EPA-340/1-86-011

Handbook for the Review of Excess Emission Reports

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Under Contract No. 68-02-3960
Work Assignment 3-120
With Engineering-Science
Fairfax, Virginia 22030

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U.S. ENVIRONMENTAL PROTECTION AGENCY
Stationary Source Compliance Division
Office of Air Quality Planning and Standards
Washington, D.C. 20460

May 1986

Disclaimer

This report has been prepared for the Stationary Source Compliance Division of the U.S. Environmental Protection Agency by Perrin Quarles Associates, Inc. and Entropy Environmentalists, Inc. The opinions, suggestions, and conclusions expressed herein are those of the authors, and do not necessarily represent those of the U.S. Environmental Protection Agency.

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HANDBOOK FOR THE REVIEW OF EXCESS EMISSION REPORTS

I. Introduction

On October 5, 1984, the U.S. Environmental Protection Agency, Stationary Source Compliance Division, issued guidance to EPA Regional Offices on the review and use of excess emission reports (EERs). (See "Technical Guidance on the Review and Use of Excess Emission Reports".) The "Handbook for the Review of Excess Emission Reports" provides more specific information and recommendations on Phase-1 review and analysis of opacity and SO_2 EERs by State agencies or EPA Regional Offices. Phase-1 review includes only the initial summarization and analysis of excess emission reports received by a State or federal agency.

Chapter II of the handbook provides guidance on the review of opacity EERs; Chapter III provides guidance on the review of SO_2 EERs. Each chapter contains all of the information usually needed for the analysis and summarization of the data. Information relevant to both opacity and SO_2 monitoring systems appears in both chapters.

The detailed instructions in this handbook will assist the inexperienced Phase-1 reviewer. A more experienced reviewer may need only to rely upon the "Summary of Phase-1 Opacity EER Review Steps" (pages 7 - 8) or the "Summary of Phase-1 SO_2 EER Review Steps" (pages 39 - 40). A very experienced reviewer may need to use only the EER Reviewer's Checklist. If unusual or unfamiliar problems with interpreting the data arise, the more detailed explanation is available in Chapters II and III.

The illustrations and example EER review in the handbook are based on reports from Subpart D NSPS sources. However, the general approach and forms may be easily adapted to many variations of State requirements and requirements for other source categories where the EER is used as a targeting or screening mechanism for enforcement follow-up.

The following general information may be useful to the reviewer:

A. Content of Excess Emission Reports

Most EERs include:

- emissions data gathered by the continuous emission monitoring system (CEMS);
- information on the performance of the CEMS; and
- information on the overall operation of the source.

The EER should include specific times during which exceedances occurred and specific times during which the monitoring system was not operating. Although not currently required by regulation, these reports should also identify times that the source or unit was not in operation. Other information contained in the EER, regarding changes in the CEMS, or explanations of the causes of CEMS downtime or excess emissions, for example, may also be very important.

Federal regulations contain minimum data requirements for quarterly EERs. The reviewer must determine whether the EER includes all the required information. Because there is no uniform format, determining whether an EER is complete may be a time consuming and difficult task. For NSPS sources, the minimum data requirements include:

- identification of all excess emissions, their cause(s), and duration;
- magnitude of excess emissions;
- identification of all periods of CEMS downtime and nature of system repairs; and
- statements, if applicable, that no excess emissions or CEMS downtime occurred.

Additional information may be required by States or for specific source categories. For purposes of illustration, the content requirements listed on the EER checklist apply to Subpart D NSPS sources. These checklists may be adapted by an agency or reviewer to reflect the requirements of any State or source category.

B. Format of EERs

There is no uniform EER format required by EPA regulations. Sources sometimes submit computer data printouts, without explanations or summaries. These reports may be difficult for the EER reviewer to interpret and analyze. Other sources submit summarized data but exclude information on specific exceedances or periods of CEMS downtime. Most EER formats are used on a company-wide basis for all plants regardless of the plant location or number of monitors. Some formats may be recommended or required by State or EPA Regional Offices. Sources frequently rely on EER formats provided by a vendor with a computerized CEMS data acquisition system.

Although a data summary is not usually required, some sources submit summaries in addition to raw data on excess emissions and CEMS performance. This summary may provide an analysis similar or identical to the data summary performed during EER review. To the extent possible, this summary should be used by the reviewer to shortcut the data summary process. Periodic checks or audits of the data summary provided by the source can be performed to ensure the quality and accuracy of the data summary.

A cover letter or forwarding memorandum is often submitted with the quarterly reports. Summary information or other relevant information may be presented in this letter or memorandum. This cover letter or memorandum should be considered part of the quarterly EER.

Many sources submit data for more than one monitoring system in a single quarterly submittal. The data submitted for each continuous emission monitoring system is an "excess emission report" and should be reviewed independently. Each EER should be associated with one pollutant-specific and unit-specific continuous monitoring system. For example, a single quarterly submittal could contain three EERs as demonstrated below.

- One opacity EER for Unit # 1. This boiler might have two opacity monitors in a combiner system generating one quarterly EER.
- One SO_2 EER for Unit # 2. This boiler might have two SO_2 monitors in a combiner system generating one quarterly EER.
- One opacity EER for Unit # 2. This same boiler might also have one opacity monitor generating one quarterly excess emission report.

The source is required by regulation to submit the data for each pollutant and each stack separately. However, some sources combine process operating information or describe boiler problems in a cover letter or separate memorandum. Other sources report and describe CEMS problems separately from the emissions data. In order to summarize and evaluate all of the data which is relevant to one monitoring system, it is necessary for the reviewer to identify carefully which boiler and control equipment problems and CEMS data and recording equipment problems are associated with emissions data from specific monitoring systems.

C. Three Phase EER Review

EPA has recommended that the review of EERs occur in three phases (see "Technical Guidance on the Review and Use of Excess Emissions Reports," October 5, 1984).

- Phase-1 review includes an evaluation of the report for timeliness and completeness and the summarization of basic excess emissions and CEMS performance data (if not submitted in the EER).
- Phase-2 review includes verification of Phase-1 results and a comparison of the EER data with preselected targeting criteria to determine if agency follow-up may be warranted. The Phase-2 reviewer also approves the entering of EER data into the CDS or other computerized database and makes a recommendation for follow-up action.
- Phase-3 review includes any follow-up to the EER including enforcement activities, source contacts, etc.

D. Flowchart: Three Phase EER Review

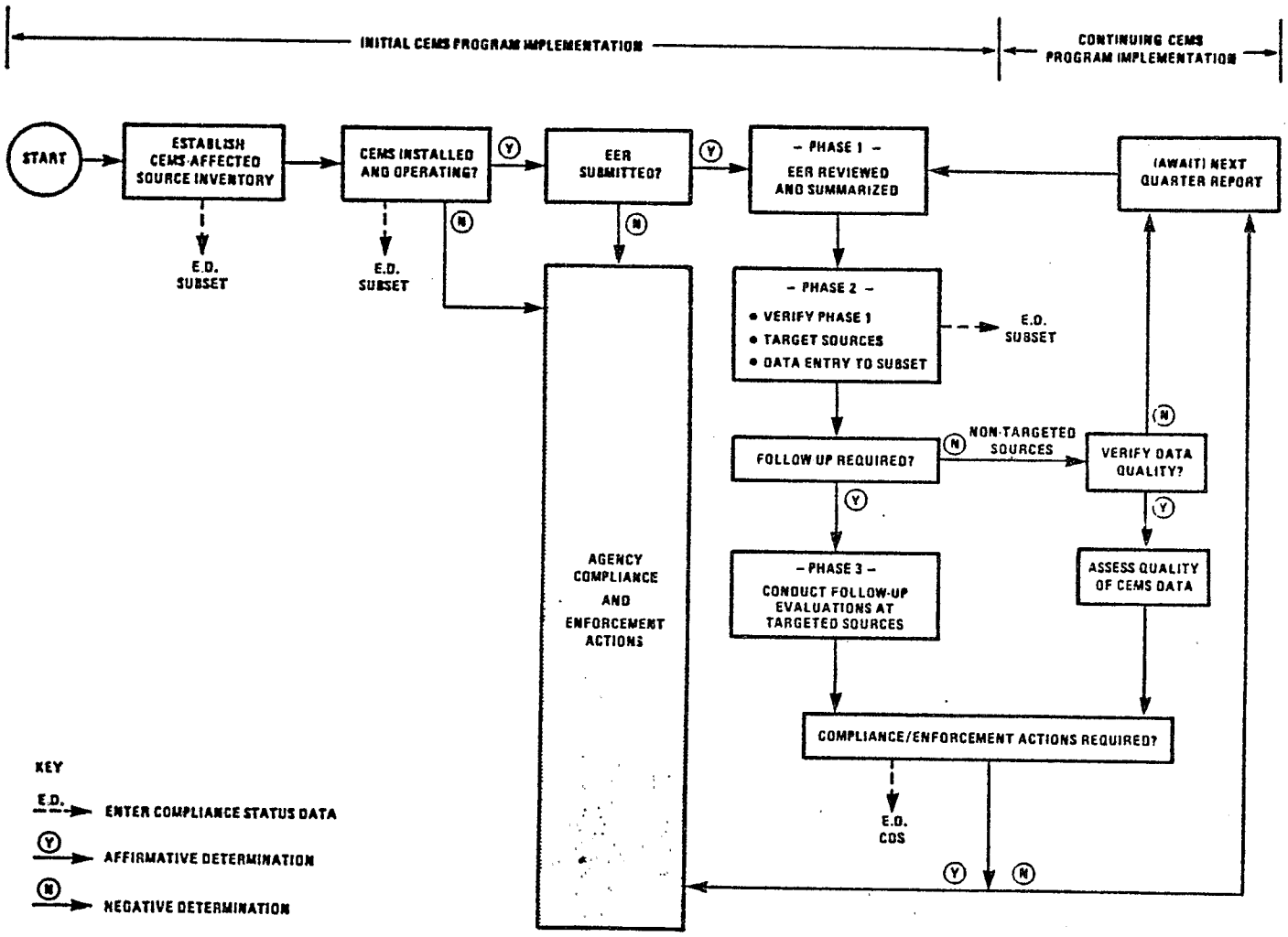
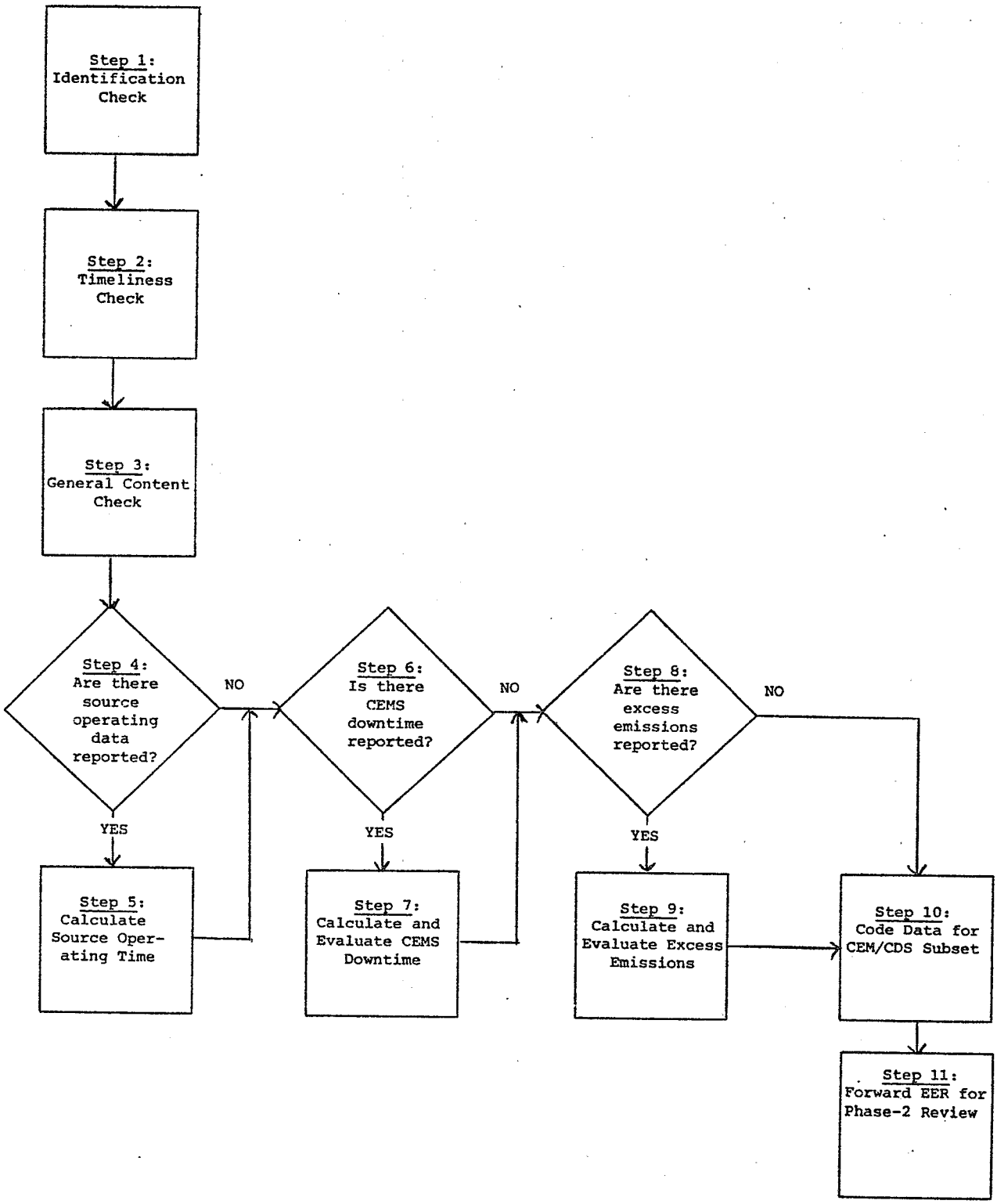


FIGURE 1. AGENCY'S REVIEW AND USE OF CEMS DATA

E. Flowchart: Phase-1 Review



II. EER Reviewer's Checklist for Opacity Excess Emissions Reports (EERs)

This chapter uses pages 1 and 2 of the EER Reviewer's Checklist (see Appendix A, pages 72 - 73) to summarize opacity EERs. The example EER Reviewer's Checklist used in this manual may be adapted to reflect the specific requirements for the source category or State regulation.

Phase-1 review includes a review of both emissions performance and CEMS performance. Source operating data and CEMS performance data should be evaluated first so that the reviewer can determine the percentage of monitored operating time the unit was reporting exceedances. The purpose of reporting emissions data is to determine the level of continuous compliance with applicable emissions standards. If the reported data on CEMS performance or source operation are unclear or show large periods of non-operation, the usefulness of the reported excess emission data as an indicator of the source's overall level of compliance is not necessarily diminished.

A. Summary of Phase-1 Opacity EER Review Steps

Step 1

Identify the source, unit, monitor, pollutant and quarter, and fill in Section 1.

Step 2

Check date of receipt or envelope postmark. NSPS sources shall submit EERs postmarked by the 30th day of the end of the quarter. Record your finding in Section 2.

Step 3

Review all EER information and note any general problems in Section 3.

Step 4

If there is no information on source operating time, enter "no" under "Source Operating Time" in Section 3. For purposes of evaluating emissions and CEMS performance, assume that the source was operating throughout the quarter.

If there is specific information or partial information, describe the information under "Source Operating Time."

Step 5A

Determine Total Hours Available in Quarter:

Quarter (identify): _____
(1,1L,2,3 or 4)

Hours available: _____

If no information on source operating time is available, go directly to Step 6, "Affirmative Statement of No CEMS Downtime."

Step 5B

Calculate the total duration of source downtime using summary information provided by the source or directly from the EER;

or

Calculate the total duration of source downtime by using Table 1 (see Appendix C) entitled, "Summary of Source Downtime."

Step 5C

Calculate the total source operating time using the formula below.

Time in Quarter (Hours)	-	Source Downtime (Hours)	=	Source Operating Time (Hours)

Step 6

Determine whether the source affirmatively states that there were no periods of "CEMS Downtime, Repair or Adjustment." If there is no CEMS downtime, go to Step 8, "Affirmative Statement of No Excess Emissions."

Step 7A

Evaluate CEMS performance information to determine if the data meets applicable EER content requirements and fill in Section 3 under "CEMS Performance Information."

Step 7B

Calculate total CEMS downtime using summary information provided by the source or directly from the EER;

or

Calculate the total CEMS downtime by using Table 2 (see Appendix C) entitled, "Summary of CEMS Downtime."

Step 7C

Compare the specific times during which the CEMS was inoperative with source operating downtime. Where the two overlap, exclude these time periods from the CEMS downtime.

Step 7D

Evaluate the causes of CEMS downtime and the nature of system repairs or adjustments to determine if the source has adequately explained reported CEMS downtime. If the reasons are inadequate or unclear, note the problem in Section 3 under "CEMS Performance Information."

Step 7E (optional)

Calculate the total CEMS downtime for each reason category. Record the total duration for each reason category in Section 4(a).

Step 7F (optional)

Calculate "Percent Unavailability" for total CEMS downtime (and for each reason code) by using the formula provided below. Enter the result in Section 4(a).

CEMS Downtime During Source Operating Time (Hours)	÷	Source Operating Time (Hours)	x 100 =	Percent Unavailability

Step 8

Determine whether the source affirmatively states that there were no periods of excess emissions. If there are no excess emissions, go to Step 10, "CDS/CEM Subset Data Coding."

Step 9A

Evaluate all information relevant to excess emissions for the following types of information and fill in Section 3. This should include the following:

1. Reporting in Periods of the Applicable Standard
2. Magnitude
3. [Conversion Factors]
4. Reporting of Malfunction Information

Step 9B

Identify the opacity standard applicable to the source and unit.

Step 9C

Identify specific periods of excess opacity. If the source provides only summary information or "average" opacity readings over a longer period of time, note this deficiency in Section 3 under "Emissions Performance" for possible agency follow-up.

Step 9D

Calculate the total duration of all periods of excess opacity, using summary information or calculating directly from the report;

or

Calculate the total duration of all excess opacity by using Table 3 (see Appendix C) entitled, "Summary of Incidents of Excess Opacity."

Step 9E

Evaluate the "nature and cause" of exceedances reported. If there is no information provided regarding the cause of excess emissions, or if the reasons are inadequate or unclear, note the problem in Section 3 under "Emissions Performance."

Step 9F (optional)

Calculate the total duration of excess emissions for each reason category. Record the total duration for each reason category in Section 4(b).

Step 9G (optional)

Calculate the percent of time (while both source and monitor were in operation) that excess emissions were occurring. This is calculated by dividing the duration of exceedances by the time in which both the source and monitor have been operating during the quarter, then converting the result to a percentage:

(Total Duration of Excess Emissions (Hours)	÷	Monitored Operating Time (Hours))	x 100 =	Percent of Monitored Operating Time (Hours)

Where:

Time in Quarter (Hours)	—	Source Down-time (Hours)	—	CEMS Downtime[4] During Source Operating Time (Hours)	=	Monitored Operating Time (Hours)

Make this calculation for the "Percent of Monitored Operating Time" for total exceedances and for each reason category. Enter the results in Section 4(b).

Step 10

Code the EER data for entry into the CDS/CEMS subset.

Step 11

Forward the EER, EER Reviewer's Checklist, proposed CDS/CEMS Subset data entry cards and other relevant information for Phase-2 review.

B. Explanation of Phase-1 Opacity EER Review Steps

(1) Step 1: Identification Check

Step 1:

Identify the source, unit, monitor, pollutant and quarter, and fill in Section 1.

Determine the type of facility and type of monitors used to measure emissions at the reporting facility. If this information is not in the excess emission report, it may be found in a source file maintained by the agency[1] or a completed "CEMS General Compliance Audit Data Sheet" (see Appendix B). Basic source identification information includes:

- the type of source (e.g., electric utility, coal or oil fired);
- location of the monitor (identification of unit and stack);
- type of control equipment used (e.g., ESP, baghouse or scrubber);
- applicable emission standards; and
- the type of monitor (brand, number of transmissometers, type of data recording system).

Note any unusual operating configuration. For example, a single monitor may record data for emissions which feed into a single stack from three boilers or control systems. Problems with any of three operating systems or three control equipment systems may be the cause of exceedances recorded by the monitor.

---

[1] It is strongly recommended that each agency maintain a permanent file of CEMS-related information for each facility for use during all stages of EER review. This file should contain basic information such as: source permits; CEMS General Compliance Audit Data Sheet (see Appendix B) or similar compliance audit information; EERs and EER summaries for the previous two years; correspondence or other documentation of EER follow-up; monitor audits or testing; plant inspections, etc.

(2) Step 2: Timeliness Check

Step 2:

Check date of receipt or envelope postmark. NSPS sources shall submit EERs postmarked by the 30th day of the end of the quarter. Record your finding in Section 2.

If the report is late, save the envelope in which the report was submitted to demonstrate that the source failed to comply with the timeliness requirement.

Timeliness of submission is an important factor because:

- Late submission makes it more difficult to associate specific exceedances with on-going problems at the source and to ensure that corrective action is promptly undertaken.
- Current information from all sources each quarter will enable the agency to compare the performance of different sources and thereby maximize the resources available to the agency for follow-up.
- Timely agency follow-up may result in greater all-around responsiveness of sources and should increase the credibility of the agency's EER review program.

Example EER Reviewer's Checklist, Sections 1 & 2

EER REVIEWER'S CHECKLIST
(40 C.F.R. Part 60, Subpart D)

	Name	Date
Phase 1 Review	DSF	4/22/85
Phase 2 Review/ Subset Data Entry		
Phase 3 Review/ CDS Action Entry		

1. Company: Everman Power & Light — Quarter: 1st — Year: 85
   Plant/Unit: Green River Station, Unit #1

2. Timeliness (Must be postmarked within 30 days of quarter)
   (a) Date Postmarked April 15, 1985 (b) Days Late --

(3) Step 3: General Content Evaluation

Step 3:

Review all EER information and note any general problems in Section 3.

More specific evaluation of the adequacy of the data will be conducted when the data are summarized. However, some information may be included or reporting problems may occur which are not directly related to data summary and which should be noted in Section 3 of the EER Reviewer's Checklist. This includes reports where:

- There were no excess emissions and no CEMS downtime and further evaluation of the EER is unnecessary.
- There were changes in the operating, control equipment or continuous emission monitoring systems. This information is very important and any changes should be noted in the source information file as well as Section 3 of the EER Reviewer's Checklist.
- Actual data in support of summary information are not reported in the EER. This is a reporting deficiency which should be noted by the Phase-1 reviewer so that appropriate follow-up action can be taken -- particularly if there is a significant amount of CEMS downtime or exceedances.
- Specific information (for example, explanations for excess emissions) appears only in the cover letter or memorandum and not with the EER data. This problem makes it very difficult to analyze causes of excess emissions and may also warrant agency follow-up.

Example EER Reviewer's Checklist, Section 3

3. Completeness[1] (For EERs which cover multiple monitors, specify monitor when noting problem)

	No Problem	Problem (Describe)/Comments
Source Operating Time [1]	✓	324 hrs. downtime -- Units 1 & 2
CEMS Performance Information		
(a) Affirmative Statement of No Period of Downtime, Repair or Adjustment (include no CEMS modifications)		
(b) Date and Time Identifying Specific Periods During Which CEMS Was Inoperative	✓	
(c) Nature of System Repairs or Adjustments	✓	Source uses 8 reason codes/ no repairs or adjustment
Excess Emissions (EEs) Information		
(a) Affirmative Statement of No EEs	--	
(b) Data Reported in Units of Applicable Standards	✓	
(c) Date and Time of Commencement	✓	
(d) Date and Time of Completion	✓	
(e) Magnitude	✓	
(f) Conversion Factors Used	--	
(g) Identification of EEs Caused by Start-up, Shutdown, or Malfunction	✓	
(h) Nature and Cause of Malfunction	✓	
(i) Malfunction Corrective Action or Preventive Measures	✓	

[1] A revision of reporting requirements to require a summarization of data, categorization of excess emissions and CEMS problems according to new uniform categories, and reporting of source operating time is now under consideration. Although not specifically required, source operating time has been included on this sample form because it is necessary to allow for data analysis included in this checklist.

(4) Step 4: Availability of Source Operating Time Information

Federal NSPS regulations do not require the reporting of source operating time, although a permit provision or similar plant-specific requirement may apply. However, the availability of this information is very important and should be noted on the EER Reviewer's Checklist.

Step 4:

If there is no information on source operating time, enter "no" under "Source Operating Time" in Section 3. For purposes of evaluating emissions and CEMS performance, assume that the source was operating throughout the quarter.

If there is specific information or partial information, describe the information under "Source Operating Time."

Source operating data allows for the adjustment of data to account for periods of time during which the source was not operating. Comparisons between sources and tracking of individual source performance from quarter to quarter are more accurate.

If no source operating time information is available, assume that the source was in continuous operation. If the source was not operating for a significant portion of the quarter, the calculation of percent excess emissions and percent CEMS downtime using this assumption may significantly under-represent the actual percentages. A preliminary indication of actual source downtime may be obtained by noting the number of incidents of excess emissions associated with "startup" and "shutdown" of the facility.

An agency may, as a matter of policy, choose to contact the source to obtain source operating data or to request routine submission of the data.

(5) Step 5: Source Operating Time

(a) Total Hours Available in Quarter

Because the number of days in each month varies, the time available in each quarter varies. The following chart provides the total hours available each quarter, including leap year.

Maximum Time Available in Quarter

Quarter	Hours
01	2,160
01L*	2,184
02	2,184
03	2,208
04	2,208

* Leap year

Step 5A:

Determine Total Hours Available in Quarter:

Quarter (identify): _____
(1,1L,2,3 or 4)

Hours available: _____

If no information on source operating time is available, go directly to Step 6, "Affirmative Statement of No CEMS Downtime."

(b) Calculation of Source Downtime

Step 5B:

Calculate the total duration of source downtime using summary information provided by the source or directly from the EER;

or

Calculate the total duration of source downtime by using Table 1 (see Appendix C) entitled, "Summary of Source Downtime."

Sources may specify periods of operation or non-operation. Some sources provide summary information only. Where the source identifies specific time periods, summarize the total source downtime.

1. Use of Summary Table 1 (optional)

The reviewer may choose to calculate source downtime by using Table 1, "Summary of Source Downtime." (See Appendix C.) If the data is not easily computed from the EER directly, or is unclear or confusing, making a record of source operating downtime will facilitate review and will allow the Phase-2 or Phase-3 reviewer to check the accuracy of the Phase-1 review, particularly where the Phase-1 reviewer is inexperienced or where the EER reveals significant emissions or CEMS performance problems.

Table 1

SUMMARY OF SOURCE DOWNTIME

Company: Everyman Power & Light
Unit: Green River, #1
Quarter: 1st 85

Incident Number	START Month/Day/Time	STOP Month/Day/Time	Duration (Hours)	Reason
1	1/15 1:00	1/24 3:00	218	Shutdown
2	3/16 13:00	3/20 23:00	106	Routine maint.

TOTAL SOURCE DOWNTIME: 324 hours

(c) Calculation of Source Operating Time

Step 5C:

Calculate the total source operating time using the formula below.

Time in Quarter (Hours)	−	Source Down-time (Hours)	=	Source Operating Time (Hours)

(6) Step 6: Affirmative Statement of No CEMS Downtime

Step 6:

Determine whether the source affirmatively states that there were no periods of "CEMS Downtime, Repair or Adjustment." If there is no CEMS downtime, go to Step 8, "Affirmative Statement of No Excess Emissions."

This statement may appear in a cover letter or in the excess emission report. Some sources report "0" CEMS downtime in a blank on the excess emissions data form.

(7) Step 7: Summary of CEMS Performance Data

(a) General Information Check

Step 7A:

Evaluate CEMS performance information to determine if the data meets applicable EER content requirements and fill in Section 3 under "CEMS Performance Information."

(b) Calculation of CEMS Downtime

Step 7B:

Calculate total CEMS downtime using summary information provided by the source or directly from the EER;

or

Calculate the total CEMS downtime by using Table 2 (see Appendix C) entitled, "Summary of CEMS Downtime."

Calculate duration in hours, expressed to the nearest tenth. The following table converts minutes of CEMS downtime to tenths of hours.

Number of Minutes	Tenths of Hours
3	.0
4-9	.1
10-15	.2
16-21	.3
22-27	.4
28-33	.5
34-39	.6
40-45	.7
46-51	.8
52-57	.9

1. Types of CEMS Downtime

Three types of CEMS downtime may be reported in the EER:

- periods during which the CEMS is inoperative;
- periods during which the CEMS is undergoing routine maintenance or other repair; and
- periods during which the CEMS is operating, but is generating inaccurate data.

All three types should be included as CEMS downtime. However, some sources report the three types of CEMS downtime in different portions of the EER. In particular, periods during which the CEMS is operating, but is generating inaccurate data are sometimes included with excess emissions data.

Scan the reasons for excess emissions to determine if the CEMS system is the "cause" of any excess emissions and include these time periods as CEMS downtime. Later, exclude these time periods from the total excess emissions time (see Step 9C of this chapter).

Sources are not required to operate the CEMS when the source is not operating. Do not include CEMS downtime which is reported during source downtime (if source downtime information is available). If the EER does not provide adequate information to make this determination, assume that all reported CEMS downtime occurred during periods of source operation.

Note that the CEMS includes all parts of the system, not just the monitor component. For example, failure to record data because of computer or data recorder problems, unless data is available through back-up recorders or strip charts, is considered to be a failure of the entire system and the time lost is included in CEMS downtime.

Sources must include the date and time identifying specific periods during which the CEMS was inoperative. Quarterly totals or daily totals are not adequate because they do not allow the reviewer to relate specific periods of CEMS downtime to specific periods of excess emissions or source downtime.

2. Use of Summary Table for Analyzing CEMS Downtime (optional)

Making a record of CEMS downtime may help the reviewer to evaluate confusing or conflicting data and may allow the Phase-2 or Phase-3 reviewer to check the accuracy of the Phase-1 review, particularly where the Phase-1 reviewer is inexperienced or where the EER reveals significant emissions or CEMS performance problems. Use of a summary chart may also make it easier for the reviewer to track corrective actions or reasons for CEMS downtime and calculate a total CEMS downtime for each reason category.

Some sources provide only the total hours of CEMS downtime per quarter or per day. If this is the only information available, if the source provides summary information, or if the reviewer chooses to total the CEMS downtime from the EER directly, fill in the blanks for total CEMS downtime in Section 4(a) of the EER Reviewer's Checklist.

Unless the total amount of CEMS downtime during source operation is very small, failure to identify the specific times during which the CEMS was inoperative or the nature of the problem or corrective action is a serious reporting deficiency which should be noted for possible agency follow-up.

Table 2

SUMMARY OF CEMS DOWNTIME

Company: Everyman Power & Light
Unit: Green River #1
Quarter: 1st 85

Incident Number	START Month/Day/Time		STOP Month/Day/Time		Duration (Hours)	Reason/Corrective Action	Reason Code
1	1/2	9:00	1/2	11:00	2	Optics cleaned	c
2	1/3	1:00	1/3	6:00	5	Power loss	d
3	1/25	10:30	1/25	20:30	10	No explanation	e
4	2/2	9:00	2/2	1:00	4	Optics/calibrate	c
5	2/10	1:00	2/14	24:00	119	Combined prob	a
6	3/2	9:00	3/2	11:00	2	Calibrati.	c

TOTAL CEMS DOWNTIME: 142 hours

Reason Codes

a = Monitor equipment malfunction — 119 hrs.
b = Non-monitor equipment malfunction — 0
c = Calibration/QA — 8
d = Other known causes — 5
e = Unknown causes — 10

(c) Identification of CEMS Downtime During Source Downtime

Step 7C:

Compare the specific times during which the CEMS was inoperative with source operating downtime. Where the two overlap, exclude these time periods from the CEMS downtime.

This may be done either directly, using the EER, or indirectly, using summary charts of source downtime and CEMS downtime already completed.

(d) Evaluation of Reasons for CEMS Downtime

Step 7D:

Evaluate the causes of CEMS downtime and the nature of system repairs or adjustments to determine if the source has adequately explained reported CEMS downtime. If the reasons are inadequate or unclear, note the problem in Section 3 under "CEMS Performance Information."

The "cause" of the CEMS downtime or the "nature of system repairs or adjustments" should be identified for all NSPS sources. Each separate incident should be explained. An incident of CEMS downtime is any uninterrupted period (of any time length) during which the CEMS is not operating or providing accurate data.

(e) Evaluation of CEMS Downtime by Reason Category (optional)

Step 7E: (optional)

Calculate the total CEMS downtime for each reason category. Record the total duration for each reason category in Section 4(a).

An agency may choose to evaluate specific causes of CEMS downtime:

- when total CEMS downtime exceeds a specified cutoff; or
- to evaluate all causes of CEMS downtime for a specific quarter or series of quarters to identify types of problems and typical levels of downtime associated with specific types of problems.

The reason categories defined below are based on the revised reason categories included in EER Regional Guidance developed by EPA in 1984. Additional reason categories may be added for other source categories or to accommodate variations in State regulations.

Sources may use their own reason codes or reason categories to report the causes of monitor problems. If the reason codes differ from those used by the agency, correlate source reason codes to the agency reason codes so that a uniform code system is used.

1. EPA Proposed Reason Categories

The reason categories proposed by EPA (with definitions and examples of typical source explanations) are:

a. "Monitor equipment malfunction." This category refers only to the actual monitoring equipment, and not to accessory equipment such as strip chart recorders and computer data acquisition systems. The actual monitoring equipment includes all of the apparatus necessary to measure the opacity of the emissions at the monitor installation location(s) and to convert the measurements to the equivalent opacity that would be observed at the stack exit. The major components of the monitoring equipment are the transceiver, reflector, signal cable, control unit and combiner system (see Appendix D for an explanation of these components).

The opacity "monitoring equipment" also includes those components of the measurement system that protect the optical components of the transmissometer from the effluent stream. The equipment consists primarily of a purge air system (i.e., power supply, blowers, air filters, and connecting hoses). The equipment which provides temporary protection for the analyzer in the event of failure of the purge air system usually consists of pneumatically or electronically activated shutter devices.

"Malfunction" refers to any period during which the monitor is not operating or is producing inaccurate data due to a failure of any component of the opacity monitoring system. A "monitor equipment malfunction" does not include periods of calibration, QA, or other normal or preventive maintenance. Also, monitor equipment malfunction does not include CEMS downtime attributable to "non-monitor equipment malfunctions," "other known causes," or "unknown causes" as described below. Because the EER often lists only the activities undertaken to correct a malfunction, the reviewer must be careful to distinguish between normal maintenance procedures and corrective actions following a malfunction. The time necessary to complete corrective actions following a malfunction should be included in the "monitor equipment malfunction" category.

"Monitor equipment malfunction" includes problems described by the sources as:

Transmissometer malfunction	Transceiver malfunction	Transceiver board damaged
Shutter failure	Repaired shutter	Blower failure
Blower shutdown	Blower problems	Blower replacement
Repair filter alarm switch	Monitor misalignment	Alignment shift
Replaced defective alarm card	Replace opacity card	Opacity PC board failure
Optical density card failure	Replace OD P.C. board	Zero cal stack
Stuck in span	Cal button stuck	Span shift
Defective micro switch	Switch contacts failed	Not integrating properly
Combiner stuck	Combiner malfunction	D/A alarm
D/A flag	D/A error	Filter alarm switch malfunction
Investigation of alarm problem	Troubleshooting for alarm problem	

b. "Non-monitor equipment malfunction" refers to all equipment other than the monitor equipment that is necessary to transfer, compute averages, and record opacity monitoring data. "Non-monitor equipment malfunction" almost always refers to failures or problems with the strip chart recorder, data losses or computer data acquisition system problems. However, the time required to perform routine maintenance of these systems should be excluded from this category and be included under "Calibration/QA." Some opacity monitoring systems which include multiple opacity monitors installed in different ducts and which utilize a computer system to calculate the equivalent combined opacity at the stack exit may also utilize the computer to perform automatic diagnostic checks of the data quality. In this situation, computer system malfunctions (usually due to software problems) may cause accurate monitoring data to be rejected. This type of problem should be classified as a "non-monitor equipment malfunction."

"Non-monitor equipment malfunction" includes problems described by the sources as:

Strip Chart Recorder Problems	Computer Data Acquisition System Problems	
Recorder not functioning	Insufficient data flag on D/AS	Reinitialized system
Chart not recording	Reload program for alarm problem	Reinitialized for time
Replace chart recorder	Malfunction -- data logger	DP30 software check
Chart drive off	Incorrect entry time update	Ran diagnostic tape
Chart drive running slow	Worked on incorrect alarm printout	Incorrect D/A alarm printout
Chart paper off track	Program error -- reset time	D/AS computer failed and repaired
Chart paper jammed	Computer stopped -- replaced I/O board	Computer down--replaced I/O bd. after trying to reprogram
Chart not inking	Reloaded program for D/A alarm problem	Printer failure
		Lost info from terminal
		Lost information in computer
		Computer did not make calculation

c. "Calibration/QA" refers to any period during which the monitoring system is out-of-service for the purpose of calibration, routine or preventive maintenance, or other quality assurance related activity. Corrective action immediately following a malfunction, however, should be classified under the appropriate malfunction category.

Federal regulations specify that all source operators required to use opacity monitors must check the monitor response at zero opacity (or at a low range) and at an upscale value (span check) at least once per day. The regulations also require that the monitor be adjusted when the zero and/or span check results exceed specified limits.

The time required to perform the daily zero and span checks is usually a few minutes per day. The reporting of this time is not required and should not be included in "Calibration/QA" or any other category, since the monitor is performing a required activity. However, when the zero or span drift limits are exceeded, a significant amount of time may elapse before the adjustments are completed. Monitor downtime associated with completing the zero or span adjustments should be included in "Calibration/QA."

In addition to zero and span checks and/or adjustments that are referred to as "calibration," other activities referred to as "calibration" include:

- o electronic checks of the transmissometer and/or data recording devices;
- o on-stack, multipoint checks of the transmissometer responses to external filters (calibration standards); and
- o off-stack or clear stack checks of both the transmissometer zero value (sometimes called zero alignment), and multipoint checks/adjustments of component or system responses to external filters (calibration standards).

The simplest of these activities usually requires only a few minutes to perform; however, the most complex activity (off-stack calibration check) may take several days or more to complete. Despite the wide variation in the amount of time required for "calibration" and the inconsistent use of terminology by source personnel, all of the above activities except routine/daily zero/span checks should be included as "Calibration/QA."

"Calibration/QA" includes problems described by the sources as:

Optics cleaned	Lens cleaned	Cleaned transceiver windows
Cleaned reflector	Cleaned zero reflector	Cleaned purge air systems
Changed filters	Replaced air filters	Cleaning monitor
General maintenance	Preventive maintenance	Cleaning ports
Cleaning site pipe	Printer maintenance	Changed chart paper
Recorder maintenance	Cleaned control unit/combiner	Replace fault lamp bulbs
Reinitiate computer system	Run diagnostic tape	Repair D/A alarm
Software enhancements	Partial calibration	Recalibrated control unit
Recalibrated combiner	On-stack audit checks	Opacity system audit
Adjust zero/span responses	Major calibration	Off-stack calibration
Off-stack zero check/ alignment	Bench calibration	Routine maintenance of terminal
Station audit and off-stack zero	Transceiver and combiner recalibration	Scheduled long-term monitor overhaul and calibration

d. "Other known causes" covers all other known reasons for monitoring downtime or inaccuracy. This catch-all category excludes all malfunctions and all "Calibration/QA" activities. This category usually includes, for example, the interruption of the monitoring equipment power supply, human error and other relatively unusual events. This category also includes monitor problems or inaccuracy associated with the inability to perform routine maintenance because of severe weather conditions.

"Other known causes" includes problems described by the sources as:

- Correct date/time changes
- Waiting for parts shipment
- Removed OD card to use in another monitor
- Moved monitor to new installation
- Control room power outage
- Waiting for vendor service
- Power rewiring on stack
- Precipitator bus outage
- Removed monitor due to duct leak
- Meter inadvertently left in calibration position
- Combiner shutdown by mistake
- Power loss on stack
- Developing new calibration procedure
- Failed to log monitor in service on computer

e. "Unknown cause" is intended to cover circumstances in which there is inaccurate or no data without an apparent explanation. If a data recorder fails, producing inaccurate data, and the reason for failure is not known, this would be categorized under "non-monitor equipment malfunction." However, if data are clearly inaccurate, and a data recorder failure is suspected but cannot be confirmed, it should be classified as "unknown cause." The reviewer should also use "unknown cause" when an insufficient explanation of the CEMS downtime is provided in the EER such that determination of the appropriate reason category is not possible.

This category includes those instances where:

- o no explanation is provided by source;
- o the source states that the cause is unknown; or
- o the source explanation is inadequate, unclear or contradictory.

(f) Calculation of Percent Unavailability (optional)

Step 7F: (optional)

Calculate "Percent Unavailability" for total CEMS downtime (and for each reason code) by using the formula provided below. Enter the result in Section 4(a).

CEMS Downtime During Source Operating Time (Hours)	÷	Source Operating Time (Hours)	x 100 =	Percent Unavailability

"CEMS Downtime During Source Operating Time (Hours)" is calculated in Step 7B. "Source Operating Time (Hours)" is calculated in Step 5C.

An agency may choose to calculate "Percent Unavailability" for sources which have a high total percentage of monitor downtime or to develop data related to CEMS performance in selected problem areas. "Percent Unavailability" may be used (in a manner similar to total duration, magnitude or number of incidents) to target sources for agency follow-up or inspections.

Example EER Reviewer's Checklist, Section 4(a)

4. Data Summary for Opacity EERs

(a) Opacity CEMS Performance

Causes of CEMS Downtime**	Total Downtime (Hours)	Percent Unavailability[2]	Comments
(a) Monitor Equipment Malfunctions	119	6.5 %	Combiner malfunc.
(b) Non-monitor CEMS Equipment Malfunctions (e.g., computer, data recorder, etc.)		%	
(c) Calibration/QA	8	0.4 %	optics cleaned/calib.
(d) Other Known Causes	5	0.3 %	power loss
(e) Unknown Causes	10	0.5 %	no reason given
(f) Total	142	7.7 %	

[2] "Percent unavailability" is calculated by the following formulas:

(CEMS Downtime[4] During Source Operating Time (Hours)	÷	Source Operating Time (Hours))	x 100 =	Percent Unavailability

Where:

Time in Quarter (Hours)	−	Source Downtime (Hours)	=	Source Operating Time (Hours)

(8) Step 8: Affirmative Statement of No Excess Emissions

Step 8:

Determine whether the source affirmatively states that there were no periods of excess emissions. If there are no excess emissions, go to Step 10, "CDS/CEMS Subset Data Coding."

This statement may be found either in a cover letter or in the report.

(9) Step 9: Opacity Excess Emissions Data

(a) Content Evaluation

Step 9A:

Evaluate all information relevant to excess emissions for the following types of information and fill in Section 3. This should include the following:

1. Reporting in Periods of the Applicable Standard
2. Magnitude
3. [Conversion Factors]
4. Reporting of Malfunction Information

1. Reporting in Periods of the Applicable Standard

The regulations specify that opacity data (for periods during which the standard was exceeded) must be reported in six-minute time periods. Most monitors are set to provide a six-minute average automatically. The time period used may be stated on the EER form. If it is not specified, the opacity data should be reported in six-minute increments or multiples of six-minute increments (i.e., 6, 12, 18, 24, or 36 minutes of opacity). Because the emission limit is a whole number, the average readings during each 6-minute period should be rounded to the nearest whole number (i.e., 21% opacity).

If only the time of commencement and the time of completion of a period of excess opacity is provided, the reviewer may need to determine the total number of minutes involved to determine whether the data is reported in six-minute

periods. For example, a report may state that an excess emission began at 2:12 and ended at 2:24. The incident lasted for 12 minutes, or two six-minute periods. Thus, the example data is reported in six-minute periods, the specified opacity data averaging period for NSPS sources.

2. Magnitude of Excess Emissions

The magnitude of an emission which exceeds the opacity standard appears as a specific numerical value which represents the average opacity over the six-minute period. Most sources report the average opacity that was measured during the six-minute periods. If the allowable opacity is 20%, the magnitude may be expressed as "43%" opacity. The value should be precise; magnitude should not be expressed as "greater than 40%," for example.

The magnitude of excess emissions is not analyzed during Phase-1 EER review. For purposes of summarizing exceedance data, the reviewer should consider any reported emissions greater than 20% to be a violation of a 20% opacity standard. Whether or not an emission which only marginally exceeds the standard is "significant" will be determined when appropriate EER follow-up is evaluated. An evaluation of the magnitude of excess emissions is useful in later stages of EER review to determine the severity of the impact of non-compliance and the appropriate agency response.

3. Conversion Factors

[Conversion Factors -- not applicable to opacity data]

4. Reporting of Malfunction Information

For NSPS, Subpart D sources, periods of excess emissions which occur during (1) startup or shutdown of the plant or unit, or (2) malfunction of the process or control equipment must be separately identified.

The nature and cause of the "malfunction" must also be specifically identified. It is not adequate to state that an excess emission is caused by a "malfunction." More specific information must be provided.

If you are unsure whether a description of a malfunction is adequate, please note that there may be a problem in Section 3 of the EER Reviewer's Checklist. Any corrective actions or measures taken to prevent future malfunctions should also be described.

Examples of descriptions which are incomplete or inadequate include:

- "malfunction"
- "breakdown"
- "problem with boiler."

(b) Emission Standard

Step 9B:

Identify the opacity standard applicable to the source and unit.

This information can be found in the cover letter or memo, in the EER itself, in the "General Compliance Audit Data Sheet," or with other file information on the source. The emission standard for NSPS electric utilities is 20% opacity (6-minute average) except for one 6-minute period per hour of not more than 27 percent opacity" (40 C.F.R. § 60.42a).

The opacity standard applies "at all times except during periods of startup, shutdown, malfunction,..." (40 C.F.R. § 60.11(c)). "Startup" is defined as "the setting in operating of an affected facility for any purpose; "shutdown" is defined as "the cessation of operation of an affected facility for any purpose; and "malfunction" is defined as "any sudden and unavoidable failure of air pollution control equipment or process equipment or of a process to operating in a normal or usual manner. Failures that are caused entirely or in part by poor maintenance, careless operation, or any other preventable upset condition or preventable equipment breakdown shall not be considered malfunctions" (40 C.F.R. § 60.2).

The Phase-1 reviewer should include all periods of excess emissions in the total excess emissions for the quarter whether or not they may be "excusable" under the standard or fall within the hourly exception. This allows the Phase-1 data summary to serve primarily as a screening mechanism. These issues will be resolved by Phase-2 or Phase-3 reviewers.

(c) Emissions Data Summary

Step 9C:

Identify specific periods of excess opacity. If the source provides only summary information or "average" opacity readings over a longer period of time, note this deficiency in Section 3 under "Emissions Performance" for possible agency follow-up.

Regulations require that the date and time of commencement and the date and time of completion of all periods of excess emissions be reported in the EER.

(d) Calculation of Duration of Exceedances

Step 9D:

Calculate the total duration of all periods of excess opacity, using summary information or calculating directly from the report;

or

Calculate the total duration of all excess opacity by using Table 3 (see Appendix C) entitled, "Summary of Incidents of Excess Opacity."

Although opacity is generally reported in six-minute periods, or multiples of six-minute periods, the duration should be calculated in hours, expressed to the nearest tenth. The following table converts minutes and six-minute periods to tenths of hours.

Number of Minutes	Number of 6-minute Periods	Tenths of Hours
3	0	.0
4-9	1	.1
10-15	2	.2
16-21	3	.3
22-27	4	.4
28-33	5	.5
34-39	6	.6
40-45	7	.7
46-51	8	.8
52-57	9	.9

Exclude any excess emissions which are "caused" by monitor problems. This time should be included as CEMS downtime. Exclude any excess emissions which occur during source downtime. If necessary, check source downtime information in the EER or in Table 1 (if used) to identify periods of overlap.

1. Use of a Summary Table (optional)

The reviewer may choose to calculate excess emissions by using Table 3, "Summary of Incidents of Excess Opacity." When the data are not easily computed making a summary record of excess emissions may facilitate review and may allow the Phase-2 or Phase-3 reviewer to check the accuracy of the Phase-1 review, particularly where the Phase-1 reviewer is inexperienced or where the EER reveals significant emissions or CEMS performance problems. Use of this summary chart may also make it easier for the reviewer to track the reasons for excess emissions and calculate a total exceedance time for each reason category.

Some sources provide only the total hours of exceedances per quarter or per day. This is a reporting problem which requires agency follow-up. If this is the only information currently available, if the source provides summary information, or if the reviewer chooses to total the exceedance data from the EER directly, note total excess emissions in Section 4(b).

Table 3

SUMMARY OF INCIDENTS OF EXCESS OPACITY

Company: Everyman Power & Light
Unit: Green River #1
Quarter: 1st 85

Incident Number	START Month/Day/Time		STOP Month/Day/Time		Duration (Hours)	Reason/Corrective Action	Reason Code
1	1/15	1:00	1/15	3:30	2.5	Shutdown	a
2	1/24	3:00	1/24	5:00	2	Startup	a
3	1/26	9:00	1/26	9:30	0.5	Sootblowing	b
4	2/1	8:00	2/1	24:00	16	ESP prob	c
5	2/6	0:30	2/6	24:00	23.5	No explanation	g
6	2/7	0:00	2/8	12:00	36	Fan prob.	d
7	2/8	10:00	2/8	10:30	0.5	Sootblowing	b
8	3/2	9:00	3/2	9:30	0.5	"	b
9	3/16	11:00	3/16	13:00	2	Shutdown	a
10	3/20	23:00	3/21	4:00	5	Startup	a
11	3/21	9:00	3/21	9:30	0.5	Sootblowing	b

TOTAL EXCESS EMISSIONS: 89 hours

Reason Codes

a = Startup/shutdown - 11.5 hrs
b = Sootblowing - 2
c = Control Equipment Failures - 16
d = Process Problems - 36
e = Fuel Problems - 0
f = Other Known Problems - 0
g = Unknown Problems - 23.5

(e) Evaluation of Causes of Excess Opacity

Step 9E:

Evaluate the "nature and cause" of exceedances reported. If there is no information provided regarding the cause of excess emissions, or if the reasons are inadequate or unclear, note the problem in Section 3 under "Emissions Performance."

(f) Evaluation of Excess Emissions by Reason Category (optional)

Step 9F: (optional)

Calculate the total duration of exceedances for each reason category. Record the total duration for each reason category in Section 4(b).

An agency may decide to evaluate specific causes of excess emissions when total exceedances exceed a specified cut-off or to evaluate all causes of excess emissions for all sources for a specified quarter or series of quarters to identify types of problems or typical levels of exceedances associated with specific problems.

1. EPA Proposed Reason Categories

The reason categories defined below are based on the categories which were proposed by EPA in the "Technical Guidance on the Review and Use of Excess Emission Reports" (October 5, 1984). Additional categories may be added for other source categories or to accommodate variations in State regulations.

Many sources currently use their own reason codes or reason categories to describe the causes of excess emissions. If the reasons are different from those used by the agency, the reviewer should correlate source reason codes to the agency reason code so that a uniform code system is used for agency review of all EERs.

For example, a source may have separate reason codes for each of the following control equipment problems: "Precipitator Control Problems," "Rapper

Problems," or "Precipitator Fields Low Power." Each of these causes would be included under the proposed reason code which includes "Control Equipment Problems."

The EPA proposed reason categories (with definitions and examples of typical source explanation) are:

a. "Startup/Shutdown", as defined in 40 C.F.R. § 60.2, means "the setting in operation of an affected facility for any purpose" and "the cessation of operation of an affected facility for any purpose." Excess emissions which are caused by startup and shutdown necessitated by process or control equipment problems should be categorized as startup/shutdown. If certain excess emissions during startup or shutdown are caused by a control equipment failure or a process problem, that portion of the exceedance should be reported as a control equipment failure or a process problem. All other excess emissions should be reported under "Startup/Shutdown," even though there may have been some additional intervening cause.

This category includes the process of shutting down but does not include the period of downtime after the completion of this process. Although there are wide variations from facility to facility, the process of starting up typically lasts between 6 and 12 hours. The process of shutting down typically lasts between 4 and 8 hours. Note any single period of startup or shutdown that lasts longer than the typical startup or shutdown.

"Startup/Shutdown" includes problems described by the sources as:

Boiler off	Poor oil atomization	Recovery from coal stoppage
Light off	Started mill	Pulverizer mill
Boiler taken down	Cyclone light off	Putting boiler on line
Boiler coming off line	Firing boiler	Unit tripped
Outage	Coal mill startup	
Oil light off	Oil firing problems	
Dew point from natural gas fuel (if exceedances last for from 1-6 hours)	Unit trip due to loss of condensate	

b. "Sootblowing" refers to the periodic removal of soot, slag and/or fly ash from the firebox walls or the tubes of fuel-burning equipment by the use of compressed air, steam or water.

"Sootblowing" includes problems described by the sources as:

Cleaning cycle	Blowing flues	Cleaning air preheater

c. "Control Equipment Problems" include any on-site control equipment failures or other problems. This category also includes emissions caused by control equipment maintenance. It does not include fuel processing or conveying equipment, boiler, or other industrial process equipment. It is intended to cover all failures whether they are excusable or inexcusable as malfunctions under 40 C.F.R. § 60.2, and even though the underlying reason for the failure is not known.

"Control Equipment Problems" include problems described by the sources as:

Precipitator electrical malfunction	Precipitator dangling electrode	Precipitator tripped
Precipitator rapper system	Rappers not working	ESP trouble
Precipitator de-energized for maintenance	Baghouse full	High fly ash
Ash handling problems (could be process problem)	Broken bags	Ash lines plugged
Precipitator power supply tripped	Ash lines leaks	Pulling hopper ash
	Air blower problems	Valve and control problems
	Baghouse control arm broken, baghouse into bypass	Ash water supply problems

d. "Process Problems" include on-site equipment failures other than control equipment. Operational problems are also included. When distinguishing between process and control equipment, any equipment necessary for the process is considered process equipment, even though it may have a role in emissions control (e.g., the I.D. fan).

"Process Problems" include problems described by the sources as:

Load changes	Upset	Working on stokers
Piling	High load piling	Working on furnace draft
Gas no coal steam S.H. leak	Steam leak	Working on boiler
Insufficient combustion air	Unstable firing conditions	Coal mill problems
Tripped feeder	Combustion control problems	Fan problems
Damper problems	Air register problems	Plugged air heater
Boiler combustion upset	Ran I.D. fan to balance wheel	
Flame scanner and interlock problems		

e. "Fuel Problems" cover any problem relating to the quality or condition of the fuel. Both opacity and SO_2 exceedances may be involved. Blending or cleaning problems would also be characterized as "fuel problems," as would the use of high sulfur fuel because of an interruption in the supply of complying fuel, or because of a supplier's error, etc. While variations in sulfur content of fuel will more frequently create excess SO_2 emissions, sulfur content may also affect particulate emissions.

"Fuel Problems" include problems described by the sources as:

Wet coal	Heavy slag/klinkers in boiler	Slag in boiler (or problem with boiler)
High ash content	Fuel out of spec.	
Low btu content		

f. "Other Known Problems" are intended to cover all known causes of excess emissions not already covered.

"Other Known Problems" include problems described by the sources as:

Tests	Fuel tests	Operator error
Power interruption		

g. "Unknown Causes" apply to all excess emissions for which the operator must guess at the reason (even though his guess might be a good one). It would not apply to an equipment failure even though the reason for failure is not known.

This category includes problems where:

- the source does not know the cause of the excess emissions;
- the source does not state any cause for the excess emissions; or
- the cause reported by the source is unclear, ambiguous or contradictory.

(g) Calculation of Percent of Monitored Operating Time (optional)

Step 9G: (optional)

Calculate the percent of time (while both source and monitor were in operation) that excess emissions were occurring. This is calculated by dividing the duration of exceedances by the time in which both the source and monitor have been operating during the quarter, then converting the result to a percentage:

(Total Duration of Excess Emissions (Hours)	÷	Monitored Operating Time (Hours))	x 100	=	Percent of Monitored Operating Time (Hours)

Where:

Time in Quarter (Hours)	—	Source Down-time (Hours)	—	CEMS Downtime[4] During Source Operating Time (Hours)	=	Monitored Operating Time (Hours)

Make this calculation for the "Percent of Monitored Operating Time" for total exceedances and for each reason category. Enter the results in Section 4(b).

Example EER Reviewer's Checklist, Section 4(b)

(b) Opacity Emissions Performance (Data Reported as Consecutive 6-minute Periods; Calculate Duration in Hours to Nearest Tenth)

Causes of Excess Emissions**	Total Duration of EE's (Hours)	Percent of Monitored Operating Time[3]	Comments
(a) Process Start-up/Shutdown	11.5	0.7 %	
(b) Sootblowing	2	0.1 %	
(c) Control Equipment Problems	16	0.9 %	ESP prob.
(d) Process Problems	36	2.1 %	Fan probs.
(e) Fuel Problems	—	— %	
(f) Other Known Problems	—	— %	
(g) Unknown Causes	23.5	1.4 %	"Unknown"
(h) Total	89	5.2 %	

(10) Step 10: CDS/CEMS Subset Data Coding

Step 10:

Code the EER data for entry into the CDS/CEMS subset.

(11) Step 11: Completion of Phase-1 Review

Step 11:

Forward the EER, EER Reviewer's Checklist, proposed CDS/CEMS Subset data entry cards and other relevant information to the designated Phase-2 reviewer for Phase-2 review.

III. EER Reviewer's Checklist for SO_2 Excess Emissions Reports (EERs)

This section uses pages 1 and 3 of the EER Reviewer's Checklist (see Appendix A, pages 72 and 74) to summarize SO_2 EERs. The example EER Reviewer's Checklist used in this manual may be adapted to reflect the specific requirements for the source category or State regulation.

Phase-1 review includes a review of both emissions performance and CEMS performance. Source operating data and CEMS performance data should be evaluated first so that the reviewer can determine the percentage of monitored operating time the unit was reporting exceedances. The purpose of requiring the reporting of emissions data is to determine the level of continuous compliance with applicable emissions standards. If the reported data on CEMS performance or source operation is unclear or shows large periods on non-operation, the usefulness of the reported excess emission data as an indicator of the source's overall level of compliance is not necessarily diminished.

A. Summary of Phase-1 SO_2 EER Review Steps

Step 1

Identify the source, unit, monitor, pollutant and quarter, and fill in Section 1.

Step 2

Check date of receipt or envelope postmark. NSPS sources shall submit EERs postmarked by the 30th day of the end of the quarter. Record your finding in Section 2.

Step 3

Review all EER information and note any general problems in Section 3.

Step 4

If there is no information on source operating time, enter "no" under "Source Operating Time" in Section 3. For purposes of evaluating emissions and CEMS performance, assume that the source was operating throughout the quarter.

If there is specific information or partial information, describe the information under "Source Operating Time."

Step 5A

Determine Total Hours Available in Quarter:

Quarter (identify): _____
(1,1L,2,3 or 4)

Hours available: _____

If no information on source operating time is available, go directly to Step 6, "Affirmative Statement of No CEMS Downtime."

Step 5B

Calculate the total duration of source downtime using summary information provided by the source or directly from the EER;

or

Calculate the total duration of source downtime by using Table 1 (see Appendix C) entitled, "Summary of Source Downtime."

Step 5C

Calculate the total source operating time using the formula below.

Time in Quarter (Hours)	-	Source Down-time (Hours)	=	Source Operating Time (Hours)

Step 6

Determine whether the source affirmatively states that there were no periods of "CEMS Downtime, Repair or Adjustment." If there is no CEMS downtime, go to Step 8, "Affirmative Statement of No Excess Emissions."

Step 7A

Evaluate CEMS performance information to determine if the data meets applicable EER content requirements and fill in Section 3 under "CEMS Performance Information."

Step 7B

Calculate total CEMS downtime using summary information provided by the source or directly from the EER;

or

Calculate the total CEMS downtime by using Table 2 (see Appendix C) entitled, "Summary of CEMS Downtime."

Step 7C

Compare the specific times during which the CEMS was inoperative with source operating downtime. Where the two overlap, exclude these time periods from the CEMS downtime.

Step 7D

Evaluate the causes of CEMS downtime and the nature of system repairs or adjustments to determine if the source has adequately explained reported CEMS downtime. If the reasons are inadequate or unclear, note the problem in Section 3 under "CEMS Performance Information."

Step 7E (optional)

Calculate the total CEMS downtime for each reason category. Record the total duration for each reason category in Section 5(a).

Step 7F (optional)

Calculate "Percent Unavailability" for total CEMS downtime (and for each reason code) by using the formula provided below. Enter the result in Section 5(a).

CEMS Downtime During Source Operating Time (Hours)	÷	Source Operating Time (Hours)	x 100 =	Percent Unavailability

Step 8

Determine whether the source affirmatively states that there were no periods of excess emissions. If there are no excess emissions, go to Step 10, "CDS/CEM Subset Data Coding."

Step 9A

Evaluate all information relevant to excess emissions for the following types of information and fill in Section 3. This should include the following:

1. Reporting in Periods of the Applicable Standard
2. Magnitude
3. Conversion Factors
4. Reporting of Malfunction Information

Step 9B

Identify the emission limitation and averaging period applicable to the source and unit.

Step 9C

Identify specific periods during which the emissions exceeded the applicable standard. If the source provides only summary information or "average" opacity readings over a longer period of time, note this deficiency in Section 3 under "Emissions Performance" for possible agency follow-up.

Step 9D

Calculate the total duration of all periods of excess emissions, using summary information or calculating directly from the report;

or

Calculate the total duration of all excess emissions by using Table 3 (see Appendix C) entitled, "Summary of Incidents of Excess Opacity."

Step 9E

Evaluate the "nature and cause" of exceedances reported. If there is no information provided regarding the cause of excess emissions, or if the reasons are inadequate or unclear, note the problem in Section 3 under "Emissions Performance."

Step 9F (optional)

Calculate the total duration of excess emissions for each reason category. Record the total duration for each reason category in Section 5(b).

Step 9G (optional)

Calculate the percent of time (while both source and monitor were in operation) that excess emissions were occurring. This is calculated by dividing the duration of exceedances by the time in which both the source and monitor have been operating during the quarter, then converting the result to a percentage:

(Total Duration of Excess Emissions (Hours)	÷	Monitored Operating Time (Hours))	x 100 =	Percent of Monitored Operating Time (Hours)

Where:

Time in Quarter (Hours)	—	Source Down-time (Hours)	—	CEMS Downtime[4] During Source Operating Time (Hours)	=	Monitored Operating Time (Hours)

Make this calculation for the "Percent of Monitored Operating Time" for total excess emissions and for each reason category. Enter the results in Section 5(b).

Step 10

Code the EER data for entry into the CDS/CEMS subset.

Step 11

Forward the EER, EER Reviewer's Checklist, proposed CDS/CEMS Subset data entry cards and other relevant information for Phase-2 review.

B. Explanation of Phase-1 SO_2 EER Review Steps

(1) Step 1: Identification Check

Step 1:

Identify the source, unit, continuous emission monitoring system, pollutant and quarter, and fill in Section 1.

Determine the type of facility and continuous emission monitoring system used to measure emissions at the reporting facility. If this information is not contained in the excess emission report, it may be found in a source file maintained by the agency[1] or a completed "CEMS General Compliance Audit Data Sheet" (see Appendix B). Basic source identification information includes:

- the type of source (e.g., electric utility, coal or oil fired)
- where the monitor is located (identification of unit and stack);
- type of control used (low sulfur fuel, fuel blending, flue gas desulfurization (FGD) (i.e., wet or dry scrubber);
- the emission standards and averaging time applicable to the source; and
- the type of CEMS (manufacturer, model number, type of data recording system, etc.).

Note any unusual operating configuration. For example, some sources may measure both scrubbed and unscrubbed emissions discharged from separate stacks and prorate the measurement results according to flow rates in the two stacks. Other sources may utilize varying combinations of different fuels (i.e., coal, oil, gas) and/or supplementary fuel (i.e., wood refuse), etc. Those sources must use special methods for determining the actual emissions rate in units of the standard.

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[1] It is strongly recommended that each agency maintain a permanent file of CEMS related information for each facility for use during all stages of EER review. This file should contain basic information such as: source permits; CEMS General Compliance Audit Data Sheet (see Appendix B) or similar compliance audit information; EERs and EER summaries for the previous two years; correspondence or other documentation of EER follow-up; monitor audits or testing; plant inspections, etc.

(2) Step 2: Timeliness Check

Step 2:

Check date of receipt or envelope postmark. NSPS sources shall submit EERs postmarked by the 30th day of the end of the quarter. Record your finding in Section 2.

If the report is late, save the envelope in which the report was submitted to demonstrate that the source failed to comply with the timeliness requirement.

Timeliness of submission is an important factor because:

- Late submission makes it more difficult to associate specific exceedances with on-going problems at the source and to ensure that corrective action is promptly undertaken.
- Current information from all sources each quarter will enable the agency to compare the performance of different sources and thereby maximize the resources available to the agency for follow-up.
- Timely agency follow-up may result in greater all-around responsiveness of sources and should increase the credibility of the agency's EER review program.

Example EER Reviewer's Checklist, Sections 1 & 2

EER REVIEWER'S CHECKLIST
(40 C.F.R. Part 60, Subpart D)

	Name	Date
Phase 1 Review	DSF	4/22/85
Phase 2 Review/ Subset Data Entry		
Phase 3 Review/ CDS Action Entry		

1. Company: Everyman Power & Light — 1st Quarter, 85 Year
   Plant/Unit: Green River, Unit #2

2. Timeliness (Must be postmarked within 30 days of quarter)
   (a) Date Postmarked April 15, 1985 (b) Days Late --

(3) Step 3: General Content Evaluation

Step 3:

Review all EER information and note any general problems in Section 3.

More specific evaluation of the adequacy of the data will be conducted when the data are summarized. However, some information may be included or reporting problems may occur which are not directly related to data summary and which should be noted in Section 3 of the EER Reviewer's Checklist. This includes reports where:

- There were no excess emissions and no CEMS downtime and further evaluation of the EER is unnecessary.
- There were changes in the operating, control equipment or continuous emission monitoring systems. This information is very important and any changes should be noted in the source information file as well as Section 3 of the EER Reviewer's Checklist.
- Actual data in support of summary information are not reported in the EER. This is a reporting deficiency which should be noted by the Phase-1 reviewer so that appropriate follow-up action can be taken -- particularly if there is a significant amount of CEMS downtime or exceedances.
- Specific information (for example, explanations for excess emissions) appears only in the cover letter or memorandum and not with the EER data. This problem makes it very difficult to analyze causes of excess emissions and may also warrant agency follow-up.

Example EER Reviewer's Checklist, Section 3

3. Completeness[1] (For EERs which cover multiple monitors, specify monitor when noting problem)

	No Problem	Problem (Describe)/Comments
Source Operating Time [1]	✓	324 hrs. downtime --Units 1 & 2
CEMS Performance Information		
(a) Affirmative Statement of No Period of Downtime, Repair or Adjustment (include no CEMS modifications)	--	
(b) Date and Time Identifying Specific Periods During Which CEMS Was Inoperative	✓	
(c) Nature of System Repairs or Adjustments	✓	
Excess Emissions (EEs) Information		
(a) Affirmative Statement of No EEs	--	
(b) Data Reported in Units of Applicable Standards	✓	
(c) Date and Time of Commencement	✓	
(d) Date and Time of Completion	✓	
(e) Magnitude	✓	
(f) Conversion Factors Used	✓	
(g) Identification of EEs Caused by Start-up, Shutdown, or Malfunction	✓	
(h) Nature and Cause of Malfunction	✓	
(i) Malfunction Corrective Action or Preventive Measures	✓	

(4) Step 4: Availability of Source Operating Time Information

Federal NSPS regulations do not require the reporting of source operation time, unless a permit provision or similar plant-specific requirement applies. However, the availability of this information is very important and should be noted on the EER Reviewer's Checklist.

Step 4:

If there is no information on source operating time, enter "no" under "Source Operating Time" in Section 3. For purposes of evaluating emissions and CEMS performance, assume that the source was operating throughout the quarter.

If there is specific information or partial information, describe the information under "Source Operating Time."

Source operating data allow for the adjustment of data to account for periods of time during which the source was not operating. Comparisons between sources and tracking individual source performance from quarter to quarter is more accurate.

If no source operating time information is available, assume that the source was in continuous operation. If the source was not operating for a significant portion of the quarter, the calculation of percent excess emissions and percent CEMS downtime using this assumption may significantly under-represent the actual percentages. A preliminary indication of actual source operating time may be obtained if excess emissions are caused by "startup" or "shutdown" of the facility.

An agency may, as a matter of policy, contact the source directly to obtain source operation data or to request routine submission of the data.

(5) Step 5: Source Operating Time

(a) Total Hours Available in Quarter

Because the number of days in each month varies, the time available in each quarter varies. The following chart provides the total hours available each quarter, including leap year.

Maximum Time Available in Quarter

Quarter	Hours
01	2,160
01L*	2,184
02	2,184
03	2,208
04	2,208

* Leap year

Step 5A:

Determine total hours available in quarter:

Quarter (identify): _____
(1,1L,2,3 or 4)

Hours available: _____

If no information on source operating time is available, go directly to Step 6, "Affirmative Statement of No CEMS Downtime."

(b) Summary of Source Downtime

Step 5B:

Calculate the total duration of source downtime using summary information provided by the source or directly from the EER;

or

Calculate the total duration of source downtime by using Table 1 (see Appendix C) entitled, "Summary of Source Downtime."

Sources may specify periods of operation or non-operation. Some sources provide summary information only. Where the source identifies the specific time periods, summarize the total source downtime.

1. Use of Summary Table 1 (optional)

The reviewer may choose to calculate the source downtime by using the Table 1, "Summary of Source Downtime." (See Appendix C.) When the data are not easily computed from the EER directly, or must be interpreted because they are unclear or confusing, making a record of source operating downtime will facilitate review and allows the Phase-2 or Phase-3 reviewer to check the accuracy of the Phase-1 review, particularly where the Phase-1 reviewer is inexperienced or where the EER reveals significant emissions or CEMS performance problems.

Table 1

SUMMARY OF SOURCE DOWNTIME

Company: Everyman Power & Light
Unit: Green River, #2
Quarter: 1st 85

Incident Number	START Month/Day/Time		STOP Month/Day/Time		Duration (Hours)	Reason
1	1/15	1:00	1/24	3:00	218	Shutdown
2	3/16	13:00	3/20	23:00	106	Routine maint.

TOTAL SOURCE DOWNTIME: 324 hours

(c) Calculation of Source Operating Time

Step 5C:

Calculate the total source operating time using the formula below.

Time in Quarter (Hours)	–	Source Down-time (Hours)	=	Source Operating Time (Hours)

(6) Step 6: Affirmative Statement of No CEMS Downtime

Step 6:

Determine whether the source affirmatively states that there were no periods of "CEMS Downtime, Repair or Adjustment." If there is no CEMS downtime, go to Step 8, "Affirmative Statement of No Excess Emissions."

This statement may appear in a cover letter or in the excess emission report. Some sources report "0" CEMS downtime in a blank on the excess emissions data form.

(7) Step 7: Summary of CEMS Performance Data

(a) General Information Check

Step 7A:

Evaluate CEMS performance information to determine if the data meets applicable EER content requirements and fill in Section 3 under "CEMS Performance Information."

(b) Calculation of CEMS Downtime

Step 7B:

Calculate total CEMS downtime using summary information provided by the source or directly from the EER;

or

Calculate the total CEMS downtime by using Table 2 (see Appendix C) entitled, "Summary of CEMS Downtime."

Calculate total downtime in hours, expressed to the nearest tenth. The following table converts minutes of CEMS downtime to tenths of hours.

Number of Minutes	Tenths of Hours
3	.0
4-9	.1
10-15	.2
16-21	.3
22-27	.4
28-33	.5
34-39	.6
40-45	.7
46-51	.8
52-57	.9

1. Types of CEMS Downtime

Three types of CEMS downtime may be reported in the EER:

- o periods during which the CEMS is inoperative;
- o periods during which the CEMS is undergoing routine maintenance or other repair; and
- o periods during which the CEMS is operating, but is generating inaccurate data.

All three types should be included as CEMS downtime. However, some sources report the three types of CEMS downtime in different portions of the EER. In particular, periods during which the CEMS is operating, but is generating inaccurate data are sometimes included with excess emissions data.

Scan the reasons for excess emissions to determine if the CEMS system is the "cause" of any excess emissions and include these time periods as CEMS downtime. Later, exclude these time periods from the excess emissions time (see Step 9B of this chapter).

Sources are not required to operate the CEMS when the source is not operating. Do not include any CEMS downtime which occurs during source downtime. If the EER does not provide adequate information to make this determination, assume that all reported CEMS downtime occurred during periods of source operation.

Note that the CEMS includes all parts of the system including:

- o sample acquisitions equipment,

- sample conditioning equipment,
- pollutant analyzer,
- diluent analyzer, and
- data handling/recording equipment.

For example, failure to record data because of computer or data recorder problems is a failure of the entire system and the time is included as CEMS downtime.

Sources must include the date and time identifying specific periods during which the CEMS was inoperative. Quarterly totals or daily totals are not adequate because they do not allow the reviewer to relate specific periods of CEMS downtime to specific periods of excess emissions or specific periods of source downtime.

2. Use of Summary Table for Analyzing CEMS Downtime (optional)

Making a record of CEMS downtime may help the reviewer to evaluate confusing or conflicting data and may allow the Phase-2 or Phase-3 reviewer to check the accuracy of the Phase-1 review, particularly where the Phase-1 reviewer is inexperienced or where the EER reveals significant emissions or CEMS performance problems. Use of a summary chart may also make it easier to track corrective actions or reasons for CEMS downtime and calculate a total CEMS downtime for each reason category.

Some sources provide only the total hours of CEMS downtime per quarter or per day. If this is the only information available, if the source provides summary information, or if the reviewer chooses to total the CEMS downtime from the EER directly, fill in the total CEMS downtime in Section 5(a) of the EER Reviewer's Checklist.

Unless the total amount of CEMS downtime during source operation is very small, failure to identify the specific times during which the CEMS was inoperative and the nature of the problem or corrective action is a serious reporting deficiency which should be noted for possible agency follow-up.

Table 2

SUMMARY OF CEMS DOWNTIME

Company: Everyman Power & Light
Unit: Green River, #2
Quarter: 1st 85

Incident Number	START Month/Day/Time	STOP Month/Day/Time	Duration (Hours)	Reason/Corrective Action	Reason Code
1	1/16 8:00	1/18 24:00	72	Internal span cells replaced and recalibrated	a
2	1/23 9:00	1/23 12:00	3	Probe cleaned	c
3	2/6 18:00	2/6 24:00	6	Storm; power out	d
4	2/8 12:00	2/8 15:00	3	Unknown	e
5	2/16 9:00	2/17 24:00	39	Loose calibration fitting -- repaired	a
6	2/18 9:00	2/19 12:00	3	Probe cleaned	c

TOTAL CEMS DOWNTIME: 126 hours

Reason Codes

a = Monitor equipment malfunction – 111 hours
b = Non-monitor equipment malfunction – 0
c = Calibration/QA – 6
d = Other known causes – 6
e = Unknown causes – 3

(c) Identification of CEMS Downtime During Source Downtime

Step 7C:

Compare the specific times during which the CEMS was inoperative with source operating downtime. Where the two overlap, exclude these time periods from the CEMS downtime summary to ensure that no CEMS downtime during source downtime has been included with total CEMS downtime.

This may be done either directly, using the EER, or indirectly, using summary charts of source downtime and CEMS downtime already completed.

(d) Evaluation of Reasons for CEMS Downtime

Step 7D:

Evaluate the causes of CEMS downtime and the nature of system repairs or adjustments to determine if the source has adequately explained reported CEMS downtime. If the reasons are inadequate or unclear, note the problem in Section 3, under "CEMS Performance Information."

The "cause" of the CEMS downtime or the "nature of system repairs or adjustments" should be identified for all NSPS sources. Each separate incident should be explained. An incident of CEMS downtime is any uninterrupted period (of any time length) during which the CEMS is not operating or providing accurate data.

(e) Evaluation of CEMS Downtime by Reason Category (optional)

Step 7E: (optional)

Calculate the total CEMS downtime for each reason category. Record the total duration for each reason category in Section 5(a).

An agency may choose to evaluate specific causes of CEMS downtime:

- when total CEMS downtime exceeds a specified cutoff; or
- to evaluate all causes of CEMS downtime for a specific quarter or series of quarters to identify types of problems and typical levels of downtime associated with specific types of problems.

The reason categories defined below are based on the revised reason categories included in EER Regional Guidance developed by EPA in 1984. Additional reason categories may be added for other source categories or to accommodate variations in State regulations.

Sources may use their own reason codes or reason categories to report the causes of monitor problems. If these reason codes differ from those used by the agency, the reviewer should correlate source reason codes to the agency reason codes so that a uniform code system is used.

1. EPA Proposed Reason Categories

The reason categories proposed by EPA (with definitions and examples of typical source explanations) are:

a. "Monitor equipment malfunction" includes the equipment needed to measure SO_2 and diluent (O_2 or CO_2) effluent concentrations. It does not include strip chart recorders and data acquisition systems.

The monitoring equipment includes (1) the SO_2 analyzer, (2) the diluent analyzer, and (3) the sample interface. The SO_2 analyzer senses SO_2 within the effluent sample and generates an output proportional to the gas concentration. The diluent analyzer senses O_2 or CO_2 within the effluent sample and generates an output proportional to the gas concentration. The nature and type of sample interface equipment varies for extractive or in situ CEMS.

Extractive CEMS's withdraw and transport samples from the effluent stream to the pollutant and diluent analyzers. The sample interface equipment for extractive monitoring systems may include (1) in-stack or out-of-stack particulate filters, (2) sampling probe(s), (3) sample transport lines, (4) conditioning systems for the removal of moisture and/or particulate from the sample stream, (5) sample pumps, (6) devices for controlling sampling rate and/or sample pressure, and (7) devices allowing for the introduction of calibration gases (e.g., pressure regulators, valves, tubing, and timing/sequencing devices). It should be noted that some extractive CEMS analyzers are designed to sample at multiple locations in a sequential fashion. In these cases, some of the sample interface components are specific to each monitoring location (e.g., sampling probes and sample lines); other sample interface components and the analyzers are essentially time-shared between the various measurement points. Some CEMS's monitor the concentrations of multiple effluent species (e.g., SO_2, NO_x, O_2, CO_2). Where such systems are used, additional sample interface equipment ensures that (1) proper sample conditioning is achieved for each analyzer and (2) all necessary sampling operations occur in the proper order when measurements of the various effluent constituents are made in a sequential fashion. Extractive CEMS's may also be equipped with protective devices, such as (1) high-pressure blowback or purge systems to prevent excessive particulate or moisture accumulation on various sample interface components and (2) protective enclosures that are heated and air conditioned to ensure that the analyzers are maintained at a constant temperature.

In-situ CEMS's project a beam of light through a portion of the effluent stream and thereby sense the concentrations of the components of interest. Cross-stack, in situ CEMS's project the light beam across all or most of the stack or duct and are similar to opacity CEMS's in design. Thus, for most in situ CEMS's, virtually all of the sample interface components are eliminated. However, for most cross-stack, in situ CEMS's "monitoring equipment" may also include those components of the measurement system that protect the optical components of the analyzer from the effluent stream. The equipment consists primarily of a purge air system (i.e., power supply, blowers, air filters, and connecting hoses). The equipment which provides temporary protection for the analyzer in the event of failure of the purge air system usually consists of pneumatically or electronically activated shutter devices.

A "malfunction" is any period during which the monitor is not operating or is producing inaccurate data due to a failure of any CEMS component. A "monitor equipment malfunction" does not include periods of calibration, QA, or normal or preventive maintenance. Also, monitor equipment malfunction does not include CEMS downtime attributable to "non-monitor equipment malfunctions," "other known causes," or "unknown causes." Because the EER often lists only the activities undertaken to correct a malfunction, the reviewer must distinguish between normal maintenance procedures and corrective actions following a malfunction. The time necessary to complete corrective actions following a malfunction should be included in the "monitor equipment malfunction" category.

"Monitor equipment malfunction" includes problems described by the sources as:

Pulled O_2 probe -- replaced sample cell
SO_2 monitor stayed in cal-gas mode -- replaced cal gas valve and repaired cal-filter problem
Lamp burned out -- replaced
Erratic O_2 readings -- replaced filter
Sample line plugged -- cleaned
Replaced leaking sample valve
Found loose calibration fitting -- repaired
Replaced SO_2 monitor probe seal
Replaced UV lamp on SO_2 monitor
Faulty zero mirror on SO_2 analyzer -- replaced
Internal SO_2 span cell reading high -- flowed gases and recalibrated
Excessive SO_2 monitor drift -- recalibrated and returned to service
Low O_2 sample gas flow rate -- recalibrated and returned to service
SO_2 monitor reference voltage swinging -- cleaned optics and returned to service
SO_2 readings unreasonable -- calibrated with gases and returned to service
Low temperature and O_2 readings -- recalibrated and returned to service
Internal span cell reading high
Replaced plugged probe filter and returned to service
SO_2 readings too high -- checked calibration, removed span cells, adjusted calibration and returned to service
High sample vacuum -- replaced probe filter
Dry stack probe plugged -- cleaned probe
High sample vacuum -- cleaned sample lines and moisture traps, adjusted purge air blowback
Leak in scrubber inlet fitting -- replaced fitting and cleaned probe
No calibration gas due to accidental leakage -- ordered and installed gas, checked for system gas leakage
Temperature fault -- calibrated heater board and O_2 board
Found bad sequence relay -- replaced relay contact, recalibrated monitor
Calibration error -- found broken rotameter -- replaced rotameter and recalibrated system
Stack sample conditioning not heating correctly -- low amperage found -- looking for break in line -- work hindered by broken wet stack drain
O_2 reading wrong on wet and dry stack -- recalibrated O_2 monitor
Auto calibration not working -- calibration gas regulator was improperly set
Found low range O_2 gas empty -- replaced gas and recalibrated
Gas calibration showed SO_2 monitor 3% high -- recalibrated temperature compensation circuit
Readings out of tolerance -- recalibrated MA loop from SO_2 monitor
Calibration readings high on test -- made range adjustment
SO_2 reference alarm -- found bad UV lamp and replaced
O_2 probe pulled from stack to weld new holder -- large hole found in probe casing -- replaced probe
Temperature difference between monitor stack reading too great -- calibrated temperature compensation circuit and flowed calibration gas
Temperature reading off -- Found loose TC connection -- checked span cell and flowed gas
Internal span cells replaced and recalibrated
SO_2 reading unreasonable and reference voltage swinging. Replaced P.M.T. socket and UV tube. U_3 chip loose on TC contact. Replaced RZ on TC contact. Recalibrated and returned to service.
Reference alarm -- reference level too high. Replaced UV tube and checked span cell. Adjusted monitor for proper readings.

b. "Non-monitor equipment malfunction" includes all equipment other than the monitor equipment that is necessary to transfer, compute averages, and record SO_2 emissions data. "Non-monitor equipment malfunction" almost always refers to failures or problems with the strip chart recorder, data losses or computer data acquisition system problems. However, the time required to perform routine maintenance of these systems should be excluded from this category and be included under "Calibration/QA."

The simplest SO_2 CEMS's record SO_2 and diluent (i.e., O_2 and CO_2) concentration measurements using strip chart recorders. Emission levels in units of the standard (lb $SO_2/10^6$ Btu) may be computed manually using appropriate conversion factors and equations, based on the concentration measurements. However, most CEMS's utilize an automated method of determining emissions in units of the standard. Thus, some CEMS's use an analog computer and record emissions in units of the standard on a strip chart recorder. Other systems convert the analog output signals of the SO_2 and diluent analyzers to a digital signal, which is then processed either by a dedicated or time-shared computer. Regardless of the approach and type of equipment that is used with a particular CEMS, a malfunction of this equipment that results in the loss of monitoring data should be classified as "non-monitor equipment malfunction."

"Non-monitor equipment malfunction" includes problems described by the sources as:

Computer Data Acquisition System Problems	Strip Chart Recorder Problems
Printer will not function -- stepping motor blowing fuses	Recorder not functioning
Cooling fan stopped -- bearing problem overheated computer	Chart not recording
Incorrect data entry from terminal	Replace chart recorder
Installed new software version	Chart drive off
Software damaged -- replaced disk	Chart drive running slow
Updated current software for calibration values	Chart paper off track
Computer down -- replaced I/O board and restarted	Chart paper jammed
Printer failure	Chart not inking
Program error -- lost data	
Reinitialized system	
Ran diagnostic software check	

c. "Calibration/QA" includes any period during which the monitoring system is out-of-service for the purpose of calibration, routine or preventive maintenance, or other quality assurance related activity. Corrective action and associated recalibration and/or calibration checks immediately following a malfunction, however, should be classified under the appropriate malfunction category.

Federal regulations specify that all source operators required to use SO_2 CEMS must check both the pollutant and diluent responses at zero concentration (or at a low range) and at an upscale value (span check) at least once per day. Approval of alternate procedures requiring only a span check (i.e., deleting the zero check) for some cross-stack in situ monitors has been granted in some cases. The regulations also require that the monitor be adjusted when the zero and/or span check results exceed specified limits.

The time required to perform the daily zero and span checks is usually a few minutes per day; however some cross-stack in situ CEMS may require as long as one hour per day for these checks. The reporting of this time is not required and should not be included in "Calibration/QA" or any other category, since the monitor is performing a required activity. However, when the zero or span drift limits are exceeded, a significant amount of time may elapse before the adjustments are completed. Monitor downtime associated with completing the zero or span adjustments should be included in "Calibration/QA."

In addition to zero and span checks and/or adjustments that are referred to as "calibration," other activities often referred to as "calibration" include:

- electronic checks of the pollutant and diluent monitors and/or data recording devices;
- injection of two or more calibration gases and adjustment of the analyzer(s) and/or CEMS responses to the correct value; and
- in situ monitors only; off-stack or clear stack checks of the zero value or comparisons and adjustments of component or system responses relative to independent effluent measurements.

The simplest of these activities usually requires only a few minutes to perform; however, the more complex activities may take a significantly longer time to complete. Despite the wide variation in the amount of time required for "calibration" and the inconsistent use of terminology, all of the above activities except routine/daily zero/span checks should be included as "Calibration/QA."

"Calibration/QA" includes activities described by the sources as:

- Washed sample line, cleaned sampling probes and performed sample line leak check
- SO_2 monitor dynamic cal check
- Flowed cal gases and adjusted temperature compensation
- Unit removed from service for general maintenance
- Flowed gas and recalibrated
- Check calibration with gas cells
- Checked and adjusted temperature compensation circuit
- Preventive maintenance on sample pump -- changed oil
- SO_2 system preventive maintenance -- calibrated SO_2 analyzer
- Quarterly gas audit

d. "Other known causes" includes other known reasons for monitor downtime or inaccuracy, excluding all malfunctions and "Calibration/QA" activities. This category includes the interruption of the monitoring equipment power supply, human error and other relatively unusual events. It also includes monitor problems or inaccuracy associated with the inability to perform routine maintenance because of severe weather conditions.

"Other known causes" includes problems described by the sources as:

Waiting for vendor service	Waiting for parts shipment
Power rewiring on stack.	Moved monitor to new installation
Removed monitor due to duct leak	Control room power outage
Monitor left in calibration mode	Power loss at monitor
Out of calibration -- gas on order	Developing new calibration procedure
Correct date/time changes	Failed to log monitor on computer

e. "Unknown cause" includes inaccurate or no data without an apparent explanation. If a data recorder fails, and the reason for failure is not known, this would be categorized under "non-monitor equipment malfunction." However, if data are clearly inaccurate, and a data recorder failure is suspected but cannot be confirmed, it should be classified as "unknown cause." Unknown cause" also includes CEMS downtime explanations which are insufficient to determine the appropriate reason category.

This category includes those instances where:

- o no explanation is provided by source;
- o the source states that the cause is unknown; or
- o the source explanation is inadequate, unclear or contradictory.

(f) Calculation of Percent Unavailability (optional)

Step 7F: (optional)

Calculate "Percent Unavailability" for total CEMS downtime (and for each reason code) by using the following formula. Enter the result in Section 5(a).

$$\frac{\text{CEMS Downtime During Source Operating Time (Hours)}}{\text{Source Operating Time (Hours)}} \div \times 100 = \text{Percent Unavailability}$$

"CEMS Downtime During Source Operating Time (Hours)" is calculated in Step 7B. "Source Operating Time (Hours)" is calculated in Step 5C.

An agency may choose to calculate "Percent Unavailability" for sources which have a high total percentage of monitor downtime or to develop data related to CEMS performance in selected problem areas. "Percent Unavailability" may be used (in a manner similar to total duration, magnitude or number of incidents, for example) to target sources for agency follow-up or inspections.

Example EER Reviewer's Checklist, Section 5(a)

5. Data Summary for SO_2 or NO_x EERs (Use Separate Forms for Each Monitor)

Type of Pollutant SO_2

(a) CEMS Performance (Includes Aggregate Downtime for Pollutant and Diluent Monitors)

Causes of CEMS Downtime**	Total Downtime (Hours)	Percent Unavailability[2]	Comments
(a) Monitor Equipment Malfunctions	111	6.1 %	
(b) Non-monitor CEMS Equipment Malfunctions (e.g., computer, data recorder, etc.)	–	– %	
(c) Calibration/QA	6	0.3 %	Probe cleaned
(d) Other Known Causes	6	0.3 %	Power loss
(e) Unknown Causes	3	0.2 %	
(f) Total	126	6.9 %	

(8) Step 8: Affirmative Statement of No Excess Emissions

Step 8:

Determine whether the source affirmatively states that there were no periods of excess emissions. If there are no excess emissions, go to Step 10, "CDS/CEMS Subset Data Coding."

This statement may be found either in a cover letter or in the excess emission report.

(9) Step 9: SO_2 Excess Emissions Data

(a) Content Evaluation

Step 9A:

Evaluate all information relevant to excess emissions for the following types of information and fill in Section 3. This should include the following:

1. Reporting in Units of the Applicable Standard
2. Magnitude
3. Conversion Factors
4. Reporting of Malfunction Information

1. Reporting in Units of the Applicable Standard

The regulations specify that monitoring data must be reported in units of the applicable standard using the applicable conversion procedures specified in subparts. For SO_2 monitors, emissions from a facility must be reported in terms which are relative to the production rate of the facility. Excess emissions are reported in terms of number of pounds of pollutant emitted per million Btu. For example, a source will report "1.5 lbs/10^6 Btu" for a specified period.

For Subpart D NSPS sources SO_2 data (for periods during which the standard was exceeded) are currently reported in three-hour time periods. (Other source categories may use a 24-hour rolling average to calculate excess emissions; for purposes of this manual, example SO_2 data is assumed to be reported in three hour "blocks.") Many data acquisition systems are designed to provide a three-hour average of SO_2 emissions for a specific three-hour period automatically. The three-hour periods used by the source must be identified and must remain consistent from day-to-day.

2. Magnitude of Excess Emissions

If the source fails to report an exact level of emissions during a time period otherwise identified as being in violation of the applicable emission standard, this should be noted in Section 3 of the EER Reviewer's Checklist. This is a serious deficiency which may warrant agency follow-up.

The actual magnitude of excess emissions is not analyzed during Phase-1 EER review. Whether or not a level of emissions which only marginally exceeds the standard is "significant" will be determined when appropriate EER follow-up

is evaluated. An evaluation of the magnitude of excess emissions is useful in later stages of EER review to determine the severity of the impact of non-compliance and the appropriate agency response.

3. Conversion Factors

At fossil fuel-fired steam generators a pollutant monitor (measuring SO_2 or NO_x concentrations) and a diluent monitor (measuring O_2 or CO_2 concentrations) are used in conjunction with the F-Factor method of calculating emissions in units of lbs/10^6 Btu to determine the level of emissions. There are a number of formulations of the F-Factor approach. The appropriate method to be used depends on whether O_2 or CO_2 measurements are obtained, and whether pollutant and diluent concentrations are obtained on a wet or dry basis. Other source categories may require or allow the use of alternative conversion factors.

The Phase-1 reviewer should note whether an F-factor and an equation (or other conversion procedures) are provided in the report. If no equation is provided, note this deficiency in Section 3 of the EER Reviewer's Checklist. Other information in the source file may provide adequate information regarding conversion factors used in the emissions calculation. A determination regarding follow-up, if appropriate, should be made during Phase-2 or Phase-3 review.

If the source provides information on the conversion factors used to determine emissions, the Phase-1 reviewer may wish to compare this information with the formulas provided in the summary tables below. However, this comparison is optional; the agency may choose to review the accuracy of the conversion method used during Phase-2 or Phase-3 review or during a general CEMS compliance audit.

F-Factor Calculation Equations

$$F_d = \frac{227.0\%H + 95.7\%C + 35.4\%S + 8.6\%N - 28.5\%O]}{GCV} \quad \text{(metric units)}$$

$$F_d = \frac{10^6\,[3.64\%H + 1.53\%C + 0.57\%S + 0.14\%N - 0.46\%O]}{GCV} \quad \text{(English units)}$$

$$F_c = \frac{20.0\%C}{GCV} \quad \text{(metric units)}$$

$$F_c = \frac{321 \times 10^3\%C}{GCV} \quad \text{(English units)}$$

$$F_w = \frac{347.4\%H + 95.7\%C + 35.4\%S + 8.6\%N - 28.5\%O + 13.4\%H_2O^*}{GCV_w} \quad \text{(metric)}$$

$$F_w = \frac{10^6\,[5.56\%H + 1.53\%C + 0.57\%S + 0.14\%N - 0.46\%O_2 + 0.21\%H_2O^*]}{GCV_w} \quad \text{(English)}$$

$$F_w = \sum_{i=1}^{n} X_i F_i \text{ (consistent basis)}$$

*Note: The $\%H_2O$ term may be omitted if %H and %O include the unavailable hydrogen and oxygen in the form of H_2O.

F-Factors For Various Fuels [a,b]

Fuel Type	F_d $\frac{DSCF}{10^6 Btu}$	F_w $\frac{WSCF}{10^6 Btu}$	F_c $\frac{SCF}{10^6 Btu}$	F_o
Coal				
Anthracite	10140 (2.0)	10580 (1.5)	1980 (4.1)	1.070 (2.9)
Bituminous	9820 (3.1)	10680 (2.7)	1810 (5.9)	1.140 (4.5)
Lignite	9900 (2.2)	12000 (3.8)	1920 (4.6)	1.0761 (2.8)
Oil	9220 (3.0)	10360 (3.5)	1430 (5.1)	1.3461 (4.1)
Gas				
Natural	8740 (2.2)	10650 (0.8)	1040 (3.9)	1.79 (2.9)
Propane	8740 (2.2)	10240 (0.4)	1200 (1.0)*	1.10 (1.2)*
Butane	8740 (2.2)	10430 (0.7)	1260 (1.0)	1.479 (0.9)
Wood	9280 (1.9)*	–	1840 (5.0)	1.5 (3.4)
Wood Bark	9640 (4.1)	–	1860 (3.6)	1.056 (3.9)

[a] Numbers in parentheses are maximum deviations (%) from the midpoint F-factors.
[b] To convert to metric system, multiply the above values by 1.123×10^{-4} to obtain scm 10^6 cal.
Note: All numbers below the asterisk (*) in each column are midpoint values. All others are averages.

F-Factors and Emission Rate Calculations

Factor	Units	Measurement Required For Excess Air Determination	Calculations	Comments
F_d	$\frac{DSCF}{10^6\ Btu}$	$\%O$ (dry basis)	$E = C_s F_d \frac{20.9}{20.9 - \%O_2}$	C_s determined on dry basis
F_c	$\frac{DSCF}{10^6\ Btu}$	$\%CO_2$ (dry or wet basis)	$E = C_s F_c \frac{100}{\%CO_2}$	C_s on dry or wet basis consistent with CO_2 measurement
F_w*	$\frac{WSCF}{10^6\ Btu}$	$\%O_2$ (wet basis)	$E = C_{ws} F_w \frac{20.9}{20.9\,(1 - B_{wa}) - \%O_2}$	The "wet" F-factor, C_{ws} and $\%O_2$ on wet basis B_{wa} = average moisture content of ambient air
F_d	$\frac{DSCF}{10^6\ Btu}$	$\%O_2$ (wet basis)	$E = C_{ws} F_d \frac{20.9}{20.9(1 - B_{ws}) - \%O_2}$	F_d used to calculate E with $\%O_2$ and C_{ws} on a wet basis and gas moisture content known
F_o	—	—	$F_o = \frac{20.9}{100} \frac{F_d}{F_c} = \frac{20.9 - \%O_2}{\%CO_2}$	Miscellaneous factor useful for checking Orsat data

*Note: The wet F-factor, F_w, may not be used in any application which involves the addition or removal of moisture from the combustion effluent. As a result, it is not suitable for wet scrubber applications without additional correction.

Note also: B_{wa} = Amount of moisture in ambient air, which value can be established by any of the following four methods.

a) Fixed constant value of 0.027 allowed
b) Continuous measured value
c) Monthly value based on previous history
d) Annual value based on previous history

4. Reporting of Malfunction Information

For NSPS, Subpart D sources, periods of excess emissions which occur during (1) startup or shutdown of the plant or unit, or (2) malfunction of the process or control equipment must be separately identified.

The nature and cause of the "malfunction" must also be specifically identified. It is not adequate to state that an excess emission is caused by a "malfunction." More specific information must be provided.

If you are unsure whether a description of a malfunction is adequate, please note that there may be a problem in Section 3 of the EER Reviewer's Checklist. Any corrective actions or measures taken to prevent future malfunctions should also be described.

Examples of descriptions which are incomplete or inadequate include:

- "malfunction"
- "breakdown"
- "fuel problem."

(b) Emission Standard

Step 9B:

Identify the emission limitation and averaging period applicable to the source and unit.

This information can be found in the cover letter or memo, in the EER itself, in the "General Compliance Audit Data Sheet," or with other file information on the source. The emission standards for SO_2 emissions from NSPS electric utilities are:

- .80 lb. per million Btu from liquid fossil fuel
- 1.2 lb. per million Btu from solid fossil fuel.

If a combination of fuels is used, the emission standard is determined by a formula specified in the applicable regulations. The standard determined through the use of this formula should appear in the excess emission report or in the source file (§ 60.43).

For sources subject to an SO_2 standard, periods of excess emissions are usually defined as "any three-hour period during which average emissions (arithmetic average of three contiguous one-hour periods) exceed the standard (§ 60.45(g)(2)).

The emission standards apply "at all times except during periods of startup, shutdown, malfunction,..." (40 C.F.R. § 60.11(c)). "Startup" is defined as "the setting in operating of an affected facility for any purpose; "shutdown" is defined as "the cessation of operation of an affected facility for any purpose; and "malfunction" is defined as "any sudden and unavoidable failure of air pollution control equipment or process equipment or of a process to operate in a normal or usual manner. Failures that are caused entirely or in part by poor maintenance, careless operation, or any other preventable upset condition or preventable equipment breakdown shall not be considered malfunctions" (40 C.F.R. § 60.2).

The Phase-1 reviewer should include all periods of excess emissions in the total excess emissions for the quarter whether or not they may be "excusable" under the standard. This allows the Phase-1 data summary to serve primarily as a screening mechanism. These issues will be resolved by Phase-2 or Phase-3 reviewers.

(c) Emissions Data Summary

Step 9C:

Identify specific periods during which the emissions exceeded the applicable standard. If the source provides only summary information or "average" SO_2 emission levels over a longer period of time than the recommended averaging period, note this deficiency in Section 3 under "Emissions Performance" for possible agency follow-up.

Regulations require that the date and time of commencement and the date and time of completion of all periods of excess emissions be reported.

(d) Calculation of Duration of Exceedances

Step 9D:

Calculate the total duration of all periods of excess emissions, using summary information or calculating directly from the report;

or

Calculate the total duration of all excess emissions using Table 4 (see Appendix C) entitled, "Summary of Incidents of SO_2 Excess Emissions."

Exclude any excess emissions which are "caused" by monitor problems. This time should be included as CEMS downtime. Exclude any excess emissions which occur during source downtime. If necessary, check source downtime information in the EER or in Table 1 (if used) to identify periods of overlap.

1. Use of a Summary Table (optional)

The reviewer may choose to calculate excess emissions by using Table 4, "Summary of Incidents of SO_2 Excess Emissions." When the data is presented in a manner which is not easily computed, making a summary record of excess emissions may facilitate review and may allow the Phase-2 or Phase-3 reviewer to check the accuracy of the Phase-1 review, particularly where the Phase-1 reviewer is inexperienced or where the EER reveals significant emissions or CEMS performance problems. Use of this summary chart may also make it easier for the reviewer to track the reasons for excess emissions and calculate a total exceedance time for each reason category.

Some sources provide only the total hours of exceedances per quarter or per day. This is a reporting problem which requires agency follow-up. If this is the only information currently available, if the source provides summary information, or if the reviewer chooses to total the exceedance data from the EER directly, note total excess emissions in Section 5(b).

Table 4

SUMMARY OF INCIDENTS OF SO_2 EXCESS EMISSIONS

Company: Everyman Power & Light
Unit: Green River Unit #2
Quarter: 1st Qtr. 1985

Incident Number	START Month/Day/Time	STOP Month/Day/Time	Duration (Hours)	Reason/Corrective Action	Reason Code
1	1/8 6:00	1/9 3:00	21	Broken recycle line - repaired	b
2	1/27 0:00	1/27 6:00	6	Emerg. power demand	c
3	1/30 12:00	1/30 21:00	9	Scrubber bypass	c
4	2/4 18:00	2/5 0:00	6	I.D. fan failure	c
5	3/5 9:00	3/5 12:00	3	No reason provided	f

TOTAL EXCESS EMISSIONS: 45 hours

Reason Codes

a = Startup/shutdown = 0
b = Control Equipment Failures = 21
c = Process Problems = 21
d = Fuel Problems = 0
e = Other Known Problems = 0
f = Unknown Problems = 3

(e) Evaluation of Causes of Excess Emissions

Step 9E:

Evaluate the "nature and cause" of exceedances reported. If there is no information provided regarding the cause of excess emissions, or if the reasons are inadequate or unclear, note the problem in Section 3 under "Emissions Performance."

(f) Evaluation of Excess Emissions by Reason Category (optional)

Step 9F: (optional)

Calculate the total duration of excess emissions associated with each reason category. Record the total duration for each reason category in Section 5(b).

An agency may decide to evaluate specific causes of excess emissions when total exceedances exceed a specified cut-off or to evaluate all causes of excess emissions for all sources for a specified quarter or series of quarters to identify types of problems or typical levels of exceedances associated with specific problems.

1. EPA Proposed Reason Categories

The reason categories defined below are based on the categories which were proposed by EPA in the "Technical Guidance on Agency Review of Excess Emission Reports and Follow-up Actions" (October 5, 1984). Additional categories may be added for other source categories or to accommodate variations in State regulations.

Many sources currently use their own reason codes or reason categories to describe the causes of excess emissions. If the reasons differ from those used by the agency, the reviewer should correlate source reason codes to the agency reason codes so that a uniform code system is used for agency review of all EERs.

The EPA-proposed reason categories for SO_2 exceedances (with definitions and examples of typical source explanation) are:

a. "Startup/Shutdown", as defined in 40 C.F.R. § 60.2, means "the setting in operation of an affected facility for any purpose" and "the cessation of operation of an affected facility for any purpose." Excess emissions which are caused by startup and shutdown necessitated by process or control equipment problems should be categorized as startup/shutdown. However, SO_2 exceedances are generally not associated with process startup and shutdown unless source operating constraints require that the scrubber be started up after the process has reached certain minimum operating levels or when the scrubber must be removed from service prior to shutting down the process. If certain excess emissions during startup or shutdown are caused by a control equipment failure or a process problem, that portion of the exceedance should be reported as a control equipment failure or a process problem. All other excess emissions should be reported under "Startup/Shutdown," even though there may have been some additional intervening cause.

"Startup/Shutdown" include problems described by the sources as:

- Process startup (FGD off-line until minimum operating level reached)
- FGD removed from service prior to boiler shutdown
- Scrubber off-line until minimum flue gas temperature reached during boiler startup

b. "Control Equipment Problems" include any on-site control equipment failures or other problems. This category also includes emissions caused by control equipment maintenance. It would only apply to facilities which use flue gas desulfurization as its control method. It does not include fuel processing or conveying equipment, boiler, or other process equipment. It is intended to cover all failures whether they are excusable or inexcusable as malfunctions under 40 C.F.R. § 60.2, and even though the underlying reason for the failure is not known.

"Control Equipment Problems" include problems described by the sources as:

- Scrubber module removed from service because of excessive pressure due to pluggage
- Reduced scrubber efficiency due to pH problems
- Automatic scrubber control system malfunction
- Clogged scrubber spray nozzles
- Excessive scrubber bypass flow due to booster fan failure
- Modules inoperative due to frozen lines in scrubber liquid system
- Scrubber removed from service due to loss of seal water to all pumps
- Module removed from service due to broken recycle line
- Low level in presaturator tank caused presat. pumps to trip. The resulting high temperature took the modules off.

c. "Process Problems" include on-site equipment failures other than control equipment failures. Operational problems are also included. When distinguishing between process and control equipment, any equipment necessary for the process is considered process equipment, even though it may have a role in emissions control (e.g., the I.D. fan).

"Process Problems" include problems described by the sources as:

- Emergency power demand -- scrubber bypass increased during load change
- I.D. fan failure -- temporary emergency scrubber by-pass

d. "Fuel Problems" include any problem relating to the quality or condition of the fuel. Both opacity and SO_2 exceedances may be involved. Blending or cleaning problems would also be characterized as "fuel problems," as would the use of high sulfur fuel because of an interruption in the supply of complying fuel, or because of a supplier's error, etc. While variations in sulfur content of fuel will more frequently create excess SO_2 emissions, sulfur content may also affect particulate emissions.

"Fuel Problems" include problems described by the sources as:	
Fuel shipment out of specification Fuel sulfur higher than expected	Fuel blending problem -- expanded low sulfur fuel supply -- low sulfur coal conveyor malfunction -- insufficient auxiliary fuel

e. "Other Known Problems" include all known causes of excess emissions not already covered.

"Other Known Problems" include problems described by the sources as:		
Tests Power interruption	Fuel tests	Operator error

f. "Unknown Causes" apply to all excess emissions for which the operator must guess at the reason (even though his guess might be a good one). It does not apply to an equipment failure even though the reason for failure is not known.

This category includes problems where:

- the source does not know the cause of the excess emissions;
- the source does not state any cause for the excess emission; or
- the cause reported by the source is unclear, ambiguous or contradictory.

(g) Calculation of Percent Monitored Operating Time (optional)

Step 9G: (optional)

Calculate the percent of time (while both source and monitor were in operation) that excess emissions were occurring. This is calculated by dividing the duration of exceedances by the time in which both the source and monitor have been operating during the quarter, then converting the result to a percentage:

(Total Duration of Excess Emissions (Hours)	÷	Monitored Operating Time (Hours))	x 100	=	Percent of Monitored Operating Time (Hours)

Where:

Time in Quarter (Hours)	—	Source Down-time (Hours)	—	CEMS Downtime[4] During Source Operating Time (Hours)	=	Monitored Operating Time (Hours)

Make the calculation for the "Percent of Monitored Operating Time" for total excess emissions and for excess emissions associated with each reason category. Enter the results in Section 5(b).

Example EER Reviewer's Checklist, Section 5(b)

(b) Emissions Performance (Data Reported as Consecutive 3-Hour Periods)

Causes of Excess Emissions**	Total Duration of EE's (Hours)	Percent of Monitored Operating Time[3]	Comments
(a) Start-up/Shutdown	—	— %	
(b) Control Equipment Problems	21	1.2 %	FGD
(c) Process Problems	21	1.2 %	
(d) Fuel Problems	—	— %	
(e) Other Known Problems	—	— %	
(f) Unknown Causes	3	0.2 %	
(g) Total	45	2.6 %	

(10) Step 10: CDS/CEMS Subset Data Coding

Step 10:

Code the EER data for entry into the CDS/CEMS subset.

(11) Step 11: Completion of Phase-1 Review

Step 11:

Forward the EER, EER Reviewer's Checklist, proposed CDS/CEMS Subset data entry cards and other relevant information to the designated Phase-2 reviewer for Phase-2 review.

Appendix A:

EER REVIEWER'S CHECKLIST

(40 C.F.R. Part 60, Subpart D)

	Name	Date
Phase 1 Review		
Phase 2 Review/ Subset Data Entry		
Phase 3 Review/ CDS Action Entry		

1. Company _____ Quarter _____ Year _____

   Plant/Unit _____

2. Timeliness (Must be postmarked within 30 days of quarter)

   (a) Date Postmarked _____ (b) Days Late _____

3. Completeness[1] (For EERs which cover multiple monitors, specify monitor when noting problem)

	No Problem	Problem (Describe)/Comments
Source Operating Time [1]		
CEMS Performance Information		
(a) Affirmative Statement of No Period of Downtime, Repair or Adjustment (include no CEMS modifications)		
(b) Date and Time Identifying Specific Periods During Which CEMS Was Inoperative		
(c) Nature of System Repairs or Adjustments		
Excess Emissions (EEs) Information		
(a) Affirmative Statement of No EEs		
(b) Data Reported in Units of Applicable Standards		
(c) Date and Time of Commencement		
(d) Date and Time of Completion		
(e) Magnitude		
(f) Conversion Factors Used		
(g) Identification of EEs Caused by Start-up, Shutdown, or Malfunction		
(h) Nature and Cause of Malfunction		
(i) Malfunction Corrective Action or Preventive Measures		

[1] A revision of reporting requirements to require a summarization of data, categorization of excess emissions and CEMS problems according to new uniform categories, and reporting of source operating time is now under consideration. Although not specifically required, source operating time has been included on this sample form because it is necessary to allow for data analysis included in this checklist.

4. Data Summary for Opacity EERs

(a) Opacity CEMS Performance

Causes of CEMS Downtime**	Total Downtime (Hours)	Percent Unavailability[2]	Comments
(a) Monitor Equipment Malfunctions		%	
(b) Non-monitor CEMS Equipment Malfunctions (e.g., computer, data recorder, etc.)		%	
(c) Calibration/QA		%	
(d) Other Known Causes		%	
(e) Unknown Causes		%	
(f) Total		%	

[2] "Percent unavailability" is calculated by the following formulas:

$$\left(\text{CEMS Downtime}^{4}\text{ During Source Operating Time (Hours)} \div \text{Source Operating Time (Hours)}\right) \times 100 = \text{Percent Unavailability}$$

Where:

$$\text{Time in Quarter (Hours)} - \text{Source Downtime (Hours)} = \text{Source Operating Time (Hours)}$$

(b) Opacity Emissions Performance (Data Reported as Consecutive 6-minute Periods; Calculate Duration in Hours to Nearest Tenth)

Causes of Excess Emissions**	Total Duration of EE's (Hours)	Percent of Monitored Operating Time[3]	Comments
(a) Process Start-up/Shutdown		%	
(b) Sootblowing		%	
(c) Control Equipment Problems		%	
(d) Process Problems		%	
(e) Fuel Problems		%	
(f) Other Known Problems		%	
(g) Unknown Causes		%	
(h) Total		%	

[3] "Percent of Monitored Operating Time" is calculated by dividing the total hours of exceedances by the time in which both the source and monitor have been operating during the quarter, then converting the result to a percentage:

$$\left(\text{Total Duration of Excess Emissions (Hours)} \div \text{Monitored Operating Time (Hours)}\right) \times 100 = \text{Percent of Monitored Operating Time (Hours)}$$

Where:

$$\text{Time in Quarter (Hours)} - \text{Source Downtime (Hours)} - \text{CEMS Downtime}^{4}\text{ During Source Operating Time (Hours)} = \text{Monitored Operating Time (Hours)}$$

[4] Assume all reported CEMS downtime occurs during periods of source operation unless explicitly stated.

** Proposed definitions for these categories appear in "Technical Guidance on the Review and Use of Excess Emission Reports."

5. Data Summary for SO_2 or NO_x EERs (Use Separate Forms for Each Monitor)

Type of Pollutant _____

(a) CEMS Performance (Includes Aggregate Downtime for Pollutant and Diluent Monitors)

Causes of CEMS Downtime**	Total Downtime (Hours)	Percent Unavailability[2]	Comments
(a) Monitor Equipment Malfunctions		%	
(b) Non-monitor CEMS Equipment Malfunctions (e.g., computer, data recorder, etc.)		%	
(c) Calibration/QA		%	
(d) Other Known Causes		%	
(e) Unknown Causes		%	
(f) Total		%	

[2] "Percent unavailability" is calculated by the following formulas:

(CEMS Downtime[4] During Source Operating Time (Hours) ÷ Source Operating Time (Hours)) x 100 = Percent Unavailability

Where:

Time in Quarter (Hours) — Source Downtime (Hours) = Source Operating Time (Hours)

(b) Emissions Performance (Data Reported as Consecutive 3-Hour Periods)

Causes of Excess Emissions**	Total Duration of EE's (Hours)	Percent of Monitored Operating Time[3]	Comments
(a) Start-up/Shutdown		%	
(b) Control Equipment Problems		%	
(c) Process Problems		%	
(d) Fuel Problems		%	
(e) Other Known Problems		%	
(f) Unknown Causes		%	
(g) Total		%	

[3] "Percent of Monitored Operating Time" is calculated by dividing the total hours of exceedances by the time in which both the source and monitor have been operating during the quarter, then converting the result to a percentage:

(Total Duration of Excess Emissions (Hours) ÷ Monitored Operating Time (Hours)) x 100 = Percent of Monitored Operating Time (Hours)

Where:

Time in Quarter (Hours) — Source Downtime (Hours) — CEMS Downtime[4] During Source Operating Time (Hours) = Monitored Operating Time (Hours)

[4] Assume all reported CEMS downtime occurs during periods of source operation unless explicitly stated.

** Proposed definitions for these categories appear in "Technical Guidance on the Review and Use of Excess Emission Reports."

Appendix B:

CEMS GENERAL COMPLIANCE AUDIT DATA SHEET

40 C.F.R. part 60, Subpart D
(See Instruction Sheet)

Audit Results

Follow-up Recommended _____ (Yes/No)

Performed By _____ (Name)

_____ (Date)

1. Company _____

2. Plant/Unit(s) _____

   Address _____

   _____

   Source Type _____

   Size _____

3. CEMS Contact _____ (Name)

   _____ (Position)

   _____ (Telphone No.)

4. Emissions Requirements

	Emissions Limitations	Are There Exceptions?	Description of Control System
Opacity			
SO_2			
NO_x			

5. CEMS Compliance Status

	Type of CSA/CEMS Requirement	Date CEMS Installed & Operational	Date of PST	Is Source Filing EERs? To Whom?	Do EERs Indicate Emissions Problems?	Do EERs Indicate CEMS Problems?	Do EERs Comply w/ Reporting Requirements?	Results of Agency Field Audit
Opacity								
SO_2								
NO_x								

6. Basic Monitor Information

	Monitor Make, Model & Serial Number	Recorder Type and Model	Computer/ Software	Other
Opacity				
SO_2				
NO_x				
CO_2				
O_2				

7. Additional Baseline Information/Comments

8. Follow-up Action Plan

Table 1

SUMMARY OF SOURCE DOWNTIME

Company: _____

Unit: _____

Quarter: _____

Incident Number	START Month/Day/Time	STOP Month/Day/Time	Duration (Hours)	Reason

TOTAL SOURCE DOWNTIME: _____ hours

Table 2

SUMMARY OF CEMS DOWNTIME

Company: _____

Unit: _____

Quarter: _____

Incident Number	START Month/Day/Time	STOP Month/Day/Time	Duration (Hours)	Reason/Corrective Action	Reason Code

TOTAL CEMS DOWNTIME: _____ hours

Reason Codes

a = Monitor equipment malfunction
b = Non-monitor equipment malfunction
c = Calibration/QA
d = Other known causes
e = Unknown causes

Table 3

SUMMARY OF INCIDENTS OF EXCESS OPACITY

Company: _____

Unit: _____

Quarter: _____

Incident Number	START Month/Day/Time	STOP Month/Day/Time	Duration (Hours)	Reason/Corrective Action	Reason Code

TOTAL EXCESS EMISSIONS: _____ hours

Reason Codes

a = Startup/shutdown
b = Sootblowing
c = Control Equipment Failures
d = Process Problems
e = Fuel Problems
f = Other Known Problems
g = Unknown Problems

Table 4

SUMMARY OF INCIDENTS OF SO_2 EXCESS EMISSIONS

Company: _____

Unit: _____

Quarter: _____

Incident Number	START Month/Day/Time	STOP Month/Day/Time	Duration (Hours)	Reason/Corrective Action	Reason Code

TOTAL EXCESS EMISSIONS: _____ hours

Reason Codes

a = Startup/shutdown
b = Control Equipment Failures
c = Process Problems
d = Fuel Problems
e = Other Known Problems
f = Unknown Problems

Appendix D:

OPACITY CEMS COMPONENTS

The monitoring equipment includes all of the apparatus necessary to measure the opacity of the emissions at the monitor installation location(s) and to convert the measurements to the equivalent opacity that would be observed at the stack exit. Almost all contemporary opacity monitors are double-pass systems (i.e., the light beam traverses the effluent stream twice; the light source and detector are both located on the same side of the stack). The major components of the opacity measurement system are:

(1) transceiver -- Contains the light source, detector, optical analyzer, and some electronic processing equipment. Also incorporates means for generating simulated zero condition and upscale (span) condition to facilitate daily zero and span checks. May also include alignment sight for checking optical alignment of transceiver and reflector components.

(2) reflector -- (Sometimes referred to as a retroreflector, although this is a trade name.) Usually contains only a corner cube reflector. Has no moving parts and no electronic components.

(3) signal cable -- Multi-conductor signal cable which transmits output signal from transceiver to control unit.

(4) control unit -- Converts electronic signal from transceiver (usually proportional to double-pass transmittance) to units of opacity corrected for path length variations between the measurement location and the stack exit. Also includes fault lamps, provisions forinitiating zero and span checks, and panel meter readout of opacity and other measurement parameters. The control unit contains multiple electronic signal processing circuits (often referred to as "PC's" -- printed currents, "cards," or "boards"), a power supply, and various switches and controls.

(5) combiner system -- Used only when multiple transmissometers are installed in multiple ducts. The combiner determines the equivalent stack exit opacity from the inputs provided by the multiple transmissometers. For some opacity measurement systems, the combiner is used in conjunction with individual control units. The combiner contains electronic signal processing circuits and other electronic hardware similar to that contained in the control unit.

The opacity "monitoring equipment" also includes those components of the measurement system that protect the optical components of the transmissometer from the effluent stream. The equipment which provides on-line protection of the analyzer consists primarily of a purge air system (i.e., power supply, blowers, air filters, and connecting hoses). The equipment which provides temporary protection for the analyzer in the event of failure of the purge air system usually consists of pneumatically or electronically activated shutter devices.

Appendix E:

DISCUSSION OF SOURCE REASONS FOR OPACITY CEMS DOWNTIME

The following are explanations of typical source descriptions of problems associated with different components of the CEMS:

Monitor Equipment Malfunctions

	What they said		What they meant
(1)	Transmissometer malfunction	--	Undefined malfunction of measurement system generally resulting in no data or obviously invalid data (e.g., offscale above 100%, offscale below 0%, data exhibiting repeating oscillating pattern clearly not due to process or control system problems, etc.).
(2)	Transceiver malfunction	--	Same as (1) except problem was isolated to transceiver.
(3)	Transceiver board damaged	--	Failure of electronic circuit board in transceiver, most often attributable to aging of electronic components, lightening strikes, or power supply fluctuations.
(4)	Shutter failure Repaired shutter	--	Steel shutters on transceiver or reflector side of stack blocking light beam. Shutters are reported to fail when they activated at an inappropriate time (i.e., when the purge air system is working properly).
(5)	Blower failure Blower shutdown Blower problems Blower replacement	--	Blower in purge air system for either the transceiver or reflector either failed completely or failed to maintain sufficient air flow through the air filters. Usually results in activation of fault light, indicating need for maintenance and activation of shutters (where so equipped), thus eliminating all further effluent opacity measurements until problem is resolved.
(6)	Filter alarm switch malfunction Repair filter alarm switch	--	Indicates faulty pressure activated switch in air purge system which is used to determine if there is sufficient air flow through system to protect transmissometer component. Failure of this switch usually results in activation of shutters, thus eliminating all further opacity measurements until the problem is resolved.
(7)	Monitor misalignment Alignment shift	--	Indicates that the optical alignment between the transceiver and reflector has deteriorated, thus resulting in opacity measurements which are biased high (or are 100% if alignment is sufficiently disturbed). This problem occurs most frequently during startup and shut-down due to thermal contraction or expansion of the duct or stack in which the transmissometer is installed.
(8)	Investigation of alarm problem Troubleshooting for alarm problem Replaced defective alarm card	--	All of these statements indicate problems with one of the fault lamp indicators or opacity alarm systems. When the fault and alarm indicators are operating properly, the activation of these systems usually indicates that some component of the monitoring system is operating outside the manufacturer's limits or source selected control limits, and thus, that the data quality may be affected. The corrective actions necessary to resolve the problem indicated by the fault lamp or alarm system are basically the same, and usually require that the monitor be removed from service during the troubleshooting/repair activities.

What they said		What they meant
(9) Replace opacity card Opacity PC board failure	--	Indicates failure of specific electronic circuits within the control unit. The opacity board converts the transmittance signal to opacity and makes correction to stack exit diameter.
(10) Optical density card failure Replace OD P.C. board	--	Indicates failure of specific electronic circuits within control unit. The optical density (OD) board converts transmittance signal to units of optical density for further signal processing. Of particular importance when multiple monitors are installed on a single unit.
(11) Zero cal stack Zero cal failure	--	Indicates monitor remaining in zero check mode, thus preventing effluent opacity measurements. Monitoring system continuously displays zero value. Problem may be due to malfunction in either transceiver or control unit electronics.
(12) Stuck in span button stuck	--	Same as (11) except internal span check filter is in Cal optical path. Monitoring system continuously displays span check value.
(13) Span shift	--	Monitor displays incorrect value for span check. Reason for drift is unknown. Span drift cannot be eliminated by normal adjustment procedure. All subsequent effluent monitoring data will be biased in same direction as span drift.
(14) Defective micro switch Switch contacts failed	--	Switches in transceiver or control unit fail to operate properly, usually resulting in problems described in (11) or (12) above.
(15) Not integrating properly	--	Monitor fails to generate 6-minute average opacity values due to electronic malfunction in sample and hold circuitry.
(16) Combiner stuck Combiner malfunction	--	Malfunction of combiner unit having similar impact to malfunction of control unit in single monitor installations (see items (8) through (14) above).
(17) D/A alarm	--	For computerized systems, "D" D/A flag usually refers to digital and A/D error "A" refers to analog. The example notations reflect (1) problems in the conversion from the monitor to digital signals in the computer, or (2) unacceptable differences in the stack exit opacity as calculated independently by the analog control unit or combiner and the computer data/acquisition system.

Non-monitor equipment malfunction:

Strip Chart Recorder Problems

(1) Recorder not functioning Replace chart recorder	--	Several possible failures are (1) chart drive functioning, but a constant value is recorded regardless of opacity monitor output; (2) chart drive not functioning, but instrument responds to changes in opacity monitor output; and (3) chart recorder dead.
(2) Chart drive off Chart drive running slow	--	Obvious problems with the recorder time axis.
(3) Chart paper off track Chart paper jammed	--	Obvious problems with chart paper.
(4) Chart not inking Chart not recording	--	Obvious problems with chart marking mechanisms.

What they said	What they meant
Computer Data Acquisition System Problems	
(1) Insufficient data flag on DAS --	Items (1) through (19) represent impenetrable computer which is not meant to be understood. Usually indicative of computer software, and/or operator malfunction and/or basic incompatability.
(2) Reload program for alarm problem	
(3) Reinitialized system	
(4) Incorrect entry time update	
(5) Worked on incorrect alarm printout	
(6) Computer down -- replaced I/O board after trying to reprogram	
(7) Program error -- reset time	
(8) Computer stopped -- replaced I/O board	
(9) Malfunction -- data logger	
(10) Reinitialized for time	
(11) DAS computer failed and repaired	
(12) Incorrect D/A alarm printout	
(13) DP30 software check	
(14) Ran diagnostic tape	
(15) Reloaded program for D/A alarm problem	
(16) Lost info from terminal	
(17) Lost information in computer	
(18) Computer did not make calculation -- ?	
(19) Printer failure	

Calibration, QA, and routine and preventive maintenance:

(1) Optics cleaned Lens cleaned Cleaned transceiver windows Cleaned reflector Cleaned zero reflector	--	Cleaned transmissometer optical surfaces exposed to effluent.
(2) Cleaned purge air systems Changed filters Replaced air filters	--	Service air purge system.
(3) Cleaning monitor General maintenance Preventive maintenance Cleaning ports Cleaning site pipe	--	Normal maintenance of transmissometer to improve monitor reliability.
(4) Printer maintenance Changed chart paper Recorder maintenance Cleaned control unit/combiner Replace fault lamp bulbs	--	Normal maintenance of control room components and data recording devices.
(5) Reinitiate computer system Run diagnostic tape Repair D/A alarm Routine maintenance of terminal Software enhancements	--	Normal maintenance of computer system.
(6) Partial calibration Recalibrated control unit Recalibrated combiner On-stack audit checks Opacity system audit Adjust zero/span responses	--	Component calibration procedure.