and Verification under a Cap-and-Trade Program*, 56 J. OF THE AIR & WASTE MGMT. ASSOCIATION 1576, 1577 (Nov. 2006). These are referred to as the Appendix D units, referring to Appendix D of the Part 75 Rules.

density.<sup>18</sup> The fuel flow rate data are then used together with the results of the fuel sampling and analysis to determine the SO<sub>2</sub> emission rate.<sup>19</sup> Gas- and oil-fired units that have emissions below a certain threshold are considered “low mass emitters” and are not required to continuously monitor their emissions.<sup>20</sup> Rather, they estimate their hourly SO<sub>2</sub> emissions using fuel usage data and default emissions factors.

The rules specify a variety of quality assurance and quality control (QA/QC) requirements depending on which monitoring technologies are employed.<sup>21</sup> For example, there are strict requirements for testing the accuracy of the CEMS. After installing the CEMS, the facility is required to conduct certification tests and submit a certification application including the test results.<sup>22</sup> Once certified, the source is also required to perform QA testing on a regular basis using either in-house or contracted expertise.<sup>23</sup> Required QA testing includes daily assessments (e.g., calibration error tests), quarterly assessments (e.g., linearity checks), and semi-annual or annual relative accuracy test audits (RATAs).<sup>24</sup>

The regulations require that the facility notify EPA and the state air agency when QA testing is taking place so that the government could send an observer.<sup>25</sup> As an incentive for high accuracy readings, the regulations provide for reduced QA testing requirements when favorable test results are achieved.<sup>26</sup> The rules contain missing data provisions (MDPs) that must be applied to estimate emissions when continuous monitoring equipment is not functioning or has not passed QA tests.<sup>27</sup> The more data that is missing, the more that the MDPs are designed to overestimate actual emissions. This gives sources an incentive to ensure that their monitoring equipment is operational and quality assured.<sup>28</sup>

The program has featured extensive use of information technology to electronically audit the very large volume of emissions data generated

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18. U.S. ENVTL. PROT. AGENCY, *supra* note 13, at 29; interview with EPA CAMD staff, EPA, in D.C. (Sept. 17 2009) (stating that 2-3% of emissions under the program are monitored in this way).

19. U.S. ENVTL. PROT. AGENCY, *supra* note 13, at 29.

20. U.S. ENVTL. PROT. AGENCY, *supra* note 13, at 43 (§ 75.19); interview with CAMD staff, EPA, in D.C. (Sept. 17 2009) (stating that less than 1% of emissions under the program are monitored in this way).

21. *Cf.* Schakenbach et al., *supra* note 18, at 1579.

22. Reitze & Schell, *supra* note 16, at 118.

23. Schakenbach et al., *supra* note 18, at 1583.

24. U.S. ENVTL. PROT. AGENCY, *supra* note 13, at 16.

25. Schakenbach et al., *supra* note 18, at 1583.

26. *Id.* at 1577.

27. *Id.* (explaining that the program’s “missing data provisions” (MDPs) get progressively more stringent the longer that the monitoring device is inoperative).

28. U.S. ENVTL. PROT. AGENCY, *supra* note 13, at 80. *See also* Lesley K. McAllister, *Putting Persuasion Back in the Equation: Compliance in Cap and Trade Programs*, 24 PACE ENVTL. L. REV. 300, 320–21 (2007).

under the program.<sup>29</sup> Regulated units report hourly emissions and related data to EPA four times a year (on a quarterly basis) in a standard electronic data reporting format.<sup>30</sup> A “designated representative,” generally a facility manager, must certify the truth and completeness of all reported data.<sup>31</sup>

Using the quarterly reports, EPA can track the quality of the emissions data throughout the year as well as the status of emissions as compared to the allowances held by each unit.<sup>32</sup> EPA has developed software that the regulated entities are encouraged to use to prescreen the data for errors.<sup>33</sup> Once EPA computers receive the reports, EPA performs additional electronic auditing to verify data accuracy and then notifies the source as to whether the quarterly data are acceptable or not.<sup>34</sup> Through the electronic auditing, the EPA may also determine the need for a field audit or inspection, which is generally performed by a state or local environmental agency official.<sup>35</sup>

Administrative, civil, and criminal penalties may apply for violations. If at the end of the compliance year a unit does not have sufficient allowances to cover its emissions, an automatic penalty is assessed for “excess emissions.” The penalty was statutorily set in 1990 at \$2,000 per ton of SO<sub>2</sub> and is indexed to inflation each year.<sup>36</sup> In addition, EPA automatically reduces the unit’s cap for the following year by the amount exceeded. Civil and criminal penalties are applicable for violations of monitoring and reporting rules, and they are also available at the EPA’s discretion to supplement the automatic excess emissions penalties.<sup>37</sup>

29. Kruger, *supra* note 12, at 10. *See also* Reitze & Schell, *supra* note 16, at 116 (stating that twenty units would generate three to four million data values each year).

30. U.S. ENVTL. PROT. AGENCY, *supra* note 13, at 86–87.

31. Marjan Peeters, *Inspection and Market-based Regulation through Emissions Trading: The Striking Reliance on Self-monitoring, Self-reporting and Verification*, 2 UTRECHT L. REV. 177, 180 (2006). *See also* Schakenbach et al., *supra* note 18, at 1583 (providing the certification statement language); Reitze & Schell, *supra* note 30, at 116 (stating that civil and criminal penalties can be imposed for false statements).

32. U.S. ENVTL. PROT. AGENCY, *supra* note 13, at 17.

33. Schakenbach et al., *supra* note 18, at 1578; Kruger & Egenhofer, *supra* note 12, at 4.

34. Schakenbach et al., *supra* note 18, at 1578; Kruger & Egenhofer, *supra* note 12, at 4; Napolitano et al., *supra* note 4, at 52–53.

35. U.S. ENVTL. PROT. AGENCY, *supra* note 13, at 88–89.

36. 42 U.S.C.A. § 7651j (1994) (current code at 42 U.S.C.A. § 7651j (2010)); Napolitano et al., *supra* note 4, at 58 n.7.

37. Napolitano, *supra* note 3, at 54; Byron Swift, *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 TUL. ENVTL. L.J. 309, 321 (2001).

## B. Enforcement Outcomes

The ARP appears to represent a great success in terms of emissions monitoring and enforcement. Notably, the program has generated a complete set of emissions data for the largest SO<sub>2</sub> sources in the country.<sup>38</sup> In contrast, for many environmental regulatory programs, the data collected by environmental agencies is insufficient to determine actual compliance rates and program effectiveness.<sup>39</sup> The ARP has also been cited as an example of “cooperative” enforcement. Interactions between the EPA and entities regulated by the program have tended to be “relatively harmonious.”<sup>40</sup> Finally, the program has reportedly required relatively minimal enforcement personnel and resources with its heavy reliance on electronic auditing of data rather than physical field inspections.<sup>41</sup>

Indeed, there have been strikingly few enforcement cases in the ARP, either for excess emissions or for monitoring violations. As shown in Table 1, from 1995, the first compliance year, through the 2007 compliance year, only 23 units out of a universe of about 3,500 that participated in the program in one or more years were assessed penalties for excess emissions.<sup>42</sup> In total, \$3,400,614 in penalties for excess emissions was collected. With respect to monitoring, nine sources were assessed a total of \$589,805 in monetary penalties for monitoring violations from 1995 through June 2005.<sup>43</sup> As described by the EPA, these violations have generally stemmed from failures to install and/or operate monitoring equipment, or failures to conduct the required testing of monitors or report the results.<sup>44</sup>

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38. *Id.* at 52.

39. *Cf.* Victor B. Flatt & Paul M. Collins, Jr., *Environmental Enforcement in Dire Straits: There is No Protection for Nothing and No Data for Free*, 85 NOTRE DAME L. REV. 55, 58–59 (2009).

40. Kruger, *supra* note 12, at 14. *See* Lesley K. McAllister, *Beyond Playing “Banker”: The Role of the Regulatory Agency in Emissions Trading*, 59 ADMIN. L. REV. 269, 287 (2007).

41. U.S. ENVIL. PROT. AGENCY, EPA430-B-03-002, TOOLS OF THE TRADE: A GUIDE TO DESIGNING AND OPERATING A CAP AND TRADE PROGRAM FOR POLLUTION CONTROL 4-6 (2003). *See also* McAllister, *supra* note 42, at 286-87; McAllister, *supra* note 29, at 321.

42. In addition to the automatic sanctions, EPA may also in its discretion assess civil or criminal penalties for excess emissions. An EPA enforcement official explained, however, that Acid Rain Program violations are low priority violations for the enforcement division because there are not any more environmental gains that can be achieved. Interview with EPA staff in D.C. (Sept. 17, 2009).

43. McAllister, *supra* note 29, at 321–22.

44. Interview with EPA staff in D.C. (Jan. 6, 2006).



TABLE 1: PENALTIES FOR EXCESS EMISSIONS IN THE  
ACID RAIN PROGRAM, 1995-2007

YEAR	NUMBER OF UNITS IN PROGRAM	NUMBER OF UNITS OUT OF COMPLIANCE	EXCESS EMISSIONS (TONS)	TOTAL PENALTIES (US\$)
1995	445	0	0	\$0
1996	431	0	0	\$0
1997	423	0	0	\$0
1998	408	0	0	\$0
1999	398	0	0	\$0
2000	2,262	8	70	\$187,740
2001	2,792	9	613	\$1,700,462
2002	3,208	1	33	\$94,017
2003	3,497	1	14	\$40,600
2004	3,391	4	465	\$1,377,795
2005	3,456	0	0	\$0
2006	3,520	0	0	\$0
2007	3,536	0	0	\$0
<b>TOTAL</b>		<b>23</b>	<b>1195</b>	<b>\$3,400,614</b>

### III. THE ENFORCEMENT STORY OF RECLAIM

RECLAIM was designed to reduce the sulfur oxide (SO<sub>x</sub>) and nitrogen oxide (NO<sub>x</sub>) emissions from stationary sources that lead to smog in the Los Angeles region. The program began operating in 1994. In contrast to the ARP, the enforcement of RECLAIM has been challenging and resource-intensive for its implementing agency, the South Coast Air Quality Management District (SCAQMD). While its monitoring and reporting rules were very similar to those of the ARP, the enforcement needs of RECLAIM turned out to be very different. To verify compliance, SCAQMD found it necessary to conduct comprehensive audits of each facility after the end of the compliance year to determine whether the emissions reported by the facility were accurate and whether the facility had sufficient allowances to cover its emissions.

## A. Annual Compliance Audits

SCAQMD in many ways followed the example of the ARP in designing the monitoring rules of RECLAIM.<sup>45</sup> A great deal of effort was spent on designing a monitoring system that could obtain accurate reports of emissions from the sources, and many of the same techniques were employed.<sup>46</sup> Yet the enforcement system that emerged—verifying the reported data through annual compliance audits—was much more labor and resource-intensive, and it presented persistent problems for program implementation.

The largest RECLAIM sources (referred to as major sources)<sup>47</sup> were required to install CEMS and report their emissions on a daily basis.<sup>48</sup> About 15% of the sources installed CEMS, accounting for 84% of total NO<sub>x</sub> emissions and 98% of total SO<sub>x</sub> emissions.<sup>49</sup> Other sources must calculate emissions by measuring fuel input and multiplying it by an appropriate emission rate. The CEMS are subject to daily calibration checks, routine quality assurance, and a semi-annual RATA.<sup>50</sup> Designed to take advantage of electronic reporting technology, the program required that major sources use a “remote terminal unit” with special software to collect the CEMS data, perform calculations, generate the appropriate files, and electronically transmit.<sup>51</sup> Other sources estimated their emissions based on fuel input or operating time, and were required to submit data either on a monthly or quarterly basis using either a remote terminal unit or manual transmission.<sup>52</sup>

All RECLAIM facilities<sup>53</sup> are required to submit quarterly emissions reports and a final annual emissions report at the end of the compliance

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45. SCAQMD, RECLAIM VOL. I, DEVELOPMENT REPORT AND RULES EX-1 (1993) (explaining that SCAQMD developed RECLAIM rules “with the assistance of the federal EPA, the California Air Resources Board, and the RECLAIM Steering and Advisory Committees.”).

46. Stranlund et al., *supra* note 7, at 348–49.

47. There are generally multiple RECLAIM emissions-producing “sources” at a single RECLAIM “facility.” In 1996, for example, there were 329 RECLAIM facilities and over 4,022 sources. S. COAST AIR QUALITY MGMT. DIST., RECLAIM PROGRAM THREE-YEAR AUDIT AND PROGRESS REPORT 1998 1-3 tbl.1-1, 5-8 to -9 tbl.5-1 (1998) (summing the number of sources categorized as major sources, large sources, and process units in tbl.5-1) [hereinafter Three-Year Audit].

48. McAllister, *supra* note 29, at 319.

49. Three-Year Audit, *supra* note 48, at 5-8 to -9.

50. Over a Dozen Years, *supra* note 6, at I-2-2 to -3.

51. Three-Year Audit, *supra* note 48, at 5–16.

52. *Id.* See also Stranlund et al., *supra* note 47, at 349 (an estimate of emissions is attained by multiplying the fuel use or time in operation by an emissions factor, such as x emissions/unit fuel, or y emissions/hour of operation).

53. On the distinction between facility and source in RECLAIM, see *supra* note 48, at ES-1 to -2.

year.<sup>54</sup> Submitted emissions reports required “certification for accuracy by the highest ranking facility official with responsibility for the subject matter of the certification.”<sup>55</sup> It was anticipated that, upon receipt of the data, SCAQMD would perform “several automated audits, including comparing the reported information with a facility’s historic data” to determine whether a field inspection was necessary.”<sup>56</sup>

Other aspects of the monitoring and reporting rules were also similar to the ARP. RECLAIM rules created incentives for accurate monitoring by including punitive MDPs modeled after the ARP’s provisions, as well as by allowing more leniency in the calculation of substitute data where a CEMS has demonstrated a high level of performance.<sup>57</sup> In addition, as in the ARP, RECLAIM administrators took “a proactive approach to work with the industry to resolve implementation issues” and “conducted extensive compliance outreach activities.”<sup>58</sup>

However, unlike ARP, the operation of CEMS and information technology systems in RECLAIM encountered problems. Installation delays and technical malfunctions were so common in the first few years of the program that about twenty percent of the emissions data were calculated through the use of the missing data provisions.<sup>59</sup> As stated by SCAQMD in a report about its first three years of program implementation, “the installation and maintenance of CEMS has proved to be a major challenge in the RECLAIM program.”<sup>60</sup> Many of these problems were resolved by the fourth year of the program, and the reliance on data generated by application of the missing data provisions accordingly decreased.<sup>61</sup> The report also stated that there had been problems associated with computer programs to automate the process of emissions reporting.<sup>62</sup>

54. CALIFORNIA AIR RESOURCES BOARD (CARB), AN EVALUATION OF THE SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT’S AIR POLLUTION CONTROL PROGRAM, V-8 (Jan. 2000).

55. Over a Dozen Years of RECLAIM, *supra* note 6, at I-3-15.

56. SCAQMD, *supra* note 46, at 4–14.

57. McAllister, *supra* note 29, at 320–21; Over a Dozen Years of RECLAIM, *supra* note 6, at I-2-3.

58. Three-Year Audit, *supra* note 48, at 5-1.

59. Over a Dozen Years of RECLAIM, *supra* note 5, at I-2-3.

60. Three-Year Audit, *supra* note 48, at 5-1.

61. Over a Dozen Years of RECLAIM, *supra* note 5, at I-2-3 (further showing that an average of 6.3% of emissions were calculated using missing data provisions in the years 1998 through 2005.).

62. Three-Year Audit, *supra* note 48, at 5–2.

Indeed, several years after RECLAIM began, SCAQMD was still trying to clarify its rules and requirements relating to electronic reporting.<sup>63</sup>

Even with electronic reporting, RECLAIM was unable to implement the type of comprehensive electronic auditing used in the ARP. In a retrospective analysis of the program issued in 2007, SCAQMD officials explained that the diversity of the types of sources included in RECLAIM prevented this. “The lack of uniformity in the data collected prevented the development of an all-encompassing emission calculation tool that could be employed facility to facility.”<sup>64</sup> With many different types of sources, many different types of monitoring and reporting equipment and methods had to be used.

RECLAIM enforcement has required the use of time-consuming and resource-intensive audits of each facility after the end of each compliance year. Each audit is conducted by a team of SCAQMD inspectors, includes a thorough review of the facility’s records and may take weeks to complete.<sup>65</sup> To detect violations, the inspectors examine not just the physical facility and its RECLAIM-related equipment, but also exhaustively review the reports and records required to be kept by each facility under the program’s rules.<sup>66</sup>

The designers of RECLAIM apparently did not anticipate the need for annual compliance audits. Rather, early program documents stated that SCAQMD would inspect facilities and audit emissions records “throughout the year,” with no mention of an audit after the year ended.<sup>67</sup> In practice, however, the agency found that such audits of each facility were necessary to verify compliance.<sup>68</sup> The audits revealed failures in the CEMS, such as computer programming bugs, analyzer failures, and improper daily calibration, as well as problems with the fuel meters and timers used to calculate emissions using emissions factors.<sup>69</sup> The audits also revealed data calculation errors and inaccurate records that presumably could not have been identified without the audits.<sup>70</sup>

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63. *Id.* at 5–17.

64. *Over a Dozen Years of RECLAIM*, *supra* note 5, at II-2-2.

65. *Over a Dozen Years of RECLAIM*, *supra* note 5, at I-3-6.

66. Interview with District Prosecutor, S. Coast Air Quality Mgmt. Dist. (June 29, 2010).

67. SCAQMD, *supra* note 46, at 4-15, 4-16.

68. *Over a Dozen Years of RECLAIM*, *supra* note 5, at II-2-2.

69. Cf. Richard Toshiyuki Drury et al., *Pollution Trading and Environmental Injustice: Los Angeles’ Failed Experiment in Air Quality Policy*, 9 DUKE ENVTL. L. & POL’Y F. 231, 259–60 (stating “Emission factors are hotly argued among technical specialists from different fields and change as new information becomes available. Emissions factors are poor surrogates for actual measurements”).

70. *Over a Dozen Years of RECLAIM*, *supra* note 5, at II-2-3-II-2-5.

Unlike the ARP, RECLAIM does not assess automatic penalties for emissions that exceed allowance holdings.<sup>71</sup> Rather, all types of RECLAIM violations are subject to the civil penalties as set forth in state law. State law provides for civil penalties of up to \$75,000 per day of violation, but SCAQMD must consider a variety of mitigating factors including the extent of harm caused by the violation, the nature and persistence of the violation, the unproven or innovative nature of the control equipment, any action taken by the defendant to mitigate the violation, and the financial burden to the defendant.<sup>72</sup> As a result, regulators have considerable discretion in how they calculate the applicable sanction. In addition to civil penalties, facilities that exceed their caps are also penalized by a deduction of the amount of their excess emissions from their cap in the following compliance year.<sup>73</sup>

### *B. Enforcement Outcomes*

Although many aspects of RECLAIM's monitoring and enforcement system were similar to the ARP's, the outcomes diverged in important ways. Like the ARP, RECLAIM has assembled a very complete and reliable set of emissions data for the regulated sources, but the need to conduct comprehensive annual audits of each facility has implied a high administrative burden on SCAQMD. As the agency stated in its retrospective analysis, "[a]ny program based on mass emissions needs to take into account the resource needs for adequate enforcement under this new method of measuring compliance." In a 2002 review of RECLAIM, the EPA concluded that the program demonstrates the possibility that compliance and enforcement may require more attention, not less, when cap-and-trade regulation replaces traditional command and control regulation.<sup>74</sup>

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71. Cf. Stranlund et al., *supra* note 7, at 350.

72. See California Health and Safety Code §§ 42,402.3, 42,403 (2009). The RECLAIM rules further provide that any emissions "in excess of the allocation shall constitute a single, separate violation for each day of the compliance year." RECLAIM Rule 2004(d)(1). The regulated source, however, has an opportunity to demonstrate that they were in violation for fewer days. See RECLAIM Rule 2004(d)(2) (placing the burden on the Facility Permit holder to establish the lesser period).

73. SCAQMD, *supra* note 46, at EX-15.

74. U.S. ENVTL. PROT. AGENCY, AN EVALUATION OF THE SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT'S REGIONAL CLEAN AIR INCENTIVES MARKET—LESSONS IN ENVIRONMENTAL MARKETS AND INNOVATION 30 (2002) [hereinafter EPA Evaluation of RECLAIM], available at <http://www.epa.gov/region9/air/reclaim/reclaim-report.pdf> (basing

The reliance on annual audits to verify compliance also imposed burdens on the regulated entities and affected the allowance market. Because of the audit, a facility's compliance status cannot be fully ascertained until well into the following compliance year.<sup>75</sup> The audits typically commence about two months after the end of the reconciliation period, and are not completed until about nine months after the end of the reconciliation period.<sup>76</sup> In effect, if the reconciliation period lasts three months after the end of the compliance year, final compliance determinations will not be made for some facilities until near the end of the following compliance year. Over that time, the facility is uncertain as to its compliance for the previous year, and will be inclined to hold onto allowances to deal with the possibility that it might need them.<sup>77</sup>

The burdens of enforcing RECLAIM are evident through analysis of the enforcement actions pursued under the program. The analysis presented below shows that enforcement actions were much more common than in the ARP, with many hundreds more enforcement actions despite the fact that RECLAIM was a much smaller program in terms of how many pollution emissions it regulated. This section describes how the RECLAIM enforcement data was collected and analyzed, as well as what the data shows about the types of violations, discovery violation and case resolution times, and settlement amounts. The final part of the section makes direct comparisons between enforcement actions in RECLAIM and the ARP.

### 1. Data and Methods

Data about RECLAIM-related Notices of Violation (NOVs) were acquired from SCAQMD through two public information requests and its online public information system. SCAQMD issues a NOV to inform a regulated company that it is out of compliance with applicable rules, permit conditions or other legal requirements.<sup>78</sup> A spreadsheet was constructed containing all RECLAIM-related NOVs for violations that occurred from the beginning of the program in 1994 through the end of 2006.

A full listing of the fields in spreadsheet and an explanation of their contents are shown in Table 2. In total, the spreadsheet contained 949

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its conclusions on data collected from November 2001 through January 2002). McAllister, *supra* note 41, at 302–03.

75. Over a Dozen Years of RECLAIM, *supra* note 6, at III-1-7 (discussing the “enforcement lag”).

76. Each audit requires up to several weeks to complete. *See id.* at I-3-6.

77. McAllister, *supra* note 41, at 299–300.

78. AQMD Notice, <http://www.aqmd.gov/comply/notices/nov.html> (last visited Nov. 15, 2010).

NOVs for violations of RECLAIM Rules 2004, 2011, and/or 2012.<sup>79</sup> Rule 2004 is a general rule that requires that RECLAIM facilities be in compliance with all permit conditions.<sup>80</sup> Excess emissions violations are usually recorded as violations of Rule 2004. Rule 2011 and Rule 2012 specify the program requirements for monitoring, reporting, and recordkeeping of SO<sub>x</sub> and NO<sub>x</sub> emissions, respectively. Each NOV considered in this analysis is based on a violation of one or more of these rules, as well as a possible violation of one or more non-RECLAIM rules that also apply to the RECLAIM facility.

As illustrated in Figure 1, the types of dispositions of the 949 enforcement actions (each NOV is considered to be an “enforcement action”) included closed (844); rejected (69); and other (18, including cancelled, dismissed, bankruptcy, and compliance only). The remaining 18 listed no disposition and are presumed to be pending. The violation description field contained the information that generally allowed a classification of the type of violation, as described below in section III.B.3. The settlement amount includes the dollar value of the monetary penalty imposed on the facility to close the case. Settlement amount values ranged from \$150 to \$81,012,360.

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79. RECLAIM rules are numbered 2000 through 2020, and are available at <http://www.aqmd.gov/rules/rulesreg.html>. See Three Year Audit, *supra* note 48. The initial spreadsheet included 1309 NOVs, but 360 NOVs were excluded because they were marked “VOID” or because they appeared to relate to violations of non-RECLAIM rules that occurred at RECLAIM facilities.

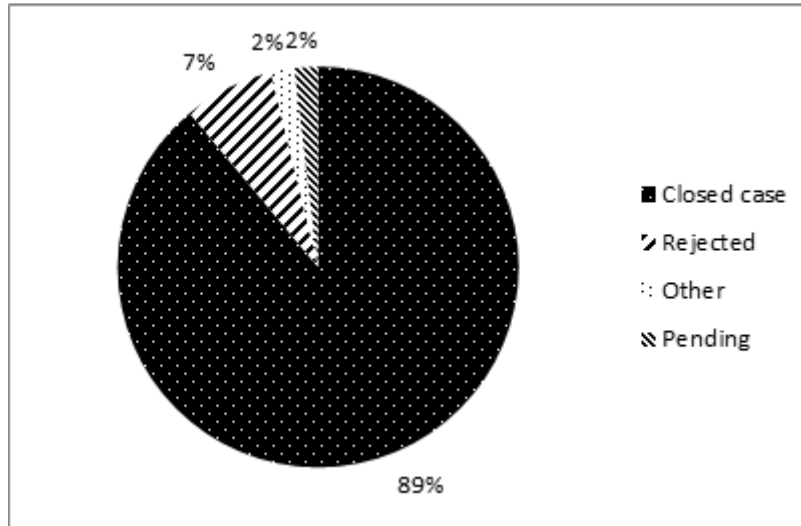
80. As such, command and control requirements that were incorporated into the RECLAIM permit are cited under Rule 2004 if violated. Email from SCAQMD (Mar. 30, 2010, 13:38 PST) (on file with author); email from SCAQMD (Apr. 2010). Those NOVs that referenced a violation of Rule 2004 but were actually issued for violations of non-RECLAIM requirements were not included in the analysis.

TABLE 2: SPREADSHEET FIELDS AND EXPLANATIONS  
OF THEIR CONTENTS

SPREADSHEET FIELD	EXPLANATION
<i>NOV Number</i>	The unique alphanumeric identifier that SCAQMD assigns to a Notice of Violation, i.e. P12345.
<i>Rule Violated</i>	Rule 2004, 2011 and/or 2012 (other SCAQMD rules may also be listed as violated in the same NOV).
<i>Name of Facility</i>	Generally the name of the company that owns the facility. A single company may own multiple RECLAIM facilities. Each facility is a stationary source with NO <sub>x</sub> or SO <sub>x</sub> emissions generally greater than 4 tons per year.
<i>Facility Identification Number</i>	A unique 3 to 6 digit number assigned to each facility.
<i>Violation Date</i>	The date that the violation occurred (often the inspector's best guess or a default date such as the first day of the compliance year in which the violation occurred). The spreadsheet includes all NOVs issued in RECLAIM with violation dates from 1994 through 2006.
<i>Issue Date</i>	The date that SCAQMD issued the NOV.
<i>Violation Description</i>	One or more phrases or sentences that indicate the reasons that the NOV was issued.
<i>Disposition</i>	The final status of the NOV: closed, rejected, cancelled, dismissed, bankruptcy, or compliance only.
<i>Disposition Date</i>	The date on which SCAQMD determined the disposition of the NOV.
<i>Settlement Amount</i>	The monetary amount for which the NOV was settled; only applicable for NOVs with a disposition of "closed." Many NOVs are settled in combination with other NOVs for a single settlement amount.



FIGURE 1: DISPOSITION OF RECLAIM ENFORCEMENT  
ACTIONS, 1994-2006



## 2. Number of Enforcement Actions

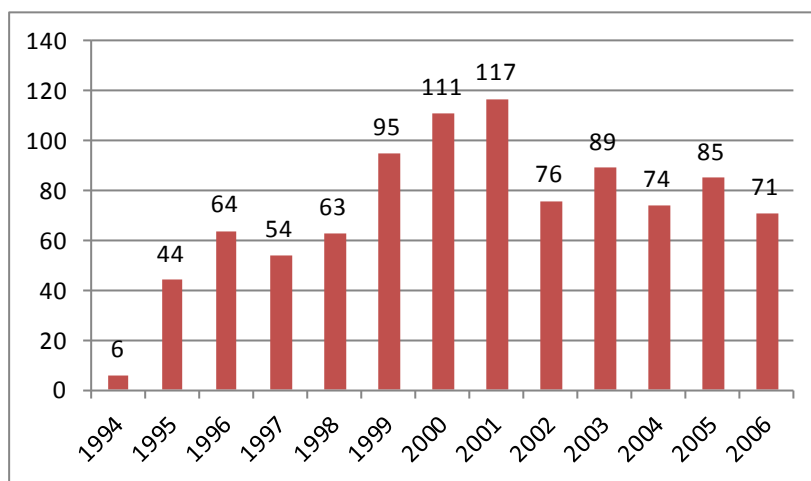
A breakdown of the 949 RECLAIM enforcement actions by year of the violation date is provided in Figure 2. The high number of violations in 2000 and 2001 is likely to be related to the crisis that the RECLAIM program underwent in these years as a result of the California electricity crisis.<sup>81</sup> In 2000, power-producing facilities in California increased their production to respond to the electricity blackouts and concomitantly purchased RECLAIM allowances to cover their increased emissions.<sup>82</sup> Allowance prices drastically increased, and the program's NO<sub>x</sub> emissions exceeded the program cap in the years 2000 and 2001.<sup>83</sup>

81. See Paul L. Joskow, *California's Electricity Crisis*, 17 OXFORD REV. OF ECON. POL'Y 365, 379-80 (2001).

82. Over a Dozen Years of RECLAIM, *supra* note 6, at II-2-7.

83. SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT, ANNUAL RECLAIM AUDIT REPORT FOR 2000 COMPLIANCE YEAR ES-1 to -2 (2002); SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT, ANNUAL RECLAIM AUDIT REPORT FOR 2001 COMPLIANCE YEAR ES-2 (2003). For more description of the electricity crisis and its impact on RECLAIM, see McAllister, *supra* note 29, at 324-27.

FIGURE 2: RECLAIM ENFORCEMENT ACTIONS BY YEAR OF VIOLATION DATE, 1994-2006



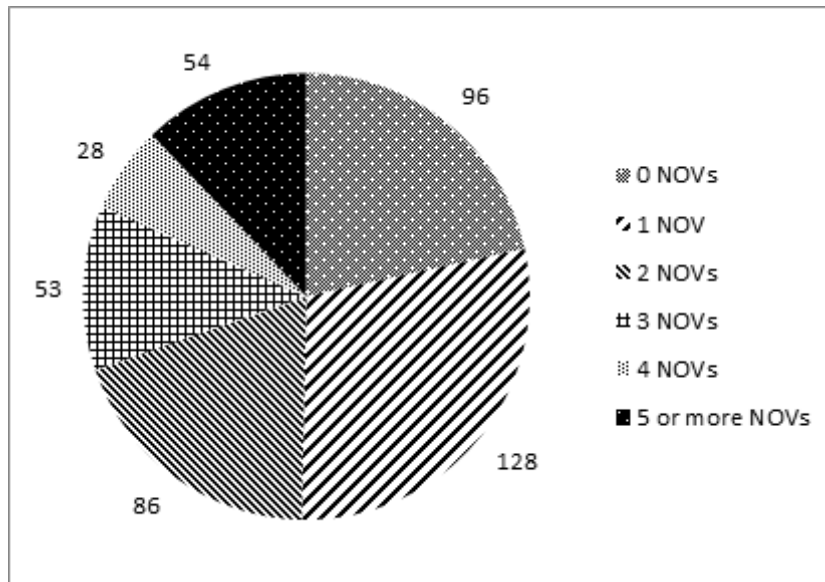
A remarkably high proportion of RECLAIM facilities have been the subject of enforcement actions. In the years 1994 through 2006, the RECLAIM universe of regulated facilities included about 330 facilities on average.<sup>84</sup> Each year, however, slight changes in the RECLAIM universe occurred as facilities were newly included in the program; excluded from the program because, for example, their emissions fell below the threshold; or closed down. Considering that 345 facilities were in the program at the end of the 1994 compliance year (see Table 3, *infra*) and that about 100 facilities were newly included between the years 1995 through 2006, a total of about 445 facilities participated in the program in at least one year of the program. Of these, 349 facilities (78%) were subject to at least one RECLAIM enforcement action. As shown in Figure 3, the other 96 had no enforcement actions lodged against them.

Many facilities had repeat violations, as further shown in Figure 3. About half of the facilities (221 out of 445) were subject to two or more enforcement actions, while almost one-third of the facilities (135 out of 445) were subject to three or more enforcement actions.

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84. The program began with 394 facilities but by the end of the first compliance year, many had been excluded such that 345 facilities participated in 1994 compliance year. In the 1995 through 2006 compliance years, the number of participating facilities varied between 354 and 295 (see Table 3, *infra*).

FIGURE 3: FACILITIES SUBJECT TO THE GIVEN NUMBER OF RECLAIM ENFORCEMENT ACTIONS



### *3. Types of Violations*

The enforcement actions were analyzed to determine the alleged type of violation. As mentioned above, the violation description field generally contains one or more phrases entered by the RECLAIM inspector describing the basis for the NOV. The length, clarity, and specificity of the descriptions varied greatly, and some required interpretation or inference to understand. The descriptions were ultimately coded into 5 categories: excess emissions; late or missing reports; inaccurate reports; lack of installation, maintenance, or quality testing of monitoring equipment; and other unspecified violations relating to monitoring, reporting or recordkeeping (MRR).

Figure 4 shows that the most common reason for the issuance of an NOV was that the facility had late or missing emissions reports. Late or missing reports was a basis for the NOV in 386 out of 949 (40%) enforcement cases. Such NOVs were issued when the facility failed to

timely submit the required daily, quarterly, or annual reports.<sup>85</sup> The second most common reason for the issuance of an NOV was that the emissions of the facility exceeded its annual allowance holdings in a given year. This reason was given in 356, or 38%, of the NOVs. Excess emission violations are generally penalized in two ways: with a monetary penalty and by deducting the amount of emissions that was over the allowance holdings from the facility's allowance holdings for the following compliance year.

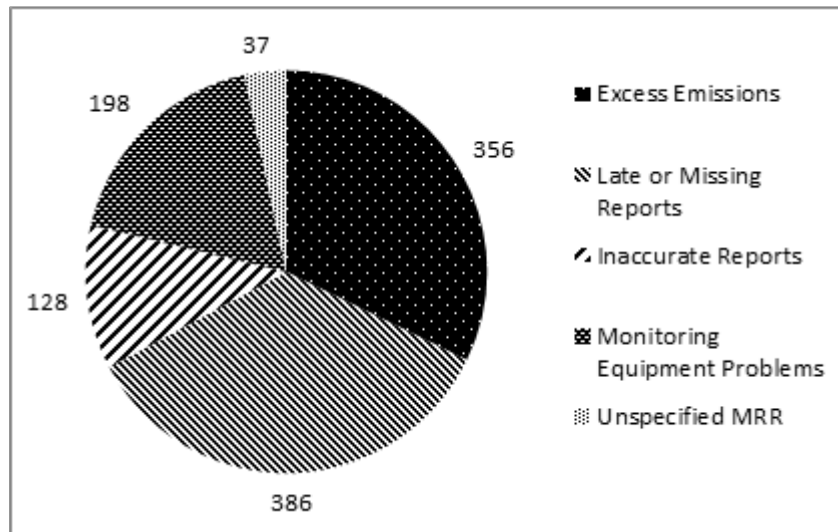
The third most common reason for the issuance of an NOV was that the facility failed to install, maintain, or quality test its emissions monitoring equipment. This was alleged in 198, or 21%, of cases. RECLAIM rules 2011 and 2012 specify the types of periodic maintenance and quality testing that is required once the equipment is installed. Facilities often failed to calibrate equipment, conduct tune-ups, or perform other required procedures within the specified period of time. In 128, or 13%, of the enforcement cases, the violation resulted from inaccuracies in the emissions reports. While often the inaccuracy was simply stated rather than detailed, some descriptions revealed that the facility had, for example, used an incorrect emissions factor, made an erroneous calculation, or misapplied the missing data provisions. Finally, in 37, or 4%, of enforcement cases, the available information indicated that the NOV was based on MRR problems, but the nature of the problem was unspecified.

In total, 1105 reasons were listed in the 949 NOVs, accounting for the fact that the above percentages add up to more than 100%. Often, for example, a single NOV resulted from a combination of inaccurate reports and monitoring equipment problems, or from a combination of late or missing reports and excess emissions.

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85. See *supra* notes 48–53 and accompanying text.

FIGURE 4: REASONS GIVEN FOR ENFORCEMENT ACTIONS



#### 4. Violation Discovery and Case Resolution Times

The data also allowed calculation of the violation discovery and case resolution times for those cases that had been disposed. As noted above, 18 of the 949 NOV cases were pending, leaving a group of 931 disposed cases. Of these, 8 had unreliable dates, wherein the listed NOV issue date came after the NOV violation date. For the remaining 923 NOVs, the violation discovery time was calculated as the time elapsed between the violation date and the issue date. The violation discovery time averaged 17 months. The case resolution time was calculated as the time elapsed between the disposition date and the issue date. The case resolution time averaged 13 months. In effect, the average RECLAIM enforcement action took 30 months, or 2 and a half years, from the date the underlying violation occurred to the date it was closed or otherwise disposed of. A variety of problems in RECLAIM have resulted from this significant “enforcement lag.”<sup>86</sup>

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86. Over a Dozen Years of RECLAIM, *supra* note 6, at II-2-6 (using the phrase “enforcement lag”). See also *supra* notes 76–78 and accompanying text.

The lengthy time required for violation discovery in RECLAIM is closely associated with SCAQMD's reliance on annual audits to verify facility emissions. Such audits cannot start until several months after the end of the compliance year, and given the large number of facilities that must be inspected and the small number of inspectors, they do not end until well into the next compliance year. It is through this audit that many rule violations that occurred during the compliance year are discovered. For example, inspectors might conduct an audit for compliance year 2003 in July 2004, and discover a monitoring equipment testing violation that occurred in August 2003. In this case, inspectors would record the violation date as August 2003, and the NOV issue date would be July 2004, resulting in an 11 month time lapse between the two.

The average violation discovery time was particularly lengthy for NOV's based on excess emissions. For these, the average violation discovery time was about two years (25 months). For NOV's based only on monitoring, reporting, and recordkeeping (MRR) violations (including late or missing reports, inaccurate reports, monitoring equipment problems, and other unspecified MRR violations), the average violation discovery time was just under one year. When both excess emissions and MRR were cited as reasons, the average violation discovery time was again close to 2 years (23 months).

The particularly lengthy violation discovery time for NOV's based on excess emissions can also be explained by SCAQMD's reliance on annual audits. For these NOV's, the violation date is typically listed as the first day of the compliance year for which the facility was found to have exceeded its emissions allowance. For example, inspectors might conduct an audit for compliance year 2003 in July 2004, and discover that the facility's 2003 emissions exceeded its allowance holdings. In this situation, inspectors would often record the violation date as January 1, 2003. With an NOV issue date in July 2004, the violation discovery time would be 19 months.

At an average of 13 months, case resolution times in RECLAIM were also protracted. A SCAQMD prosecutor explains that case resolution takes a lot of time because an NOV goes through several layers of review after it is issued.<sup>87</sup> The NOV goes first to the issuing inspector's supervisor and manager, who both conduct a detailed examination of it before signing off on it. This review often takes 6 months or more due to an existing backlog. Then it arrives at the prosecutor's office, where investigators further review the NOV. Finally it is assigned to one of the agency's 4 or 5 prosecutors, who is then responsible for meeting with the violator

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87. Interview with District Prosecutor, S. Coast Air Quality Mgmt. Dist. (June 29, 2010).

and negotiating the settlement. Because RECLAIM violations tend to be complex, the prosecutor may have to spend considerable time explaining it to the violator and coming to agreement on the amount of the penalty. SCAQMD is able to settle almost all its cases and thereby avoid the need for litigation to collect penalties.

### 5. Settlement Amounts

Settlement amount data were available for the 844 NOV's that resulted in a disposition of "closed."<sup>88</sup> SCAQMD often settles multiple pending NOV's against a facility in a single settlement. The 844 NOV's were closed through 595 settlement agreements, with 595 associated settlement amounts. Also, in some settlements, particularly large ones, RECLAIM-related NOV's may be settled together with non-RECLAIM-related NOV's. For this reason, for all settlement amounts greater than \$50,000, the author consulted SCAQMD online public information system to determine whether the settlement amount related primarily to RECLAIM-related offenses. Of the 44 settlement amounts greater than \$50,000, 16 were excluded because the precipitating NOV's were a combination of RECLAIM- and non-RECLAIM-related violations, with the majority of NOV's being non-RECLAIM-related. The remaining 579 settlement amounts form the basis of the analysis below.<sup>89</sup>

As apparent from Figure 5, more than half of the settlement amounts were for less than \$5000, and almost a third were for less than \$2000. In contrast, a few very high penalties were assessed for RECLAIM violations, including a \$17 million dollar penalty against AES Alamos for excess emissions during the California electricity crisis in 2001, and fines of about \$8 million and \$2.5 million for combinations of excess emissions

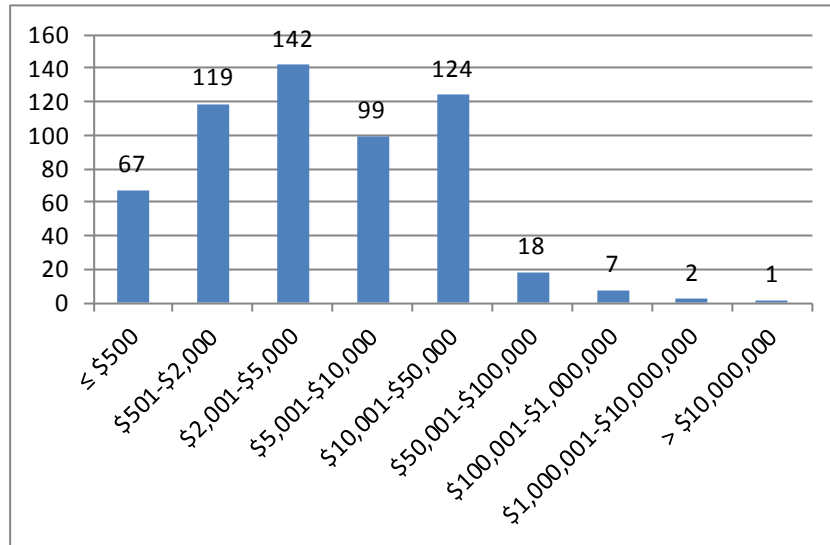
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88. Settlement amounts are usually paid in cash, but some settlement amounts also include payment of all or a portion of the settlement amount through a Supplementary Environmental Project (SEP). The SEP may include, for example, pollution-reducing capital improvements to the facility that are not required by law or some kind of investment for the health benefit of the community where the facility is situated. Interview with District Prosecutor, S. Coast Air Quality Mgmt. Dist. (June 29, 2010). In a sample of 115 settlement amounts negotiated after July 25, 2006, 10 included SEPs, and they constituted on average about 70% of the settlement amount. Response to Public Records Request to South Coast Air Quality Mgmt Dist. (Jun. 25, 2010).

89. The settlement amounts discussed in this section are overestimates, because it is likely that some of the settlements under \$50,000 are also based in part on non-RECLAIM violations. However, the author's experience with the data suggests that the large majority of settlements are due primarily or solely to RECLAIM violations.

and monitoring violations against American Airlines and Shultz Steel respectively. The median settlement amount was \$4,600, the average was \$59,536, and the total of all settlement amounts was \$34,471,112.

FIGURE 5: NUMBER OF OCCURRENCES OF SETTLEMENT AMOUNTS IN GIVEN VALUE RANGES

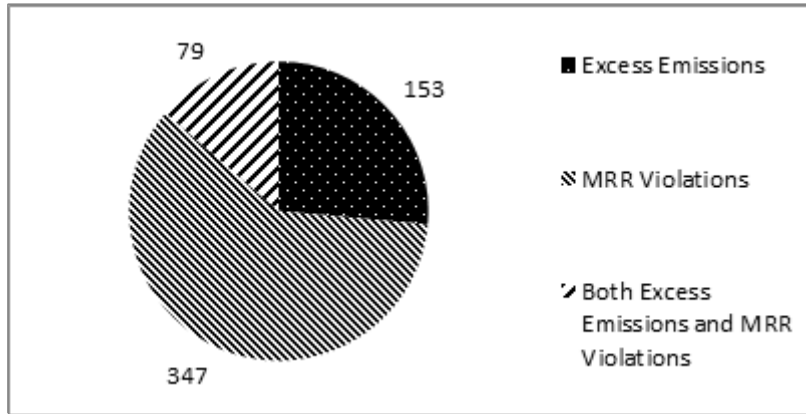


On average, excess emissions were penalized with significantly higher settlement amounts than monitoring, reporting, and recordkeeping (MRR) violations. To determine the differences, the 579 settlement agreements were classified according to the reasons for the NOVs that they disposed of. If all the RECLAIM-related NOVs disposed of by the settlement were for excess emissions, the settlement amount was classified as an excess emissions settlement. If all the NOVs disposed of by the settlement were for MRR violations (missing or late reports, inaccurate reports, monitoring equipment problems, and/or unspecified MRR problems), the settlement amount was classified as an MRR settlement. Alternatively, the settlement might have disposed of NOVs related to both excess emissions and MRR. Figure 6 shows how many settlement amounts fell into each of these categories.

The 79 settlements based on both excess emissions and MRR violations averaged \$155,074. The 153 settlements based on only excess emissions averaged \$129,529. The 347 settlements based on only MRR violations averaged \$6,923.



FIGURE 6: NUMBER OF SETTLEMENT AMOUNTS JUSTIFIED  
BY GIVEN REASON(S)



### 6. Comparing RECLAIM to the ARP

To make the quantitative comparison between enforcement outcomes in RECLAIM and the ARP clearer, it is helpful to look at their enforcement data over comparable times. Direct comparisons can be made for enforcement actions based on both excess emissions and MRR violations.

For the ARP, as presented above, excess emission data were available for its first thirteen years, 1995 through 2007. The data showed that, in total, 23 ARP units were penalized for excess emissions, and the total penalty amount was about \$3.4 million (see Table 1). Table 3 sets forth comparable information for RECLAIM for its first thirteen years, 1994 through 2006. In RECLAIM, 316 facilities had excess emissions violations in these years, and together they paid about \$32 million in penalties.<sup>90</sup> It is important to note, however, that many of the penalties imposed for excess

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90. There were 316 NOVs (out of 844 NOVs with a status of “closed”) issued in whole or part because of excess emissions, with the years of the violation date distributed as shown in Table 3. In about 10 cases, a single facility had two excess emissions NOVs for a given year, but the violation description for most of these indicated that the two excess emissions violations actually occurred in different years. They were retained in the count because while removing them might have led to more accuracy in the annual counts, it would have led to less accuracy in the total count.

emissions in RECLAIM were also based on MRR violations. Of the \$32 million shown in Table 3, about \$20 million in penalties were assessed on facilities for excess emissions alone and the other \$12 million in penalties were assessed for a combination of excess emissions and MRR violations.<sup>91</sup>

TABLE 3: PENALTIES FOR EXCESS EMISSIONS IN RECLAIM, 1994 TO 2006

YEAR OF VIOLATION	NUMBER OF FACILITIES IN RECLAIM	NUMBER OF FACILITIES WITH EXCESS EMISSIONS	PENALTIES FOR EXCESS EMISSIONS (US\$)
1994	345	0	0
1995	334	5	\$33,400
1996	329	42	\$624,564
1997	326	10	\$78,267
1998	331	23	\$2,795,100
1999	354	45	\$8,813,277
2000	335	50	\$18,181,395
2001	330	32	\$397,774
2002	332	25	\$426,900
2003	324	28	\$208,875
2004	311	17	\$233,417
2005	304	19	\$197,400
2006	295	20	\$89,500
TOTAL		316	\$32,079,869

In the ARP, as explained above, a total of \$589,805 in monetary penalties for nine monitoring violations was assessed from 1995 through June 2005. In RECLAIM, 375 MRR violation cases had been concluded by June 2005.<sup>92</sup> Penalties for these violations amounted to about \$5 million, with about \$1.5 million in penalties assessed for MRR violations alone and

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91. As discussed above, some of the penalties stated may also be based on non-RECLAIM violations settled at the same time as the RECLAIM violations. As also discussed above, all settlement amounts greater than \$50,000 were researched to ensure that they were primarily based on RECLAIM; those that were not were excluded from the calculation of total penalties per year in Table 2, *supra* p. 11.

92. Five hundred and fifty-eight NOVs were closed between 1994 and July 1, 2005. Three hundred and seventy-five of the NOVs were issued in whole or part for MRR violations. One hundred and eighty-three were issued only for excess emissions.

the other \$3.5 million assessed for a combination of MRR and excess emissions violations.<sup>93</sup>

The much greater level of enforcement activity in RECLAIM is particularly notable because RECLAIM is a significantly smaller program in terms of the amount of pollution emissions that it regulates.<sup>94</sup> Emissions regulated by the ARP each year have been in the millions or tens of millions of tons, while emissions regulated by RECLAIM each year have been in the thousands or tens of thousands.<sup>95</sup> In this sense, RECLAIM is less than a hundredth the size of the ARP.

#### IV. CONCLUSION

The experience of the ARP is often cited as demonstrating the ease of enforcing cap-and-trade regulation. The experience of RECLAIM provides a counterpoint. Even though RECLAIM regulated far fewer emissions, far more enforcement actions were pursued and far more penalties were imposed on regulated entities. RECLAIM further suggests that under some conditions, environmental agencies may find cap-and-trade programs more difficult and costly to enforce than traditional regulation.

While this empirical study has focused on quantifying the differences in enforcement outcomes in the two programs, data collected also shed some light on the reasons for these differences. With respect to excess emissions violations, it is significant that the program caps in RECLAIM became very constraining in the year 2000, particularly due to the California electricity crisis. The number of excess emissions violations reached its highest point in the lifetime of the program in that year. With respect to monitoring violations, it is notable that the ARP included a more homogenous set of sources. The similarity of the sources appears to have enabled a greater systematization of data collection, transmission,

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93. The difference between the \$3.5 million here and the \$12 million above for penalties assessed for a combination of MRR and excess emissions violations results from the fact that the calculation above includes NOV's closed after July 1, 2005 (a set of 844 NOV's instead of 558 NOV's).

94. RECLAIM is also a smaller program based on the number of regulated facilities. In 2009, there were 1,248 ARP facilities. In the latter half of the 2000s, the number of RECLAIM facilities has hovered around 300 (*see* Table 3 *supra* p. 1). However, as described in *supra* note 48, each RECLAIM facility generally includes many sources. From available information, the number of ARP units (about 3500, *see* Table 1) seems roughly comparable to the number of RECLAIM sources. *See supra* notes 9, 48.

95. *See* McAllister, *supra* note 8, tbl.1, tbl.2.

and verification. It is also worth observing that RECLAIM's enforcement approach, namely the use of annual audits, was arguably much more exhaustive than the ARP's system of electronic violation. While all RECLAIM facilities were comprehensively audited, the EPA relied very heavily on electronic verification in the ARP and focused its efforts in this regard on only the largest sources equipped with CEMS. The much larger number of RECLAIM enforcement actions has likely resulted in part from the greater effort expended to discover violations.

This study clearly shows that the ease of enforcement in cap-and-trade cannot be assumed. Much will depend on how the cap-and-trade program is designed, implemented, and enforced. Given the paramount importance of accurate emissions data in cap-and-trade regulation, adequate resources must be available to do the enforcement work necessary to ensure that violations are discovered and sanctioned.