United States General Accounting Office 143790

GAO Testimony

For Release
on Delivery
Expected at
9:30 a.m. EST
Thursday
May 2, 1991

SARA Capacity Assurance: Data Problems Underlying the 1989 State Assessments

Statement of
Eleanor Chelimsky
Assistant Comptroller General
Program Evaluation and
Methodology Division

Before the
Subcommittee on Environment,
Energy and Natural Resources
Committee on Government Operations
House of Representatives

GAO/T-PEMD-91-4

MR. CHAIRMAN AND MEMBERS OF THE SUBCOMMITTEE: I welcome this opportunity to contribute to your deliberations on hazardous waste management. Ensuring the safe and efficient processing of the hazardous waste produced in this country is critical to the protection of the environment and the health and safety of our citizens. Further, the number of sites on the Superfund National Priorities List, the number of candidate sites continually being evaluated for such priority listing, and the enormous cost of the Superfund program make the effective management of hazardous waste a matter requiring urgent policy attention. Indeed, the Congress and your Subcommittee have long recognized this point.

But in order to know how well we are doing in managing hazardous waste, we need data on its production, data on its prevention, and data on our capability to treat, store or dispose of it. These data are not easy to design and collect, they must be both reliable and valid and the confidence we can have in them depends heavily upon their methodological credibility. Put another way, Mr. Chairman, if findings are based on methodologically weak data, they cannot be relied on for policymaking purposes.

On the other hand, data systems that do allow their users to understand the degree to which policies or programs are (or are not) working have great importance for policymakers. And when the data inform on dangers to the environment and to public health --

as is the case with the SARA[1] assessments of hazardous waste volume and management capacity -- then the quality of those data systems becomes critical, not only for knowledge but also for accountability.

Accordingly, we at GAO did a comprehensive evaluation of the Environmental Protection Agency (EPA) data systems that produce hazardous waste data; this included the RCRA[2] biennial reporting system that serves as the principal data base for the states' capacity assurance plans required by SARA. These plans include assessments which utilize current and forecasted data to reach conclusions concerning whether adequate hazardous waste management capacity will exist. We did this to determine what confidence users could have in the hazardous waste data these assessments report. First we looked at the design of EPA's reporting system and then at the data the states have produced under SARA, which are based on information furnished by EPA's system.

Our conclusions are three: (1) EPA's system and the data it produces are severely flawed; (2) many of these flaws could have been avoided; and (3) some appropriate methodological revisions in the underlying system design could greatly improve our ability in the future to rely on the data produced by the SARA capacity assessments.

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[1]Superfund Amendments and Reauthorization Act of 1986

[2]Resource Conservation and Recovery Act of 1976

Those are GAO's general conclusions. Now let me explain our evaluation approach and then present our findings in more detail.[3]

GAO's EVALUATION APPROACH

System Design

In the evaluation we conducted for the Subcommittee, we assessed EPA's overall reporting system design by examining three technical areas likely to affect the meaningfulness of the SARA capacity assurance assessments. These were: the way information requirements were defined; the quality of measurement; and the data collection methods used.

Definition of Information Requirements

Determining whether EPA identified the data needed to support the agency's hazardous waste mission required three steps. First, we conducted a detailed examination of those EPA activities that are intended to achieve the program's mission. We performed interviews with the relevant division directors, branch chiefs, section chiefs and project managers in the Office of Solid Waste and Emergency Response. Each branch prepared a list of the activities performed in each of its sections. During the

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[3]For a full account, see our final report "Hazardous Waste: EPA's Generation and Management Data Need Further Improvement", GAO/PEMD-90-3

interviews, we determined which activities used data on hazardous waste generation or management. We also identified the data that are required to perform the activity and any problems EPA personnel were experiencing with available information. We also obtained and reviewed available samples of the products generated by the activities, using these data to further specify needed information.

Second, to identify state data needs, we interviewed program officials in a judgment sample of both large and small states using semistructured interview techniques. In addition, we attended meetings of the National Governors Association's advisory panel devoted to the redesign of the EPA reporting system. We also conducted a two-day workshop with selected state program experts from both large and small states to help identify state activities and data needs.

Third, we compared the results of our analysis of both EPA and state data needs to the revised data collection instruments EPA developed to determine whether the agency has in fact identified and defined the required information.

Measurement Quality

We evaluated the new, revised data collection instruments EPA developed for the RCRA reporting system by applying generally accepted measurement conventions to determine whether the measures

are likely to result in valid and reliable data.[4] We particularly examined all of EPA's measures, including those specifying waste type; amount of waste generated and managed; and management technologies.

Data Collection Methods

Here, we again applied generally accepted conventions for data collection methods to determine whether adequate data quality was likely to result from EPA's measures. We also examined whether the different data collection mechanisms were integrated so that they functioned together, and whether data collection was fully supported by federal regulations.

State Capacity Assurance Plans

Selecting a judgmental sample of state assessments to review, we focused on the three types of problems we had identified in our evaluation of EPA's biennial reporting system. Since the vast majority of the states had relied on that reporting system's data

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[4]The measurement and data collection conventions we used can be found in any number of standard texts. Among these are:

- Blalock, Hubert M. Measurement in the Social Sciences: Theories and Strategies. Chicago: Aldine Publishing Company, 1974

- Zeller, Richard A., and Edward G. Carmines. Measurement in the Social Sciences: The Link Between Theory and Data. London: Cambridge University Press, 1980.

to produce their assessments, we specifically selected state assessments that were based on those data. We treated each assessment selected as a separate case and looked for problems within each case that would threaten the quality and meaningfulness of the assessment.

FINDINGS: SYSTEM DESIGN PROBLEMS

Defining What Information Is Needed

Existing General Requirements Including SARA

There are four policy-related assessments that require hazardous waste information. (Three are capacity assessments.) First, the Hazardous and Solid Waste Amendments of 1984 (HSWA) requires a determination about whether "sufficient capacity" exists to implement the land disposal restrictions.[5] If sufficient capacity does not exist, EPA may postpone the regulations. Second, EPA has been conducting an integrated capacity analysis to determine the likely effects of proposed regulations on waste generation and management capacity. (This is an internal analysis that is used in risk assessments and regulatory impact analyses). Third, SARA requires each state to ensure that sufficient capacity will exist to manage the hazardous wastes produced in the state for

[5]The determination of "sufficient capacity" involves comparing the amount of capacity required to manage hazardous waste to the amount available for that purpose.

the next 20 years. The fourth policy-related assessment is of waste minimization results. EPA has been examining the effects of existing waste minimization efforts in order to establish whether (and which) regulations are needed to achieve waste minimization.

The SARA capacity assurance planning assessment, which is the focus of my discussion today, not only requires data that are credible methodologically, but also consistent nationally. EPA is responsible for establishing comparable data and analysis requirements across all states, but the states are responsible for developing their own assessments. To conduct the analyses mandated by SARA, the states require an extensive amount of data.

The SARA assessment has three stages: (1) the determination of volume needing treatment, (2) the determination of total management capacity, and (3) the determination of whether available capacity is sufficient for future requirements.

SARA: Determination of Volume Needing Treatment

Establishing how much volume needs treatment includes two basic steps: (1) identifying the volumes of waste covered or affected by the capacity assessment; and (2) analyzing both the "treatability" of the affected waste and the consequent required capacity for each type of management technology. The first step includes identifying the volumes of primary and secondary

generation of all wastes from all sources that are currently treated and disposed of at Subtitle C facilities and that will require treatment and disposal in the foreseeable future. In addition to currently managed wastes, the analysis requires information on quantities of waste at CERCLA (or Superfund) sites[6], corrective action sites, and closure sites that require treatment over the time frame of the analysis. The analysis also requires information on the volumes of waste that will become subject to management requirements as a result of new regulations currently under development. Additionally, information is needed on potential forms of waste management, including underground vaults, salt domes, and other geological formations used for disposal, that prevent the migration of wastes. Information on the extent of waste minimization is also needed. This information is necessary to determine the impact that waste minimization efforts will have on the volume of waste that will require additional capacity. Finally, information on state-level imports and exports is needed.

The second step in determining the volume needing treatment is the "treatability analysis": this assigns each quantity of affected waste to an appropriate management technology and then establishes the required capacity for that technology. The type or types of treatment technology required by a specific volume of waste are determined by its physical and chemical characteristics,

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[6] CERCLA is the Comprehensive Environmental Response, Compensation and Liability Act of 1980

including the presence and concentration of some hazardous and some nonhazardous constituents. In order to perform this analysis, information is required of the physical and chemical characteristics on each volume of waste, including the concentration of some hazardous and nonhazardous constituents that determine applicable treatment technologies.

SARA: Determination of Total Management Capacity

To complete the second stage of a SARA assessment -- that is, the determination of total management capacity -- information on current total capacity and future total capacity is required. Establishing current total capacity requires three types of information: (1) the capacity of individual units of equipment, (2) the management technology or technologies used in each unit, and (3) scheduling diagrams to show how the units are linked together into process systems. (A process system is a number of linked units of one or more management technologies in series.) The analysis also requires information on those units of equipment that are shared by one or more process systems. This requires detailed design and operational information on unit process capacities (including ancillary equipment), throughput operations and amount of downtime per operating period. This information allows the capacity of each management technology and system to be calculated.

Establishing future total capacity requires information on

future plans and an assessment of regulatory changes. Current management facilities may plan to increase or decrease total capacity, and parties that do not currently manage hazardous waste may plan to. Moreover, these plans are themselves contingent on regulatory changes. In addition, some types of equipment can be quickly converted to another management technology.

The analysis of future capacity changes also requires an assessment of the effects of regulatory changes. For example, changes in minimum technology requirements have led to the closure of many surface impoundments, which decrease total management capacity. Information on design characteristics of management units and permit status is required to determine the capacity that currently meets each alternative proposed standard.

SARA: Determination of the Sufficiency of Available Capacity for Future Requirements.

Available capacity is the difference between total and utilized amounts of management capacity. Utilized capacity includes that portion used by nonhazardous wastes managed in hazardous waste facilities and by agents added to hazardous waste during management. Hazardous waste management capacity is sufficient if available capacity is equal to or greater than required capacity. For the SARA assessments, the changes in total capacity over the time frame of analysis (20 years) are compared to

the changes in total demand from all sources for the same period on an individual state basis.

Findings on the Quality of Information Definition

Based on our evaluation, we defined the total information requirements for SARA capacity assurance assessment along with the requirements for the other three assessments discussed earlier. These are listed in table 1. We then compared these information requirements with those data encompassed by EPA's data collection systems (table 2). Note first the absence of data collection on such important items as (1) the total quantities and types of waste present at CERCLA and corrective action sites (yet these will ultimately require treatment and secure disposal at RCRA-regulated facilities), and (2) the management capacity of potential disposal technologies such as salt domes and other geologic formations. As a result, we see immediately that the SARA capacity assurance assessments will necessarily contain significant omissions.

A second problem is that, as table 2 shows, the 1985 and the 1987 RCRA reporting cycles, in and of themselves, contain major data gaps. The 1985 cycle has extensive omissions in the areas of waste and waste characteristics, management data, waste sources, and waste minimization that are required for SARA capacity assessments. The 1987 cycle, although an improvement over the 1985 version, still has critical data gaps, principally in the areas of

TABLE 1

Types of Information Required for Capacity Analyses and Waste Minimization Policy Assessment

Type of information	SARA[a]	INTEG[b]	HSWA[c]	WMPA[d]
Regulatory status				
EPA identification number	X[e]	X	X	X
Type of status	X	X	X	X
Reason for nonregulated status	X	X	X	X
Wastes and waste characteristics				
Each regulated waste stream (as defined by EPA waste code) present in a quantity of waste	X	X	X	X
Quantities	X	X	X	X
Physical form data for determining treatability of wastes	X	X	X	X
Chemical characteristics for treatability analysis	X	X	X	X
Concentration of hazardous and nonhazardous waste for treatability analysis	X	X	X	X
Waste management				
Treatment technologies	X	X	X	
Storage technologies	X	X	X	
Current disposal technologies	X	X	X	
Potential disposal technologies (geological formations)	X	X		
Types of recycling	X	X	X	
Residual waste generation	X	X	X	
Type of equipment	X	X	X	
Ancillary equipment	X	X	X	
Capacity of each unit of equipment	X	X	X	
Design characteristics affected by proposed regulations	X	X	X	
System diagrams	X	X	X	
Type of management system (technologies and equipment)	X	X	X	
Capacity of management system	X	X	X	
Quantity hazardous waste managed by each technology or system of technologies	X	X	X	
Quantity of nonhazardous waste managed by each technology or system of technologies	X	X	X	
Quantity of agents added during management	X	X	X	
Planned capacity changes	X	X	X	
Commercial status	X	X	X	
Permit status	X	X	X	
Imports and exports				
Originating facility identification	X			
Destination facility identification	X			
Waste source				

(continued)

Table 1, continued

Type of information	SARA[a]	INTEG[b]	HSWA[c]	WMPA[d]
Routine industrial production	X	X		X
One-time-only generation, including decommissioned equipment, off-specification product, CERCLA, corrective action, closure, and other remedial action	X	X		X
CERCLA volumes requiring management	X	X		X
Corrective action volumes requiring management	X	X		X
Additional sources affected by pending regulations	X	X		
Waste minimization				
Waste stream affected	X	X		X
Specific industrial process	X	X		X
Total waste volume change	X	X		X
Total production change	X	X		X
Specific product change	X	X		X
Specific waste volume change	X	X		X
Concentration of each hazardous constituent				X

[a]SARA = SARA capacity assurances

[b]INTEG = integrated capacity analysis

[c]HSWA = HSWA capacity analysis for land disposal restrictions

[d]WMPA = Waste Minimization Policy Assessment

[e]An "X" indicates that information is required.

TABLE 2
Comparison of SARA Information Needs with the Information Gathered by the EPA Data Collection Instruments

Type of information	Data collection instrument[a] 1985	1987
Regulatory status		
EPA identification number	X[b]	X
Type of status	X	X
Reason for nonregulated status		X
Wastes and waste characteristics		
Each regulated waste stream (as defined by EPA waste code) present in a quantity of waste	X	X
Quantities	X	X
Physical form data for determining treatability of wastes		X
Additional physical form data for determining mobility of wastes		
Chemical characteristics for treatability analysis		X
Additional chemical characteristics for determining mobility		
Concentration of hazardous and nonhazardous waste for treatability analysis		X
Major additional hazardous metals present		X
Major additional hazardous nonmetals present		X
Concentration/amount of all hazardous chemicals present		
Management data		
Treatment technologies	X	X
Storage technologies	X	X
Current disposal technologies	X	X
Potential disposal technologies (geologic formations)		
Types of recycling		X
Residual waste generation		X
Type of equipment		
Ancillary equipment		
Capacity of each unit of equipment		
Design characteristics affected by proposed regulations		
Design characteristics for estimating releases		
Type of monitoring methods		
Construction material		
System diagrams		
Type of management system (technologies and equipment)		X
Capacity of management system		X
Quantity hazardous waste managed by each technology or system of technologies		X
Quantity nonhazardous waste managed by each technology or system of technologies		X
Quantities of agents added during management		

Table 2, continued

Type of information	Data collection instrument[a] 1985	1987
Planned capacity changes		X
Commercial status		X
Permit status		X
Imports and exports		
Originating facility identification	X	X
Destination facility identification	X	X
Geohydrologic and environmental data		
Soil types		
Groundwater flow rates		
Proximity to water source		
Height of water table		
Distance from management units to property line		
Distance from property line to nearest potential human exposure		
Actual releases to environment		
Latitude and longitude		
Waste source		
Routine industrial production		X
One-time-only generation, including decommissioned equipment, off-specification product, CERCLA, corrective action, closure, and other remedial action		X
Total CERCLA and total corrective action volumes that will require management		
Additional sources affected by pending regulations (underground storage tanks)		
Waste minimization		
Waste stream affected		X
Specific industrial process		X
Waste volume change		X
Production change		X
Change in concentration/amount of each hazardous constituent		

[a]1985 = 1985 RCRA reporting instrument
1987 = 1987 RCRA reporting instrument

[b]An "X" indicates the presence of the required information.

waste characteristics and management data.

Findings on Measurement Quality

We defined measurement problems as those likely to produce significant errors in determining the volume of each type of waste generated, the type of treatment technologies used, the total capacity of management technologies (such as some types of incineration), and the degree of waste minimization.

We found that the RCRA waste codes, which are used on all data collection instruments, will produce inaccurate counts of the volumes of regulated waste streams due to misclassification. That is, the mixture of independent attributes creates a complex and redundant measure that significantly reduces reliability because it is ambiguous and respondents can interpret it differently. The qualitative measures used constitute still another type of problem because they are even less precise than available quantitative measures.

Although EPA developed new, improved measures on the types of management technologies between the 1985 and 1987 reporting cycles, misclassification again remains likely due to the mixing of attributes. The development of a valid general waste classification system with mutually exclusive, exhaustive, and hierarchical categories would fully correct these problems.

We found other critical measurement problems in the waste management capacity area. The measure of the capacity of cement kilns and similar forms of incineration was not sufficiently specific to ensure that respondents will provide data in a consistent manner. If respondents assume either unlimited demand for their product or waste with a low heating value, the capacity of this form of incineration could be significantly overestimated. Some overestimation of capacity is also likely because some respondents may not have considered permit restrictions in reporting maximum capacity.

A further finding is that the measures of the extent of waste minimization developed by EPA will not produce valid data on changes in waste generation per unit of production. The measures do not account for the production of different products from one year to the next that may generate unequal amounts of hazardous waste. The results will be misleading because incidental changes in production will be mixed with, and thus will obscure, actual waste minimization. Moreover, the qualitative measure of toxicity can only show the percentage of cases in which waste minimization led to increased concentration, not the amount of toxicity over time. When we translated these measurement problems into the various information categories presented earlier, we found that they affected important information required for the SARA assessment (see table 3).

TABLE 3

Required SARA Information Types for which Measurement Problems Exist

Type of information	Data collection instrument[a] 1985	1987
Regulatory status		
EPA identification number		
Type of status	X[b]	
Reason for nonregulated status	X	
Wastes and waste characteristics		
Regulated waste stream present in a quantity of waste	X	X
Quantities	X	
Physical form data for determining treatability of wastes		X
Additional physical form data for determining mobility of wastes		
Chemical characteristics for treatability analysis		X
Additional chemical characteristics for determining mobility		
Concentration of hazardous and nonhazardous waste for treatability analysis		X
Major additional hazardous metals present		
Major additional hazardous nonmetals present		
Concentration and range of all hazardous chemicals present		
Management data		
Treatment technologies	X	X
Storage technologies	X	
Disposal technologies	X	
Types of recycling		X
Residual waste generation		
Type of equipment		
Ancillary equipment		
Capacity of each unit of equipment		
Design characteristics affected by proposed regulations		
Design characteristics for estimating releases		
Construction material		
System diagrams		
Type of management system (techniques and equipment)		
Capacity of management system		X
Quantity hazardous waste managed by each technique or system of techniques		
Quantity nonhazardous waste managed by each technique or system of techniques		
Planned capacity changes		
Commercial status		
Permit status		
Imports and exports		
Originating facility identification		

Table 3, continued

Type of information	Data collection instrument[a] 1985	1987
Destination facility identification		
Geohydrologic and environmental data		
Soil types		
Groundwater flow rates		
Proximity to water source		
Air emissions		
Distance from management units to property line		
Distance from property line to nearest potential human exposure		
Actual releases to environment		
Waste source		
Routine industrial production		
Specific industrial process		
One-time-only generation, including decommissioned equipment, off-specification product, CERCLA, corrective action, closure, and other remedial action		
CERCLA volumes requiring management		
Corrective action volumes requiring management		
Additional sources affected by pending regulations		
Waste minimization		
Waste stream affected		
Specific industrial process		
Waste volume change		
Production change		X
Change in concentration/amount of each hazardous constituent		X

[a]1985 = 1985 RCRA reporting instrument
1987 = 1987 RCRA reporting instrument

[b]An "X" indicates that a measurement problem exists.

Findings on Data Collection Methods

The data collection methods indicated in the RCRA reporting system have made three problems likely: (1) inaccurate identification of the regulated population, (2) the development of inconsistent information, and (3) failures of quality control.

Voluntary Data Collection

The 1985 RCRA reporting system did not update the notification forms used by waste handlers to notify EPA of their activities. EPA had thus been unable to develop accurate lists of active hazardous waste handlers. The new information on regulatory status included in the 1987 RCRA reporting cycle could have fully corrected this problem. That is, if accurate data on regulatory status were collected in all states, the regulated population would be adequately identified for the first time. However, the 1987 RCRA reporting instrument is voluntary; this, of course, interferes with the accomplishment of this goal.

Inconsistent Data Collection

We found that 36 states (70 percent) elected not to use the

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Inconsistent Data Collection

We found that 36 states (72 percent) elected not to use the

complete data collection instrument in the 1987 reporting cycle.[7] There are no federal regulations that require states to collect specific federal data elements. States electing not to use the 1987 reporting instrument used whatever instrument they had used in previous reporting cycles; some of these states used the instrument for the 1985 reporting cycle while others used their own instruments. Yet, the consistency and comparability of the information collected is a very important issue as far as SARA capacity assurance assessments are concerned. Lack of consistent information means, for example, that some states will report wastes treated in exempt processes and some will not; some states will have more stringent definitions of hazardous waste than others, affecting the volumes of waste reported; and states will use differing measures to report volumes. This is a critical problem for the SARA capacity assurance effort, where the principal goal is to ensure that enough management capacity exists to handle the hazardous waste within a state, transferred across states and at the national level. Without consistent and comparable data collection, it hardly seems possible to say what the volume is, much less how much treatment capacity is now needed -- and will be needed in the future.

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[7]Eighteen of the 36 elected to use the waste minimization portion of the form; EPA administered the waste minimization portion of the instrument in all states that did not elect to use it and EPA administered the entire revised instrument in 1 of the 36 nonparticipating states.

Uncertain Quality Control

EPA initially planned to develop an automated data management system and a national repository for the data collected from the RCRA biennial reporting system. These initiatives would have helped transform the data collected into a consistent, usable form. However, because of limited resources, EPA did not provide all the software planned. In addition, these technical quality control assistance activities are applicable primarily to the states that voluntarily adopted the 1987 reporting format. In fact, EPA's plan for developing accurate information depended heavily on the extent of quality control work that states were expected to perform, detecting and correcting reporting inconsistencies, measurement problems, and so on. However, states are also constrained by funding levels. Nevertheless, some quality control work was conducted; the extent to which this resulted in accurate data is currently unknown.

Many of the measurement and data collection problems described above were quite unnecessary: they arose in large part from inattention to conventional methodological norms. Together with practical constraints -- such as funding shortages and EPA's dependence on voluntary data collection -- they clearly would be expected to produce bias error of unknown magnitude in the SARA capacity assessments conducted by the states. We therefore reviewed the actual data resulting from the use of these measures.

ACTUAL DATA PROBLEMS APPEARING IN STATE PLANS REVIEWED BY GAO

I turn next to our review of the state SARA capacity assurance plans that were submitted to EPA. According to EPA, thirty-one states reported using the 1985 or the 1987 RCRA reporting cycle data as the source of their generation data, and 26 states reported using those sources for management data. To date, every one of these assessments has been approved by EPA. We reviewed a sample of eight: those of California, Colorado, Idaho, Kansas, Maryland, New Hampshire, New Mexico, and Vermont. Like the other assessments, they used data from the 1985 and 1987 RCRA reporting cycles.

Findings on the Quality of Definition: Omissions, Inclusions, Exclusions

The data contained in the state SARA capacity assurance assessments we reviewed were aggregated at a higher level of detail than that we had found in evaluating the biennial reporting system design, as discussed earlier. Consequently, the data summarized in the tables and narratives in the assessments did not allow us to determine whether some of the data gaps we identified at the detailed level were, in fact, present. There were, however, obvious definition problems that we were able to discern.

- First, it is important to note that small-quantity generators

were not included in the data submitted. Small-quantity generators -- generally defined as those that produce less than 1,000 kilograms of waste in a given month -- were not required to complete the 1987 data collection instrument; they needed merely to confirm their status as small-quantity generators. Although they produce a small percentage of the total waste, they are by far the largest class of generator; EPA estimates that there are hundreds of thousands of them. In some cases, small-quantity generators constitute a significant portion of a state's generators. New Mexico, for example, observed that their contribution amounts to roughly a quarter of the state's total generated hazardous waste volume. This is a fairly significant omission.

Second, we were able to identify several situations in which wastes not defined as RCRA hazardous wastes were included in the reported data. For example, wastes treated at publicly owned treatment works, household wastes, state-defined toxic wastes, and radioactive and mixed wastes were reported. States raised the concern that failure to include these non-RCRA wastes could result in distortions of overall waste generation and capacity requirements. Similarly, some states were concerned that household wastes, often disposed of in landfills, could become part of the hazardous waste stream when land disposal restrictions are imposed. The disposal of radioactive and mixed wastes is a serious issue in states such as Colorado and Idaho, where federal facilities produce large amounts of radioactive wastes that are not

RCRA-defined hazardous wastes, but that are large parts of their overall waste stream. In other cases, states took it upon themselves to devise means of factoring such waste streams in or out of their data.

Finally, the states had problems distinguishing between one-time and recurring wastes. The implication of this last point is that recurring wastes are those that will require planning attention; without being able to differentiate recurring from one-time wastes, the planning capability of a state is compromised.

Findings on Measurement Quality

Two kinds of measurement problems were observed in the state assessments we reviewed. The first concerns the way RCRA waste categories are defined. Approximately 700 RCRA waste codes must be translated into 17 SARA waste type and 15 SARA treatment type categories, in order to conduct the SARA capacity assurance assessments. These RCRA waste codes (or categories) are not, as already noted, mutually exclusive, exhaustive, or hierarchical, and therefore they are often ambiguous. For example, whether a quantity of solvent waste is halogenated is addressed five different times because it must be repeated in combination with other attributes such as organic liquids, solids and sludge that may contain halogenated solvents. What this means is that the codes are not reliable. They produce many different answers,

depending on who is using them and how they are interpreted. Worse, when RCRA codes are translated into SARA codes, these problems are vastly magnified.

Officials in Colorado, Kansas, Maryland, and Vermont, who all used the 1987 RCRA reporting method, drew attention to these problems. Confusion proliferated in the way hazardous waste generators provided the data, the way waste handlers completed manifests and how the kinds of wastes that states were importing and exporting were defined. In addition, Colorado, Idaho, Kansas, and Maryland all drew attention to the problem of determining what specific wastes to include in the "other" category of SARA waste treatment. This is a classification result related to the coding unreliability. The significance here is once again the states' inability either to accurately measure volume or to properly assess its management capacity.

A second kind of measurement problem resulted from the failure to adequately define waste management process stages. Here, state officials themselves reported that these processes had not been defined by stages, resulting in multiple counting of capacity. Finally, residuals of treatment -- that is, the waste produced by treating the primary waste streams -- were not counted, thus understating the requirement for management capacity.

Findings on Data Collection Methods

Here we found a number of different issues. First, manifests describe the type, quantity, and disposition of shipped wastes and can be used to develop data for the state assessments and to verify the data included therein. However, for some states, these manifests were not systematically collected to ensure complete reporting, and thus an indispensable means of information verification was lost.

Second, for all eight states, the export-import data were collected from different data sources. Idaho, New Hampshire, New Mexico, Vermont all reported difficulties in reconciling their export-import data with other related states. In some cases, they reported that they were able to determine either a source of error or difference in interpretation of the data and to make adjustments. When they could not, however, one state would often simply accept another state's data.

Third, waste minimization data were a problem for all states. Except for California, data were simply not collected that described the extent to which waste was being reduced. In many cases the states attributed this failure to their lack of a developed waste minimization program. For California which has developed a waste minimization program, production mix data were not collected. (Production mix data serve to describe the various

products a company produces and to associate them with hazardous waste streams.) But without the ability to account for production mixes -- that is, for changes in the production profile of a company, -- data on hazardous waste volume changes are meaningless. This is because one cannot determine whether changes in waste levels are a result of actual reduction per unit type produced versus a reduction occurring because of a change in the product line of the company (in which case, the waste levels remain the same for the remaining products).

CONCLUSIONS

Mr. Chairman, these findings demonstrate that the hazardous waste data systems that have been used to develop data for the SARA capacity assurance assessment have serious methodological flaws. We have identified such flaws in the design of the systems and in the actual data used in the assessments. The Environmental Protection Agency, we believe, recognizes these flaws and maintains it is taking steps to improve its data systems. However, it is clear that the state capacity assurance plans, all of them approved by EPA, reveal such serious problems of data definition, measurement and data reliability, validity and consistency as to make them practically unusable. The Congress can rely on these assessments neither to determine volume nor to gauge capacity. Despite EPA's efforts, nothing in this first round of assessments augurs that we will get better data next time unless some action is

taken to make this happen. Yet, the present results are not without a fairly steep cost. Exact costs are difficult to estimate. But, the clearance package which the EPA submitted to the Office of Management and Budget for the 1987 data collection effort alone had a cost range of approximately $38 million to $46 million. Addressing these problems could greatly help the confidence we have in the next round of data that will be produced. Consequently, we recommended, among other steps that we felt needed to be taken, that EPA should:

- Close the existing data gaps by collecting data in areas including (1) the volumes of wastes located at CERCLA and corrective action sites that will ultimately require management capacity, and (2) the potential capacity of salt domes and other geological formations that are capable of preventing the migration of wastes.

- Assure the use of the most appropriate measures of the relevant attributes of hazardous waste generation and management. Specifically, quantitative measures should be used to measure waste characteristics (such as those needed for assessing management capacity or waste minimization), and in addition, a valid general classification system should be developed for treatment technologies.

- Ensure that state data collection and quality control efforts receive fully adequate support and include specific indicators related to data collection and verification in the agency's mechanism for monitoring state performance.

- Use probability sampling rather than a census of waste handlers whenever feasible for routine data collection and quality control to ensure that EPA obtains the information necessary to develop regulations efficiently and without unnecessary data collection burden.

- Amend federal recordkeeping and reporting regulations so that states are required to collect and provide standard data elements in a disaggregated form and hazardous waste handlers are required to provide sufficiently detailed data.

Mr. Chairman, we know that the initial response of EPA to our recommendations was favorable; they reported to us that they felt that many of these actions were needed. However, we have been unclear until now as to whether EPA had in fact acted on these recommendations and if so, which ones and to what degree. Now we have learned that EPA is considering our recommendations for use in the 1991 biennial reporting cycle. This means that, as of this date, no implementation has been made by EPA of the actions we

recommended in February, 1990.

In addition, Congress should consider whether a refinement in legislation may also be necessary to improve the quality of EPA's information. Nonuniform data and procedures across the states, which are associated with a joint federal-state data collection effort under RCRA, degrade the quality of information about hazardous waste. Under current law, responsibility for data collection, as well as other regulatory activities, is shared by federal and state governments. This problem could be corrected by separating the recordkeeping and reporting provisions of the act from other regulatory provisions and making EPA solely responsible for collecting the information required for developing and implementing the federal program. Uniform national data would then be assured, but states would retain the authority to add data elements and to use supplemental data collection mechanisms to support data needs.

I would be happy to answer any questions you or the Subcommittee members may have.