ENVIRONMENTAL PROTECTION AGENCY

40 CFR Parts 125 and 423

[WH FRL 1569-4]

Effluent Limitations Guidelines, Pretreatment Standards and New Source Performance Standards Under Clean Water Act; Steam Electric Power Generating Point Source Category

AGENCY: Environmental Protection Agency.

ACTION: Proposed regulation.

SUMMARY: EPA is proposing to revise its regulations limiting pollutant discharges from steam electric power plants. EPA is proposing these revisions because the Clean Water Act requires EPA to review and revise its regulations periodically and because EPA is under a court order to develop regulations for toxic pollutant discharges from steam electric power plants. Today's proposal relates only to the discharge of toxic and other chemical pollutants; EPA is not proposing regulations for thermal discharges at this time.

DATES: Written comments must be submitted by December 9, 1980.

ADDRESSES: Comments should be sent to John W. Lum or Teresa Wright at the address listed immediately below. Supporting information and all comments on this proposal will be available for inspection and copying at the EPA Public Information Reference Unit, Room 2404 (Rear) PM 213 (EPA Library), 401 M Street, S.W., Washington, D.C. 20460. The EPA information regulation (40 CFR Part 2) provides that a reasonable fee may be charged for copying.

FOR FURTHER INFORMATION CONTACT: For general and technical information contact John W. Lum or Teresa Wright (WH-552), EPA, 401 M Street, S.W., Washington, D.C. 20460, telephone (202) 426-4617. For information concerning the economic impact analysis, contact Jeffrey Wasserman (PM-221), EPA, 401 M Street, S.W., Washington, D.C. 20460, telephone (202) 755-4803.

SUPPLEMENTARY INFORMATION:

I. Legal Authority

EPA is proposing these regulations under the authority of sections 301, 304, 306, 307, 308, and 501 of the Clean Water Act (the Federal Water Pollution Control Act Amendments of 1972, Pub. L. 92-500 as amended by the Clean Water Act of 1977, Pub. L. 95-217, (the "Act")). These regulations are also proposed in compliance with the Settlement Agreement in *Natural Resources Defense Council* v. *Train*, 8 ERC 2120 (D.D.C. 1976), modified at 12 ERC 1833 (D.D.C. 1979).

II. Background

A. Introduction

On October 8, 1974, EPA promulgated a comprehensive set of regulations limiting water pollution discharges from steam electric power plants. 39 FR 36186. These regulations are codified at 40 CFR Part 423 (hereafter referred to as "Part 423"). The 1974 regulations covered two basic kinds of pollution from power plants: (a) thermal pollution (discharges of heat) and (b) chemical pollution (such as discharges of chlorine, phosphorus, suspended solids, etc.).

On July 16, 1976, the U.S. Court of Appeals for the Fourth Circuit remanded the thermal portion of the regulations. *Appalachian Power* v. *Train*, 545 F. 2d 1351 (4th Cir. 1976). Most of the chemical limitations, however, remain in effect. In today's notice, EPA is proposing revisions and additions to the chemical limitations in Part 423. This notice does not propose any regulations for thermal discharges. EPA is still considering various thermal options in light of *Appalachian*.

There are separate chemical limitations in Part 423 for each of the following power plant waste streams:

(1) Once-through cooling water;
(2) Cooling tower blowdown;
(3) Fly ash transport water;
(4) Bottom ash transport water;
(5) Low volume wastes;
(6) Metal cleaning wastes;
(7) Boiler blowdown; and
(8) Area runoff.

Today's proposal, with minor exceptions, relates only to the first three waste streams described above. An overview of this proposal is:

(1) Once-through cooling water—increase the stringency of the chlorine limits now in Part 423;

(2) Cooling tower blowdown—increase the stringency of the chlorine limits and add a prohibition on the discharge of certain toxic pollutants;

(3) Fly ash transport water—add a prohibition on the discharge of certain toxic pollutants from new facilities.

EPA is also proposing to relax certain existing limitations for bottom ash transport water and boiler blowdown.

EPA seriously considered proposing further control beyond BPT on the discharge of fly and bottom ash transport water from existing facilities. As described below, however, EPA has concluded that with its present data base, such controls should not be imposed in view of the high cost involved.

In the discussion below, EPA will generally describe the legal, technical, and economic aspects of the proposed revisions. More detailed support for the proposal is found in three EPA documents:

(1) *Development Document for Proposed Effluent Limitations Guidelines, New Source Performance Standards and Pretreatment Standards for the Steam Electric Power Generating Point Source Category,* (EPA 440/1-80/029-B September, 1980);

(2) *Economic Analysis of Proposed Effluent Limitations Guidelines, New Source Performance Standards and Pretreatment Standards for the Steam Electric Power Generating Point Source Category,* (EPA August, 1980); and

(3) *Sampling and Analysis Procedures for Screening of Industrial Effluents for Priority Pollutants,* (EPA, Effluent Guidelines Division, as Revised April, 1977). Proposed with some modifications, in 44 FR 69364-69575, December 3, 1979.

Copies of these documents may be obtained from the EPA personnel listed in the "Further Information" section above. Copies will be available for public inspection and copying as noted in the ADDRESSES section above. The abbreviations, acronyms, and other terms used in the Supplementary Information section are defined in Appendix A to this notice.

B. The Clean Water Act and the NRDC Settlement Agreement

The Federal Water Pollution Control Act Amendments of 1972 established a comprehensive program to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters." Section 101(a). The Act required existing industrial dischargers to achieve by July 1, 1977, effluent limitations representing the application of the best practicable control technology currently available (BPT), Section 301(b)(1)(A); by July 1, 1983, these dischargers were required to achieve effluent limitations representing the application of the best available technology economically achievable (BAT), "which will result in reasonable further progress toward the national goal of eliminating the discharge of all pollutants", Section 301(b)(2)(A).

New industrial dischargers were required to comply with § 306 new source performance standards (NSPS), based on best available demonstrated technology, and new and existing dischargers to publicly owned treatment works (POTW's) wre subject to pretreatment standards under Sections 307 (b) and (c).

While the requirements for direct dischargers (plants discharging wastewaters into the Nation's waterways) were incorporated into National Pollution Discharge Eliminating System (NPDES) permits issued under Section 402 of the Act, pretreatment standards are enforced by the Agency directly against indirect dischargers (plants discharging at least part of their wastewaters to POTWs). Although Section 402(a)(1) authorized the setting of requirements for direct discharges on a case-by-case basis, Congress intended for the most part that control requirements be based on EPA regulations.

Section 304(b) of the Act required the Agency to promulgate regulations providing guidelines for effluent limitations that set forth the degree of effluent reduction attainable through the application of BPT and BAT. Sections 304(c) and 306 required promulgation of regulations for NSPS, and Sections 304(f), 307(b), and 307(c) required promulgations of regulations for pretreatment standards. In addition to these regulations for designated industry categories, Section 307(a) of the Act required the Agency to promulgate effluent standards applicable to all dischargers of toxic pollutants. Finally, Section 501(a) authorized the Administrator to prescribe any additional regulations "necessary to carry out his functions" under the Act.

EPA was unable to promulgate many of these regulations by the dates specified in the Act, and in 1976 was sued by several environmental groups, including the Natural Resources Defense Council (NRDC). In settlement of this lawsuit, EPA and the plaintiffs executed a "Settlement Agreement," which was approved by the Court. This Agreement required EPA to develop a program and adhere to a schedule to promulgate for 21 major industries (including the steam electric power industry) BAT effluent limitations guidelines, pretreatment standards, and new source performance standards for 65 classes of toxic pollutants (subsequently defined by the Agency as 129 specific "priority pollutants"). *NRDC v. Train,* 8 ERC 2120 (D.D.C. 1976), modified at 12 ERC 1833 (D.D.C. 1979).

On December 27, 1977, the President signed into law the Clean Water Act of 1977. Although this law makes several important changes in the Federal water pollution control program, its most significant feature is the incorporation of several of the basic elements of the Settlement Agreement program for toxic pollution control. Sections 301(b)(2)(A) and 301(b)(2)(C) of the Act now require the achievement by July 1, 1984, of effluent limitations reflecting BAT for toxic pollutants, including the 65 pollutants and classes of pollutants which Congress declared toxic under Section 307(a). Likewise, the Agency's programs for new source performance standards and pretreatment standards are now aimed principally at toxic pollutant controls. Moreover, to strengthen the toxics control program, Section 304(e) of the Act now authorizes the Administrator to prescribe "best management practices" ("BMPs") to prevent the release of toxic and hazardous pollutants from plant site runoff, spillage or leaks, sludge or waste disposal, and drainage from raw material storage associated with, or ancillary to, the manufacturing or treatment process.

In keeping with its emphasis on toxic pollutants, the Clean Water Act of 1977 also revised the control program for non-toxic pollutants. Instead of BAT for "conventional" pollutants identified under Section 304(a)(4) (including biochemical oxygen demand, suspended solids, fecal coliform, oil and grease and pH), the new Section 301(b)(2)(E) requires achievement by July 1, 1984, of "effluent limitations requiring the application of the best conventional pollutant control technology" ("BCT") by July 1, 1984. The factors considered in assessing BCT for an industry include the costs and benefits of reducing pollutants at a point source compared with the costs and benefits of reducing pollutants at a publicly owned sewage treatment works. (Section 304(b)(4)(B)). For non-toxic, nonconventional pollutants, Sections 301(b)(2)(A) and (b)(2)(F) require achievement of BAT effluent limitations within three years after their establishment or by July 1, 1984, whichever is later, but not later than July 1, 1987.

The purpose of these proposed regulations is to provide effluent limitations guidelines for BAT and to establish NSPS, pretreatment standards for existing sources (PSES), and pretreatment standards for new sources (PSNS), under Sections 301, 304, 306, 307, and 501 of the Clean Water Act.

C. Current EPA Regulations

Current Part 423 contains BPT, BAT, and NSPS limitations for "direct" sources (39 *FR* 36186, October 8, 1974) and pretreatment standards for existing and new "indirect" sources (PSES, PSNS) (42 *FR* 15695, March 23, 1977). A "direct" source discharges pollutants directly into the waters of the United States. An indirect source discharges pollutants into a publicly owned sewage treatment works (POTW).

Today's proposal will supplement, not replace, much of current Part 423. In the regulatory section at the end of this notice, however, EPA has reprinted the entire Part 423 as it would be supplemented by this proposal. The reprint reflects some additional changes in format and style, and reflects deletion of the old and small unit subcategories (see Section VII below). The fact that a currently-existing limitation (such as all BPT limits) appears in the proposed regulatory amendments does not mean that EPA is reconsidering the limitation or that it is subject to comment as part of this proposed rulemaking. Similarly, the reprint designates as BCT existing BAT limitations for conventional pollutants. In all such cases, the existing BAT is equivalent to BPT; thus, the designation is not subject to comment as part of this proposed rulemaking.

III. Industry Overview

The steam electric power generating industry is included within the U.S. Department of Commerce Bureau of the Census Standard Industrial Classification (SIC) 4900. These proposed regulations apply to subgroup SIC 4911, Electric Services, and SIC 4931, Electric and Other Services Combined. Included in these two subgroups are those establshments primarily engaged in the generation of electricity for distribution and sale from processes using fossil-type fuel (coal, oil, or gas) or nuclear fuel in conjunction with a thermal cycle with the steam/water system as the thermodynamic medium.

There are approximately 850 steam electric power plants in the United States with a total capacity of over 450 gigawatts (GW). Coal plants, with an average capacity of nearly 650 megawatts (MW), account for slightly more than 50 percent of the total capacity and just over forty percent of the total number of plants. Oil and gas plants have an average capacity of 400 MW and make up over 50 percent of the plants but less than 40 percent of the capacity. Nuclear plants average 1,400 MW and account for 12 percent of capacity and less than 5 percent of the plants. About 2 percent of the plants use other fuels such as refuse; however, this accounts for less than 1 percent of the capacity.

The industry has two ownership categories: investor-owned and publicly-owned, with the latter further divided into federal, non-federal, and cooperative facilities. Approximately 80 percent of the capacity in the industry is privately owned, the remaining 20 percent is owned by municipalities, the federal government, and cooperatives. Generally, plants in the private sector are larger than those in the public sector.

Overall, the Agency estimates that by 1995 the electric power generating industry will experience approximately 60 percent growth in generating capacity. Growth in the steam section of the industry, however, will be more rapid; that is, a 90 percent increase in generating capacity is expected by 1995.

There is a definite correlation between plant size and age. Forty-four percent of the capacity of existing plants were built since 1970, and 93 percent of this capacity is in plants larger than 500 MW. By way of contrast, 27 percent of the steam electric capacity was built before 1960, and only 54 percent is in plants greater than 500 MW. The significance of these facts for the industry is that these older and smaller plants have shorter remaining economic lives in which to amortize the costs of pollution control equipment.

The overwhelming majority of steam electric power plants are direct dischargers. Only about 85 of the 850 plants are indirect dischargers. Moreover, many of these 85 plants discharge at least one or more waste streams into the waters of the United States and are thus also direct dischargers.

Existing indirect dischargers are much smaller on the average (150 MW) than direct dischargers (540 MW). With new plant construction, the proportional dominance of direct over indirect dischargers will increase.

The basic process for producing electricity begins with boiling water to produce high-temperature, high-pressure steam. At a fossil-fuel plant, coal, oil, or gas is burned to boil water. Ash materials are formed in coal and low-grade oils that must be collected and disposed of. A common disposal method uses water to sluice ash materials to a disposal pond. At a nuclear plant, atomic reactions produce the heat to boil the water.

Expansion of high pressure steam drives the blades of a turbine, and a generator then converts the turbine's mechanical energy into electrical energy. Once steam has passed through the turbine, it is condensed by transferring heat to cooling water in a heat exchanger called the condenser. The condensed water is returned to the boiler (after polishing) to begin the cycle again.

As a result of the steam/water cycle and ash handling operations, chemical pollutants may be discharged into the Nation's waterways through various waste streams. Two of the major waste streams covered by today's proposal are related to the process of condensing the steam with cooling water (once-through cooling water and cooling tower blowdown); the other major waste streams are related to the process of burning coal or oil in the boiler (fly and bottom ash transport water).

—*Once-through cooling water.*—All plants circulate large volumes of water through their condensers in order to condense steam in the turbines. About 550 of the 850 existing plants use a "once-through" cooling system. With such a system, the plant withdraws water from a water body, passes the water through the condensers, and then discharges the heated water into a receiving water body. At an average plant, the flow of the once-through cooling water is approximately 210 million gallons per day (MGD).

The thermal efficiency of the steam cycle can be greatly reduced if biological growth ("biofouling") occurs in the condensers. Primarily because of this problem, about 60 percent of all plants add chlorine to once-through cooling water systems to control biofouling. Plants using chlorine have the potential to discharge total residual chlorine (TRC) and chlorinated compounds into the navigable waters. TRC is a pollutant that has been studied extensively and is known to adversely affect aquatic life.

—*Cooling tower blowdown.*—Some plants recirculate part of the cooling water. When the cooling water passes through the condensers, it is heated from the condensing steam, and must be cooled before reuse. One common cooling device, used at approximately 330 plants, is the evaporative cooling tower.

Cooling towers do not recirculate 100 percent of the cooling water. To control the buildup of dissolved solids, a small percentage of the recirculating water is discharged. This discharge is known as cooling tower "blowdown."

At an average plant, the flow of the cooling tower blowdown is approximately 0.6 MGD. Since most plants with recirculating systems add chlorine to control condenser biofouling and cooling tower slime, this practice results in the discharge of TRC. In addition, other toxic chemicals may be added to control surface scaling, corrosion, and biofouling within the cooling tower.

—*Ash transport water.*—Coal or oil that is burned in a boiler produces some ash that requires disposal. Some relatively fine and light-weight ash is commonly carried out of the boiler with the flue gases and collected with air pollution control equipment. This is called "fly ash." The relatively bulky and heavy ash that settles at the bottom of the boiler's furnace is called "bottom ash."[1]

Most plants discharge all of the water used for ash sluicing. This practice is called once-through sluicing. Some plants recirculate some of this water, and these systems are called recirculating ash sluicing sytems. At an average plant using wet fly ash systems, the discharge is approximately 2 MGD. For wet bottom ash transport systems, the discharge rate from an average plant is about 1.3 MGD.

IV. Scope of Rulemaking and Summary of Methodology

EPA's 1973–1976 round of rulemakings emphasized the achievement of best practicable technology (BPT) by July 1, 1977. In general, this technology level represents the average of the best existing performances of well known technologies for control of familiar (i.e., "classical") pollutants.

This round of rulemaking, in contrast, aims for the achievement by July 1, 1984, of the best available technology economically achievable (BAT) that will result in reasonable further progress toward the national goal of eliminating the discharge of all pollutants. At a minimum, this technology level represents the very best economically achievable performance in any industrial category or subcategory. Moreover, as a result of the Clean Water Act of 1977, the emphasis of EPA's program has shifted from "classical" pollutants to the control of a lengthy list of toxic substances.

In its 1977 legislation, Congress recognized that it was dealing with areas of scientific uncertainty when it declared the 65 "priority" pollutants and classes of pollutants "toxic" under Section 307(a) of the Act. These priority pollutants were relatively unknown outside of the scientific community, and those engaged in wastewater sampling and control had little experience dealing with them. Additionally, these pollutants, primarily the organic pollutants, often have toxic effects at very low concentrations, and analytical techniques were not available to monitor these quantities. Though Congress was aware of these difficulties and of the expense of "toxics" control and detection, it nevertheless directed EPA to act quickly and decisively to detect, measure, and requlate these substances.

[1] Sometimes "economizer ash" is collected from the flue gas between the boiler and the air pollution control device. This ash is generally intermediate in size and weight between bottom ash and fly ash. It is commonly combined with bottom ash for transport and disposal.

EPA's implementation of the Act required a complex program to develop new analytical techniques, as well as extensive technical and economic data about the industry. Using the information from this program, the Agency has developed regulations for the steam electric power generating industry.

EPA first studied the steam electric power industry to determine whether differences in fuel type, equipment, age and size of plants, water usage, wastewater constituents, or other factors required the development of separate effluent limitations and standards for different segments of the industry. This involved a detailed analysis of wastewater discharges and treated effluent characteristics, including: 1) the sources and volume of water use, the processes employed, and the sources of pollutants and wastewaters in the plant; and 2) the constituents of wastewaters, including toxic pollutants. Such analyses enabled the Agency to determine the presence and concentrations of priority pollutants in wastewater discharges.

EPA also identified several distinct control and treatment technologies (both in-plant and end-of-pipe processes) for potential use in the steam electric power industry. The Agency analyzed both historical and newly generated data on the performance of these technologies, including their non-water quality environmental impact on air quality, solid waste generation, water consumption, and energy requirements.

The cost of each control and treatment technology was estimated from unit cost curves developed by standard engineering analyses of control technologies representative of the proposed effluent standards. EPA derived the unit process costs by applying model plant characteristics (production and flow) to the unit cost curve of each treatment technology (i.e., dechlorination, chlorine minimization, dry fly ash transport, recirculation of ash sluice water, etc.). These unit process costs were added together to yield the total cost.

A two-pronged approach was taken in the economic analysis of the steam electric industry that examined the economic effects of the regulations at both plant and industry level.

The plant level analysis focused on plants representing the most common characterics of steam electric generating plants, as well as the sectors believed to be most vulnerable to the impact of BAT regulations. After selecting five model plants based on these criteria, the Agency computed the costs of generating electricity at each of the plants in order to establish a benchmark. Later, the costs of the technologies capable of achieving the proposed regulations were computed, and the differences between these and the baseline costs were compared.

The industry level analysis, on the other hand, was aimed at determining the total cost of the proposed regulations that will be assumed by the electric utility industry and its customers. An additional effort was made to assess the effects of the increased costs on the physical and financial operations of the industry. Here too, baseline projections were made which were later compared to the projections that incorporated the costs of the proposed regulations.

Using the technical and economic data, the Agency characterized the various control and treatment technologies as BAT, PSES, PSNS, and NSPS. The proposed regulations, however, do not require the installation of any particular technology. Rather, they require effluent limitations representative of the proper operation of these technologies or equivalent technologies.

V. Data Gathering Efforts

In 1976–77, under the authority of Section 308 of the Act, the Agency sent detailed questionnaires to approximately 900 steam electric facilities, of which 812 responded. Requested information included: age distribution by boiler; mode of operation; fuel type; discharge flow; construction material; chemcial additives; intake water quality; geographical location; and best engineering judgment on the presence of the 65 families of toxic pollutants in power plant wastewaters.

EPA, through the use of its contractors, visited 36 power plants in order to gather additional information on costs, wastewater characteristics, production details, and pollution control systems. The Agency also surveyed literature and conducted both field and bench scale studies to collect information on treatability and treatment systems not currently used in the industry.

In addition to the foregoing data sources, supplementary data were obtained from NPDES permit files in EPA regional offices, engineering studies on treatment facilities, and contacts with state pollution control offices. EPA also contacted suppliers and manufacturers for information regarding chemical use and treatment systems.

VI. Sampling and Analysis Program

As Congress recognized in enacting the Clean Water Act of 1977, the state-of-the-art ability to monitor and detect toxic pollutants is limited. Apart from the metals and a small number of organic pollutants, most of the toxic pollutants were relatively unknown until a few years ago. As a result, for many toxic pollutants, primarily the organic pollutants, the Agency has not yet promulgated analytical methods under Section 304(h) of the Act. The sampling protocol and analytical techniques used in this rulemaking are described in *Sampling and Analysis Procedures for Screening of Industrial Effluents for Priority Pollutants*, as revised April 1977. These procedures, with minor modifications, were proposed in *FR* 69464–69575, December 3, 1979.

Before proceeding to analyze any industrial wastewaters, EPA concluded that it had to isolate specific toxic pollutants for analysis. The list of 65 pollutants and classes of pollutants potentially includes thousands of specific pollutants; analyses for all of them would overwhelm private and government laboratory resources. In order to make the task more manageable, EPA selected 129 specific toxic "priority pollutants" for study in this rulemaking and other industry rulemakings. The criteria for choosing these pollutants included the frequency of their occurrence in water, their chemical stability and structure, the amount of the chemical produced, and the availability of chemical standards for measurement.

Because Section 304(h) methods were available for analyzing most toxic metals, pesticides, cyanide, and phenolics, the analytical effort focused on methods of sampling and analyzing organic toxic pollutants. EPA considered three basic analytical approaches: infra-red spectroscopy; gas chromatograhpy (GC); and gas chromatography/mass spectrometry (GC/MS). In selecting among these alternatives, EPA considered their sensitivity, laboratory availability, costs, applicability to diverse waste streams from numerous industries, and capacity for implementation within the statutory and court-ordered time constraints of EPA's program.

EPA chose GC/MS for its first phase of the steam electric sampling program because it is the only available technique that can identify a wide variety of pollutants in many different wastewaters, in the presence of interfering compounds, and within the time constraints of the program. In EPA's judgement, GC/MS and the other analytical methods used in this rulemaking represent the best state-of-the-art methods for toxic pollutant analyses available when this study began. The Agency chose GC only for most of the second phase of the steam electric sampling program because: (1) GC is a better analytical method for quantification where there is no interference with the compounds of interest; and (2) the time and cost of GC analyses were more attractive to the Agency.

Although EPA has refined its sampling and analytical protocols as technology has advanced, resource constraints prevent the Agency from reworking completed analyses according to new analytical methods. The analytical techniques used in some rulemakings may therefore differ from those used in others, but each case represents the best analytical methods available for a given industry study.

The steam electric sampling data base includes information on the presence and magnitude of the 129 pollutants from 52 power plants. Although the primary focus of this program involved streams with the largest discharge flows—once-through cooling water, cooling tower blowdown, and ash transport waters—the Agency also sampled other waste streams such as flue gas desulfurization system blowdown, boiler blowdown, floor drainage, and demineralizer regenerants.

The high costs, slow pace, and limited laboratory capability for toxic pollutant analyses presented limitations to both the amount and quality of steam electric power plant data that could be collected. The cost of analyzing each wastewater sample for organic priority toxic pollutants ranges between $650 and $1,700, not including sampling costs. Although efficiency has been improving, when this sampling program began, a well-trained technician using the most sophisticated equipment could perform only one complete organic analysis in an eight-hour work day. Moreover, there were less than 20 commercial laboratories in the United States with sufficient capability to perform these analyses. Today there are about 75 commercial laboratories known to the Agency that have the capability to analyze for priority pollutants, and the number is increasing as the demand for such capability increases.

The organic priority pollutants were analyzed using EPA's December 3, 1979 proposed 304(h) method. Methylene chloride was used to extract the acid and base/neutral organic fractions; hexane/methylene chloride extracted the pesticide containing fractions. The acid and base/neutral fractions were reduced in volume and analyzed by gas chromatography-mass spectrometry (GC/MS) or gas chromatography (GC). Pesticides were analyzed by electron-capture gas chromatography followed by GC/MS confirmation of positive results. Volatile organics were analyzed by the purge and trap method of introducing the material into the inlet system.

Metals analyses were by atomic adsorption (AA) spectrophotometry or inductively coupled argon plasma (ICAP) optical emission spectrometry except that the standard cold vapor method was used for mercury. ICAP is now a proposed standard 304(h) method of analysis.

Analyses for cyanide and cyanide amenable to chlorination also used 304(h) methods. Analyses for asbestos fibers used transmission electron microscopy with selected area defraction; results were reported as chrysotile fiber count.

Analyses for conventional pollutants (BOD_5, TSS, pH, and oil and grease) and nonconventional pollutants (total residual chlorine, iron, ammonia, fluoride, and COD) were performed by 304(h) methods. Table XIX summarizes those pollutants that were detected as a net discharge at least once for each waste stream in the steam electric sampling data base. Additional data is included in the development document.

VII. Industry Subcategorization

Current Part 423 divides the steam electric industry into three subcategories based on generating units, small units and old units.[2] This was based on considerations relating to thermal regulations; all of the 1974 chemical limitations apply uniformly to each subcategory. Partly because regulations for thermal discharges are not included in the proposal, this subcategorization scheme is not retained here.

This scheme was also reevaluated from information compiled through questionnaire surveys, plant visits, and the sampling and analysis program for priority pollutants. This reevaluation consisted of both statistical and engineering analyses to assess the influence of age, size, fuel type, geographic location (certain factors specified in S304), and other variables on wastewater pollutant loading and the need for subcategorization. On the basis of the statistical and engineering studies, EPA concluded that there is no

[2] A fourth "subcategory" is area runoff. 40 CFR Part 423, Subpart D. EPA recently reinstated certain limitations in this subcategory (45 FR 37432, Vol 45, No. 108, June 3, 1980).

need to retain the current subcategorization scheme, and that the basic differences among plants can be accomodated through separate limitations for each waste stream. A description of the slightly modified waste stream subcategorization scheme, and the statistical and engineering analyses are presented in Section IV of the Development Document.

As discussed in Part XV below, the regulations contain a built-in "safety valve" in the event an individual plant's technical, cost, non-water quality environmental impact, and engineering characteristics are so fundamentally different as to warrant a variance from national limitations.

EPA is also proposing to change the Part 423 format in three other respects. First, boiler blowdown discharges currently are regulated separately from low volume waste discharges. While both have the same TSS and oil and grease limitations, there are additional copper and iron limitations for boiler blowdown. (Compare 40 CFR 423.12(3) with 40 CFR 423.12(6).) Information available to EPA since 1974 indicates that the levels of copper and iron in boiler blowdown have consistently been much lower than expected. Because of the low concentrations, and because of the relatively low flow levels from the boiler blowdown stream (33,260 gpd at an average coal-fired plant) the Agency has concluded that boiler blowdown should be regulated as any other low volume waste. Accordingly, the regulations proposed below no longer treat boiler blowdown as a separately regulated stream. Boiler blowdown discharges would be regulated as part of low volume wastes, and the copper and iron limitations would no longer apply.

Second, certain limitations currently designated as BAT are now re-designated as BCT (see Section VIII below). The current list of conventional pollutants includes BOD, TSS, fecal coliform, oil and grease, and pH. Limitations for TSS and oil and grease are designated as BCT for low volume wastes, metal cleaning wastes, and runoff from coal piles and chemical storage areas. The limitation for pH is also designated as BCT and is applied to all discharges, except once-through cooling water. In all cases the limitations now designated as BCT are the same as those under current BPT because the BAT limits had been equivalent to BPT. Accordingly, the BCT designations are not to be considered subject to comment as part of this proposed rulemaking package.

Third, the regulations proposed below clarify an issue of applicability for the "metal cleaning wastes" stream limitations. In the current Part 423, there are identical TSS and oil and grease limits for both the metal cleaning waste stream and the "low volume" waste stream. Compare 423.12(b)(3) with 423.12(b)(5). For the metal cleaning waste stream, however, there are additional limitations for copper and iron.[3] Currently, some confusion exists as to what types of cleaning practices are subject to the more stringent metal cleaning waste limitations.

Current Part 423 broadly defines "metal cleaning wastes" to include wastes derived from cleaning any metal process equipment, including boiler fireside cleaning and air preheater cleaning. 40 CFR 423.10(j). Despite the regulatory language, however, EPA adopted a policy in a memorandum of June 17, 1975, which narrowed the coverage of the metal cleaning waste limitations. In this memo, EPA stated that metal cleaning with water only would be considered a "low volume" waste and that only wastes resulting from cleaning with chemical solutions would be considered as metal cleaning wastes.

EPA has reconsidered this position and concluded that it should not be followed in the future. The cost and technology data supporting the copper and iron limitations in the original Part 423 apply to all wastes defined in 423.10(j), whether they result from washing with water only or with chemical solutions. Moreover, there are toxic pollutants in these waste streams even where only water is used for washing.[4]

Accordingly, the regulations proposed below make clear that the "metal cleaning waste" definition will apply according to its terms, and the question of whether washing is done with water only will be irrelevant. Because many dischargers may have relied on EPA's memorandum of June 1975, however, the regulations proposed below adopt the memorandum's position for purposes of BPT only.

Finally, it should be noted that discharges from flue gas desulfurization (FGD) systems are currently regulated as low volume waste discharges. EPA has determined that this discharge stream should be regulated separately because the flow of the blowdown from the wet scrubber system can be far greater than flows from other low volume streams. Further, analyses of effluents from this waste stream indicate potential discharges of toxic substances such as arsenic, lead, mercury, selenium, cadmium, etc. The Agency does not have sufficient data on this stream at this time to propose revised BAT, NSPS and pretreatment standards. In the interim, the BPT control for low volume wastes limiting TSS, pH, and oil and grease will still be applied to discharges from flue gas cleaning systems using wet scrubbing.

Accordingly, the Agency reserves this stream for limitations to be developed in the future.

[3] For both streams, the BAT limitations are identical to the BPT limitations.

[4] EPA based the iron and copper limitations on the availability of chemical precipitation technology.

VIII. General Critiera for Effluent Limitations

A. BAT Effluent Limitations

In its assessment of the best available technology economically achievable, EPA considers the following factors:

1. Age and size of equipment and facilities;
2. Process employed;
3. Engineering aspects of applying various technologies;
4. Process changes;
5. Costs of achieving effluent reductions; and
6. Non-water quality environmental impacts (including energy requirements).

At a minimum, BAT represents the very best economically achievable performace of plants of various ages, sizes, processes, or other shared characteristics; uniformly inadequate performance may require a transfer of BAT from different industry categories or subcategories. BAT also may include process changes or internal controls even when these are not common industry practice.

The statutory assessment of BAT "considers" costs, but does not require a balancing of costs against effluent reduction benefits (see *Weyerhauser Company* v. *Costle,* 590 F. 2d 1011 (D.C. Cir. 1978). In developing this proposed BAT, however, EPA has given substantial weight to the reasonableness of costs. The Agency has considered the volume and nature of discharges both before and after application of BAT, the general environmental effects of the pollutants, and the costs and economic impacts of the required pollution control levels. Nevertheless, the primary determinant of BAT is effluent reduction capability. Congress stressed in Section 301(b)(2)(A) that BAT "shall require the elimination of discharges of all pollutants" if the Administrator finds such a requirment technologically and economically achievable.

B. Best Conventional Pollutant Control Technology

The 1977 amendments added Section 301(b)(4)(E) to the Act, establishing "best conventional pollutant control technology" (BCT) for discharges of conventional pollutants from existing industrial point sources. Conventional pollutants are those defined in Section 304(b)(4)—BOD, TSS, fecal coliform, and pH—and any additional pollutants defined by the Administrator as "conventional." On July 30, 1978, EPA designated oil and grease as a conventional pollutant (44 FR 44501).

BCT is not an additional limitation; rather it replaces BAT for the control of conventional pollutants. BCT requires that limitations for conventional pollutants be assessed in light of a new "cost-reasonableness" test which involves a comparison of the cost and level of reduction of conventional pollutants from the discharge of publicly owned treatment works (POTW) to the cost and level of reduction of such pollutants from a class or category of industrial sources. As a part of its review of BAT for certain "secondary" industries, the Agency has promulgated a methodology for this cost test. (See 44 FR 50732, Aug. 29, 1979.) The Agency compares industry costs with that of an "average" POTW with a flow of 2 mgd and costs (1977 dollars) of $1.18 per pound of pollutant removal (BOD and TSS).

C. New Source Performance Standards

The basis for new source performance standards (NSPS) under Section 306 of the Act is the best available demonstrated technology. New plants have the opportunity to design the best and most efficient steam electric generating processes and wastewater treatment technologies, and Congress therefore directed EPA to consider the best demonstrated process changes, in-plant controls, and end-of-pipe treatment technologies which reduce pollution to the maximum extent feasible.

D. Pretreatment Standards for Existing Sources

Section 307(b) of the Act requires EPA to promulgate pretreatment standards for existing sources (PSES) which must be achieved within three years of promulgation. PSES are designed to prevent the discharge of pollutants which pass through, interfere with, or are otherwise incompatible with the operation of POTWs. The Clean Water Act of 1977 adds a new dimension by requiring pretreatment for pollutants, such as heavy metals, that limit POTW sludge management alternatives, including the beneficial use of sludges on agricultural lands. The legislative history of the 1977 Act indicates that pretreatment standards are to be technology-based, analogous to the best available technology for removal of toxic pollutants. The general pretreatment regulations (40 CFR Part 403), which served as the framework for these proposed pretreatment regulations for the steam electric power generating industry, can be found at 43 FR 27736 (June 26, 1978).

E. Pretreatment Standards for New Sources

Section 307(c) of the Act requires EPA to promulgate pretreatment standards for new sources (PSNS) at the same time that it promulgates NSPS. New indirect dischargers, like new direct dischargers, have the opportunity to incorporate the best available demonstrated technologies (including process changes, in-plant controls, and end-of-pipe treatment technologies) and to select plant sites that ensure adequate treatment system installation.

IX. Rationale for Proposal by Waste Streams

A. Once-Through Cooling Water

1. *Pollutants present.*—The Agency detected several pollutants in once-through cooling water discharges. Table XIX lists those pollutants detected at least once in greater concentrations in the effluent than in the influent. The pollutants present as a result of plant operation are copper, chromium, nickel, zinc, bromoform, chloroform, chlorodibromonethane, and total residual chlorine (TRC).

2. *Need to control TRC.*—In general, chlorine is a strong oxidizing agent with a high solubility in water. Numerous reports are available that document the toxicity of chlorine and its byproducts to aquatic organisms. Chlorine in water may be present as free available chlorine (hypochlorous acid or hypochlorite ion) or combined residual chlorine (mono-, di-, and tri-chloramines) or other chlorine derivatives. Studies have shown that the toxicity to aquatic life is dependent on the concentration of total residual chlorine (TRC) remaining in the water, including both free available and combined residual chlorine, as well as the duration of contact.[5]

Of about 550 plants with once-through cooling, EPA estimates that 335 use chlorine for biofouling control.

3. *Available technologies and techniques.*—Because of current requirements in Part 423, and because of state and local requirements, many power plants already are making efforts to reduce their TRC discharges. The principal ways in which to curtail or eliminate TRC discharges include the following:

(a) *No biocides.*—The intake water quality at many plants is such that condenser biofouling is not a problem. Characteristics of this type of intake water include high turbidity, low dissolved oxygen or low temperatures. Currently, 40 percent of the plants with once-through cooling water do not chlorinate.

(b) *Use of alternative biocides to chlorine.*—Some plants with biofouling problems use other biocides than chlorine. The alternative biocides include chloride bromide, chlorine dioxide and ozone.

(c) *Chlorine minimization.*—In the past, caution has dictated the liberal chlorination of chlorination of condenser tubes. Plant operators are discovering, however, that by following careful operating, monitoring, and maintenance procedures, they can significantly reduce the use of chlorine without impeding effective biofouling control.

In essence, "chlorine minimization" is nothing more than a program designed to assure the most efficient use of chlorine and reduce the amount of TRC discharged. Such a program requires plant personnel to conduct a number of tests to determine the minimum amount of chlorine necessary to control biofouling. Chlorination practices then can be adjusted in accordance with the test results. Continued monitoring and inspection of the condensers on a periodic basis is also required.

Many power plants undergoing some form of chlorine minimization program find that they do not need biofouling control at all; others find that their current chlorine doses can be reduced significantly.

(d) *Dechlorination.*—Some plants have installed chemical treatment devices that remove a significant amount of TRC from the cooling water before it is discharged from the plant. Most of these dechlorination devices use sulfur dioxide or sodium thiosulfate to accomplish TRC reduction. The reaction products, if sulfur dioxide is used, are sulfate ions, chloride ions and ammonium bisulfate. Each is present in low concentrations and have been shown to have insignificant pH and dissolve oxygen shift effect. This technology has been demonstrated to be effective both in fresh and salt water media. This technology reduces TRC to less than 0.14 mg/l at any time (instantaneous maximum).

[5] In estuarine/marine environments, brominated compounds are formed instead. The term "residual oxidants" is more appropriate than "residual chlorine" in such cases.

(e) *Mechanical antifouling devices.*—Some plants use mechanical devices, either with chlorine or in place of chlorine, to control biofouling. Two types of on-line mechanical devices are used. One method uses sponge rubber balls of slightly larger diameter than the inside diameter of the tubes to be cleaned. The balls are fed to the inlet of the exchanger, forced through the tubes under water pressure, removed at the downstream side of the heat exchanger, and recycled. A second method uses brushes which are installed in each tube. Movement of the brushes is induced by periodic changes in the direction of the cooling water flow.

4. *Proposed Regulation*— a. *BAT.*—The Agency is proposing to prohibit the discharge of total residual chlorine (TRC); however, power plants that demonstrate a need for chlorine to control condenser biofouling may discharge the minimum amount of TRC necessary (chlorine minimization program). In no event may a TRC discharge exceed 0.14 mg/1 maximum concentration at the point of discharge. Moreover, TRC may not be discharged from any discharge point for more than two hours per day unless the plant shows that chlorination for a longer period is required for crustacean control. The current Part 423 provision prohibiting simultaneous chlorination of several units would be deleted. This provision is already incorporated into the chlorine minimization requirements.

Section 301(b)(2)(A) of the Act requires the Agency to develop limitations that will result in reasonable further progress towards eliminating all pollutant discharges. This section states that BAT limitations must prohibit pollutant discharges if the Agency finds this technologically and economically achievable.

The Agency has determined that at many plants, a prohibition against TRC discharges is technologically and economically achievable. As noted earlier, about 40 percent of existing power plants with once-through cooling do not chlorinate at all. Moreover, the Agency believes that some plants now using chlorine could discontinue it without adverse effect.

Many plants, however, must use chlorine or other means to control biofouling because of the nature of their intake water. For such plants, a total prohibition against TRC discharges may be neither technologically nor economically achievable. Mechanical anti-fouling devices are expensive to backfit, and are not always adequate substitutes for chlorine. There is insufficient data to demonstrate that the alternative biocides can substitute for chlorine under all cases, or if they are more or less environmentally acceptable on a national basis.[6]

Dechlorination has been demonstrated to be effective from both technical and economic standpoints. While dechlorination significantly reduces the amount of TRC discharged, it does not eliminate it.

Accordingly, the Agency has structured the proposed TRC regulation in two basic parts. First, the proposed regulation contains a general prohibition against TRC discharges. This is BAT for the many plants that do not need chlorine for biofouling control. Second, the proposed regulation requires that any plant which must control biofouling must use only the minimum amount of chlorine demonstrated to be necessary at that plant (chlorine minimization).

Plants needing to use chlorine to control biofouling in their once-through cooling water must demonstrate to the NPDES permit-writer, through the chlorine minimization study set forth in Appendix A of the proposed regulations, how much chlorination is actually necessary at the plant. Based on this study, the permit writer establishes a BAT limitation for that plant (in terms of a TRC concentration level (mg/l) as well as limits on the duration and frequency of chlorine added) reflecting the minimum amount of chlorination necessary to control biofouling. The limitations may vary seasonally or vary with intake water temperture.

The proposed regulation specifies that in no event may a TRC limitation exceed 0.14 mg/l concentrtion at the point of discharge. The Agency believes that many plants can achieve this limitation merely by following the minimization program. In the event a plant cannot meet this limit with minimization only, the plant could meet the limitation by adding a dechlorination system. Thus, the proposed BAT for plants that must chlorinate requires a minimization program in all cases, and may require dechlorination in some.

The Agency considered the option of merely requiring minimization without specifying a maximum TRC concentration level. Under this option, no plant would be required by BAT to dechlorinate. The Agency's conclusion, however, is that this approach would impede reasonable further progress toward the elimination of TRC discharges throughout the nation because some plants would be allowed to discharge TRC at concentrations much greater than those which can be achieved by a technology (dechlorination) that is both technically and economically available.

Another option was to specify a maximum TRC concentration level (based upon dechlorination technology for plants that must chlorinate) without first requiring that the plants minimize their use of chlorine. The Agency has rejected this option because many plants have the ability with economically and technologically available procedures (chlorine minimization) to discharge a lower maximum TRC concentration level than is generally achievable on a national basis by dechlorination (maximum of 0.14 mg/l). Further, the chlorine minimization program is environmentally advantageous in that it always reduces, and in some cases eliminates, the discharge of chlorine. Further, those plants that will be required to dechlorinate after the chlorine minimization program will use less declorination chemicals.

The Agency believes that the proposed scheme best follows the mandate of § 301(b)(2)(A), which is that BAT should be no discharge unless it is not technogically or economically feasible. The Agency's scheme assures that there will be no TRC discharge at plants where this is technologically and economically feasible, and limits discharges at other plants to the maximum degree technologically and economically feasible.

The Agency is also proposing to limit TRC discharges from plants that must chlorinate to no more than two hours per day unless plant personnel can demonstrate that discharges for longer periods are necessary for crustacean control. This limitation is essentially the same as that which is already in effect for free available chlorine.

Finally, the Agency is proposing to relax current Part 423 in one respect. The current BAT regulation prohibits simultaneous chlorine discharges from more than one unit at any plant, even if each unit is meeting the maximum concentration and hours-per-day limitations. The Agency is proposing to eliminate this restriction because plants with multiple units may not be able to comply with the one unit at a time restriction. The current Part 423 provision prohibiting simultaneous chlorination of several units (unless a demonstration of need is made) would be deleted. This provision is already incorporated into the chlorine minimization requirements.

This change is necessary because the proposed discharge limitations are more stringent than BPT and adequate

[6] This is not to say that the use of alternative biocides and/or mechanical systems might not be appropriate in some cases.

biofouling control for multi-unit plants, in some cases, may require multi-unit chlorination. It should be noted that BPT provides for exemption from the "one-unit-at-a-time" requirement if the need for multi-unit chlorination can be demonstrated. The minimization program required by this proposed regulation is equivalent to the demonstration of need required under BPT.

b. *NSPS.*—The proposed NSPS is the same as the proposed BAT.

Section 306(a)(1) directs the Agency to set a NSPS which prohibits pollutant discharges "where practicable." The Agency must also consider costs. § 306(b)(1)(B). For the same reasons discussed in part 4a above, practical considerations and high costs are the reasons for not imposing an accross-the-board prohibition on TRC discharges. The Agency is accordingly proposing to make NSPS equivalent to BAT.

c. *PSES.*—The proposed PSES do not restrict the discharge of any pollutants from this wastewater source.

For PSES, the Agency is proposing no limitations on TRC because no plants currently discharge their once-through cooling water to POTW's. In addition, TRC dissipates in the POTW system.

d. *PSNS.*—For PSNS, EPA is proposing no limitations on TRC or any other pollutants. Because of the massive flows, it is unlikely that new plants will discharge to POTW's. In addition, the TRC dissipates in the POTW system.

B. Cooling Tower Blowdown

1. *Pollutants present.*—Several pollutants detected in cooling tower blowdown discharges were attributed entirely to their presence in the intake water. The sampling data show that the following pollutants are being discharged as a result of power plant operations: copper, nickel, zinc, asbestos, benzene, chloriform, 2-4dichlorophenol, total phenolics and TRC. Table XIX lists those pollutants that were detected at least once in the EPA data base in greater concentrations in the effluent than in the influent.

2. *Need to control TRC and other chemicals added for cooling tower maintenance.*—Chlorine is commonly added to cooling water to inhibit organism growth in both the tower and the condenser. Of about 300 plants with recirculating cooling systems, approximately 75 percent of these plants use chlorine. The need to control TRG discharges was covered in the previous discussion on once-through cooling water. In addition to chlorine, other chemicals may be added to control scaling, corrosion, and biofouling of the tower itself. Scaling, corrosion, and biofouling affect cooling tower performance and are the major maintenance items that are commonly handled by chemical treatment. Some of these chemicals contain priority pollutants.

3. *Available technologies and techniques*—(a) *For control of TRC.*—The technologies and techniques for TRC control are essentially the same as discussed for once-through cooling (Part IV (A)(3) above).

(b) *For control of 129 toxic pollutants discharged from chemicals added for cooling tower maintenance.*—Many power plants can avoid or minimize discharges of the 129 toxic pollutants from the cooling tower blowdown stream by using chemicals that do not contain the 129 toxic pollutants. Many plants are already using some of these readily available chemicals.

(c) *For control of all pollutants from recirculating cooling water systems.*—Some plants (principally in the southwest) do not discharge cooling tower blowdown but use evaporation ponds to eliminate all discharges. In areas where net evaporation is less than 20 inches/year, this is not a practical technology. Vapor compression distillation (VCD) is sometimes used to reduce the volume of wastewater to be evaporated and to provide recovery of water for inplant use. VCD is a forced-evaporation system which evaporates over 90 percent of the water. The vapor is condensed and reused by the plant as makeup water, and the remaining 10 percent is a concentrated brine that is disposed of in evaporation ponds or spray dryers.

(d) *For control of heavy metals.*—An available option for removal of chromium and zinc is precipitation. This treatment method involves the addition of chemicals to precipitate the dissolved metals and sedimentation or filtration to remove suspended solids. This technology is required under existing BAT. This treatment method is effective in lowering amounts of dissolved metals.

4. *Proposed regulation*—a. *BAT.*—The Agency is proposing to limit TRC discharges to a maximum concentration of 0.14 mg/l at any time. The Agency is also proposing to prohibit the discharge of all chemicals used for tower and condenser maintenance that contain any of the 129 toxic priority pollutants. Plants with cooling towers are not required to demonstrate the need to chlorinate or to undergo a minimization program.

For Control of TRC: One technology that is available to achieve the .14 mg/l TRC limit is dechlorination. In some cases, plants may be able to meet this limitation without declorination, by a minimization program, and/or by using other good management practices, i.e., discontinuation of discharge for two to three hours until the TRC dissipates inside the system.

The Agency is not requiring a chlorine minimization program because such a program would be unduly complex for this stream (as compared to once-through cooling) since chlorine may be required for cooling tower maintenance as well as biofouling control in the condenser tubes. Moreover, minimization is not as important in this waste stream because the daily flow is commonly less than 1/100th of the once-through cooling water flow.

The Agency has rejected a no discharge limitation because it would either require the use of alternative biocides for biofouling control or would require vapor compression distillation. Some of these alternative biocides may be as toxic as chlorine. The Agency does not believe vapor compression distillation is a viable technology for the treatment of this waste stream since disposal of the brine wastes in an environmentally acceptable manner may not be technically feasible in some cases and, may be too expensive in some geographical locations.

Thus, because dechlorination is clearly technologically and economically achievable, the Agency has determined that the 0.14 mg/l limit, which can be met by dechlorination, is BAT for the control of TRC. Meeting this limit will result in reasonable further progress toward the Act's no discharge goal.

For control of the 129 toxic pollutants: Many chemicals are available for cooling tower maintenance that do not contain any of the 129 toxic pollutants, and these chemicals can effectively and economically protect cooling towers and system equipment from scaling, corrosion, and biofouling problems. High levels of chromium and zinc are present in cooling tower blowdown only if they were added for tower maintenance. Although precipitation reduces the discharge of these chemicals, it will not be able to eliminate it as in the case of using replacement material. Therefore, BAT for this stream prohibits the use of chemicals containing the 129 pollutants (no discharge of chemicals added for cooling tower maintenance).

For control of phosphorus: Phosphorus is used in cooling towers primarily for scaling control. The existing BAT requires treatment of phosphorus to 5 mg/l. The Agency has determined that this requirement is not necessary because (1) the limited use of phosphorus in cooling towers and (2) the environmental impact is quite site specific. The Agency has determined that the environmental effect of this non-toxic/non-conventional pollutant is adequately addressed by water quality standards. The proposed BAT is, therefore, relaxed in this respect, and the current limitation for phosphorus will not apply.

b. *NSPS.*—The proposed NSPS controls for cooling tower blowdown are identical to the proposed BAT controls. The same factors and considerations discussed in the BAT section immediately above apply here.

c. *PSES and PSNS.*—For PSES and PSNS, EPA is proposing no limitations on TRC because most of the TRC dissipates before reaching the POTW and the remaining low levels do not warrant control. For the 129 priority pollutants and phosphrous, EPA is proposing PSES equal to BAT because the Act's legislative history indicates that pretreatment standards should be equivalent to BAT. Moreover, these pollutants (primarily chromium, zinc, and pentachlorophenol) are not compatible with POTW treatment and may interfere with POTW operation or limit their sludge disposal options. For PSES and PSNS, the Agency is proposing no limitations on phosphorus as in the case for BAT.

C. Ash Transport Water

1. *Fly ash*—a. *Pollutants present.*—Table XIX lists those pollutants that were detected at least once in the EPA data base in greater concentrations in the effluents than in the influents. The following toxic pollutants are believed to be a result of transporting fly ash: arsenic, antimony, beryllium, selenium, nickel, lead, chromium, copper, zinc, and cadmium.

These materials enter the water primarily via dissolution of reactive compounds on the surface of the fly ash particles. Only plants handling fly ash with partially recirculating or wet once-through systems contribute to this problem. Gas-fired and nuclear plants do not generate ash. Further, out of approximately 850 steam electric plants, only 43 oil-fired plants and 183 coal-fired plants currently discharge fly ash sluice water (many of the oil-fired facilities do not collect fly ash and would not be affected by regulations for fly ash transport water).

b. *Need to control toxics from this stream.*—The sampling data demonstrates that toxic pollutants are present in the fly ash transport water discharge stream; however, most of these pollutants are also present in the plants' make-up or intake water source. Data on concentrations of pollutants in the intake water and fly ash transport water discharges are limited to seven of approximately 25 plants (nationally) with separate fly ash ponds. These data do not demonstrate a consistent pattern. That is, at certain plants the observed concentrations (or average concentrations) of some toxics are higher in the intake water than in the ash pond discharge while for other toxics the reverse is true. In other cases, effluent concentrations are higher than intake concentrations but the observed values are close to or at the detectable limit for the pollutant. The Agency's conclusion is that the present data base is not sufficient to support any reasonable estimation of net discharges of toxic pollutants for the industry from this waste source. This conclusion is based on the small numbers of observations and the large variation in the data.

C. Available technologies and techniques

1. *Dry fly ash transport.*—Currently 48 percent of the 352 coal-fired plants and 14 percent of the 429 oil-fired plants in the country use dry fly ash transport and disposal systems. Such systems of transport carry fly ash collected in precipitators to short-term storage vessels (silos) by vacuum or pressurized air. No water is used in the transport. The ash in the silos is trucked to landfill disposal sites.

A number of these facilities retrofitted their systems—that is, they replaced wet sluicing to ponds with the dry transport systems. This method of handling fly ash eliminates the discharge of all ash sluice water and thus eliminates priority pollutant discharge.

The motivation for retrofitting dry fly ash systems for these facilities may be the result of a water shortage in the area, state or local requirements, or a plant's desire to market the fly ash.

2. *Partial recirculation of fly ash sluice water.*—Currently 52 percent of coal fired plants and 10 percent of oil fired plants wet sluice their fly ash to a disposal pond. This method carries ash from the fly ash hoppers to a settling pond or basin using water as the transport medium. Most plants operate in a once-through mode since they do not pump any of the ash water back to be reused. Of the plants wet sluicing fly ash, 9 percent coal-fired plants partially recirculate the sluice water. The sluiced ash is commonly pumped to settling ponds and then flows to a clear pond where water is recirculated to the main sluice pumps. In partially recirculating systems, a portion of the clear pond overflow is discharged. Theoretically, partial recirculation reduces the flow of ash transport discharge and therefore the mass rate of discharge for priority pollutants; however, data to quantify the degree of toxic reduction are not available at the present time.

Essentially no major equipment need be removed in order to retrofit a partially recirculating system from a wet once-through system, other than the rerouting of old pipe. The addition of recirculation pumps to move the pond water, and a recirculation pond are required. The technology is in use today at some facilities and is available to all plants. The degree of water recycle/reuse practiced by existing facilities with recirculating systems varies. The Agency has not identified any plants with complete recirculation (no blowdown or point source discharge).

3. *Chemical precipitation.*—Another available technology option is chemical precipitation of the final discharge from the partially recycled ash sluice water.

Chemical precipitation, in particular lime precipitation, has been demonstrated over many years as an effective method of removing heavy metals from aqueous solutions. The Agency has data to quantify arsenic removal to 50 ppb although the removal of other inorganic priority pollutants was also studied. The Agency has demonstrated the effectiveness of lime precipitation for reducing levels of metals in fly ash pond effluents in bench scale tests.

The Agency's data base indicates that approximately 10 percent of the plants discharging fly ash sluice water will have high levels of dissolved arsenic (exceeding .05 mg/1).

d. *Proposed regulation*—1. *BAT.*—The Agency is not proposing any additional controls for fly ash transport water beyond those established by BPTat this time. This decision is the result of careful consideration of factors including costs, treatment technology availability, quantity of pollutants removed, and other factors. The ash ponds generally used to achieve BPT limits already produce substantial reductions in the amounts of toxic pollutants discharged from fly ash transport water.

EPA seriously considered proposing a no-discharge limitation for all plants larger than 200 MW based upon dry fly ash transport. While EPA found this option to be technologically feasible for these plants, EPA has concluded that the extremely high costs to the industry ($3.19 billion in capital costs for 1980–1985) could not be justified in view of the inconclusive nature of the available data regarding the degree of toxic pollutant reduction to be achieved beyond BPT. EPA does not feel that it would be responsible to impose such costly additional requirements in the face of such uncertainty. EPA's decision is not based upon consideration of water quality impacts. The decision is based solely on the inconclusive nature of the data regarding the degree of effluent reduction that would be achieved.

Another option to eliminate discharge is through complete recirculation of ash transport water. However, the information available to the Agency at this time is not sufficient to determine if this system is technically achievable.

The Agency rejected partial recirculation (with blowdown) because data are not available at this time to support a specific numerical effluent limitation for any toxic pollutant; nor can the Agency conclude at this time that any non-toxic pollutant parameter (such as TSS) could serve as an "indicator" for toxic control from partial recirculation. In addition, more stringent limitations for conventional pollutions based on partial recirculation are not imposed because the cost will not pass the cost reasonableness test for Best Conventional Technology.

Precipitation has been explored as a technology option for inorganic priority pollutant removal from ash pond overflows. Precipitation is rejected because the mean concentrations of most of the inorganic pollutants from the untreated ash ponds overflow are less than the treated levels through precipitation from other industrial plants, and thus no technology transfer can be made. The Agency conducted a pilot study and determined that precipitation can remove inorganic pollutants from ash pond overflows; but the data are not sufficient to specify the removal level achieveable at a full scale plant.

Precipitation is an option for treating arsenic at certain plants with high levels of arsenic. Existing data are available to specify a removal level for arsenic of 0.05 mg/l. This level is estimated to be exceeded by 10 percent of the coal-fired facilities. Although the precipitation technology option was not selected for proposal, it, together with the dry fly ash transport requirements will be seriously considered as an alternate BAT option in the future.

EPA has decided not to propose further control of fly ash transport water beyond BPT for existing sources at this time because the available data do no support the need for further control.[7] EPA is considering further sampling and industry profile studies, that would possibly allow the Agency to reassess its position. The Agency requests public comment on how such a program might best be structured.

2. *NSPS and PSNS.*—The proposed NSPS and PSNS prohibits all discharges of fly ash water. In light of the large number of plants already using dry fly ash systems, the technology is clearly demonstrated and available. Unlike BAT, the costs for a dry fly ash handling system are not appreciable different than costs for wet sluicing fly ash in a new plant. All new sources regardless of size are prohibited from discharging fly ash water. The Agency does not anticipate any of the new sources to discharge their fly ash transport water to POTWs.

3. *PSES.*—For PSES, EPA is proposing no additional control beyond existing PSES. This is equivalent to no control.

2. *Bottom ash transport water*—a. *Pollutants present.*—Similar pollutants were detected in bottom ash transport water and fly ash transport water (see Part IV(C)(1)), but the concentrations detected in bottom ash sluice water discharges were typically lower. Moreover, in comparision to the fly ash sampling data, the data on bottom ash water discharge displays a more consistent pattern of lower concentrations in the effluent than in the intake water.

At most plants sampled, the concentrations of priority inorganic pollutants detected in the bottom ash pond were less than the concentrations detected in the raw or intake water source. The bottom ash data are still somewhat inconclusive due to small sample size and large variability. The pollutants detected in bottom ash transport water are summarized in Table XIX of Section XI.

b. *Need to control toxics from this stream.*—The following priority inorganic pollutants were detected at least once in the EPA sampling data base: antimony, nickel, arsenic, lead, beryllium, chromium, copper, cadmium, mercury, selenium, and zinc. In most cases, however, the observed effluent concentrations of these pollutants are smaller than the intake water concentrations. Thus, the need to control toxic pollutants for this waste stream beyond BPT is not warranted on the basis of the sampling data now available to the Agency.

c. *Available technologies and techniques*—(i) *Dry transport.*—Approximately 70 plants currently transport their bottom ash using a dry system and report no discharge to the navigable waters. Dry transport of bottom ash entails the mechanical removal of the bottom ash from the bottom ash bin and mechanical transport (conveyor-type) to a temporary storage vessel. The ash from the temporary storage vessel is transported by truck to the permanent disposal site. No water is required in this transport system. Dry handling of bottom ash is typical of plants with stoker-fired boilers. These plants usually have small capacities, with relatively small amounts of bottom ash generated.

(ii) *Partial to complete recirculation.*—Many plants recirculate their bottom ash transport water with a blowdown stream to control the buildup of dissolved solids. A completely recirculating system returns all of the ash sluice water to the ash collecting hoppers for repeated use in sluicing. A recirculating system can be operated at partial recirculation, usually 12.5 or 25 times recycle, or operated with a complete recycle of bottom ash sluice water. The Agency has not identified any plants with complete recirculation except those in arid areas using evaporation ponds to eliminate final discharge.

(iii) *Precipitation.*—This is the same treatment method as discussed in part 3(c) of the fly ash section.

d. *Proposed regulation*—1. *BAT.*—No further control beyond BPT is proposed. The Agency has considered the above options and determined that in view of the waste characteristics and costs of control options, adequate control methods are imposed under BPT for this waste stream.

Dry transport of bottom ash for all plants is rejected because this technology is known to be adequate for handling only small amounts of bottom ash. The Agency does not believe that this technology is economically feasible and technically available on a national basis.

The Agency seriously considered the options of partial to complete recirculation of bottom ash sluice water. Although complete recirculation is concluded to be a technically feasible option, the high costs, and the fact that the data to quantify the affluent reduction beyond BPT are inadequate, are the two major reasons for not selecting this option. The Agency may gather additional information on this waste source (through the sampling program discussed in Part IV (c)(1) above), and the Agency's position may be reassessed upon review of the new information.

The Agency is proposing the withdrawal of the current BAT requirement of 12.5 recycle of bottom ash sluice water based on the removal of conventional pollutants because the "reasonableness" of this option using

[7] All available data are published as an appendix to the Steam Electric Development Document.

the cost tests for conventional pollutants in 40 CFR Part 405 (August 23, 1978) was assessed and for all plant sizes, the 12.5 recycle option did not pass the BCT test.

Precipitation is rejected because the effectiveness of this technology in bottom ash wastewater is uncertain. The mean concentrations of the inorganic priority pollutants are lower than the treated levels from other industries using this technology, and thus a technology transfer cannot be established. Bench scale studies applying this technology to ash pond effluents indicate effective removal of certain trace metals, but more studies are necessary to confirm these results.

2. *NSPS*.—For the same reasons that EPA is not proposing any requirements beyond BPT for existing sources, EPA is proposing to withdraw the current NSPS requirement of 20 times recycle and substitute the basic BPT requirement in its place. Unlike dry fly ash handling systems for new sources (which are no more costly than other fly ash handling systems) a recycle system for bottom ash is substantially more expensive than other bottom ash handling systems.

3. *PSES and PSNS*.—The proposed PSES and PSNS do not restrict the discharge of any pollutants from this wastewater source. The costs of controlling priority inorganic pollutants and the low levels of pollutants detected do not warrant the imposition of effluent standards for this waste stream at this time.

X. Pollutants Not Regulated

Under the Settlement Agreement, the Agency is generally required to establish BAT, NSPS, and pretreatment standards for each of the 129 toxic pollutants detected, unless a pollutant is present in a discharge solely because of its presence in intake waters. Paragraph 8 of the Settlement Agreement, however, permits the Agency to exclude a detected toxic pollutant from coverage on several grounds, among which are:

Ground 1—Sufficient protection is already provided by the Agency's guidelines and standards under the Act (¶8(a)(i));

Ground 2—The pollutant is detectable only in a small number of sources within the industrial category and is uniquely related to those sources (¶8(a)(iii));

Ground 3—The pollutant is present only in trace amounts and is neither causing nor likely to cause toxic effects (¶8(a)(iii)):

Ground 4—The pollutant is present in amounts too small to be effectively reduced by technologies known to the Agency (¶8(a)(iii)).

Paragraph 8(c) requires the Agency to prepare an affidavit for the parties involved in the Settlement Agreement stating the reasons for all paragraph 8 exclusions. This provision also requires the Agency to identify each exclusion, summarize the reasons for it, and solicit public comments in the Federal Register preamble announcing the proposed regulations. The Agency is therefore listing each exclusion below and summarizing the reason for them. The Agency hereby solicits comment on the proposed exclusions.

(a) Once-Through Cooling Water—Seven priority pollutants were detected in the cooling water discharge that were attributed to power plant operation.

Copper, nickel, zinc and chromium may be discharged from plants using those metals as alloys for piping or equipment. The average detected levels range from one to ten ppb. The Agency has determined to exclude these metals on Ground 4.

Bromoform, chloroform, and chlorodibromomethane are trihalomethanes that are believed to result from cooling water chlorination to control biofouling. These compounds were detected in very low concentrations. The plant with bromoform in the effluent has a marine/estuarine intake. Four of the 18 plants sampled used marine/estuarine water for cooling. Formation of bromoform, as well as other trihalomethanes, is strongly dependent on factors such as chlorine dosage, contact time, pH, temperature, and the presence of precursors in the intake water. These pollutants are excluded from regulation on Grounds 2 and 4. There are no demonstrated technologies economically available to remove these low levels of trihalomethanes at the levels detected and the flows that would require treatment.

(b) Cooling Tower Blowdown—Both organic and inorganic priority pollutants were detected in the cooling tower blowdown. Cooling towers decrease their volume of water primarily through evaporation. this evaporation increases concentration of pollutants in the remaining water, with the exception of possible volatile organics which may be stripped in the tower and some suspended metals which may settle in the cooling tower basin. Pollutants present in cooling tower blowdown as a result of plant operation include several organic and inorganic priority pollutants as listed in Table XIX. Specific limitations for these pollutants are excluded on Grounds 1 and 4.

(c) Fly Ash Transport Water—The waste characteristic data on this waste stream are limited. The observed concentrations of the detected pollutants are generally low and vary considerably from plant to plant. The Agency has made a preliminary deterimination that the pollutants in this waste stream from existing power plants are excluded from further control on Ground 1.

(d) Bottom Ash Transport Water—The Agency has determined that the presence of priority inorganic pollutants are the result of these pollutants leaching from the bottom ash. Most of the concentrations of these metals were below the proposed water quality criteria for industrial and municipal effluents. Thus, the Agency is not proposing any further control of these pollutants and is excluding these pollutants from further regulation on Grounds 1 and 3.

(e) Low Volume Wastewaters—As explained in part VII above, the Agency is proposing to add boiler blowdown wastes into this subcategory and remove air scrubber blowdown wastes. The Agency is not proposing further control of pollutants from this waste stream on Ground 4. The net pollutants detected at least once from this waste stream are listed in Table XIX. The inorganic pollutants are present at concentrations which are below the level of treatability (Ground 4) and in such small quantity that they will not cause toxic effects (Ground 3). The concentrations observed are representative of plants after compliance with BPT.

(f) Metal Cleaning Wastewaters—The Agency is not proposing further control of pollutants from this waste stream on Grounds 1 and 4. The Agency already requires precipitation technology under BPT.

(g) Coal Pile and Chemical Handling Area Runoff—The Agency has excluded further control (beyond BPT) of pollutants from this waste stream on Ground 1 in that sufficient protection is already provided by the Agency's guidelines and standards under the Act.

XI. Variances and Modifications

Upon the promulgation of final regulations, federal and state NPDES permits issued to direct dischargers must apply the numerical effluent limitations. Also on promulgation, the pretreatment limitations are enforced directly by the Agency against indirect dischargers.

In setting these national limitations, the Agency has considered data from various power plants in light of all of the relevant statutory factors contained in §§ 301 and 304 (i.e., non-water quality impact, age, size, etc.). The Agency has accordingly determined that the national limits proposed herein generally represent BAT, etc., for plants throughout the country. It is possible, however, that a specific plant might be so fundamentally different with respect to the plants the Agency studied such that the national limitations do not accurately reflect BAT, etc., within the meaning of the Act for that plant.

Accordingly, the Agency is proposing to allow individual plants (and/or other interested parties) to seek case-by-case variations from EPA's national limitations through a "fundamentally different factors (FDF)" variance clause. The Agency already has promulgated such a clause that applies to all other industrial categories. 40 CFR 125.30–32, 44 FR 32950, June 7, 1979, amended at 45 FR 33512, May 19, 1980. The Agency is hearby proposing to extend the same clause to the steam electric industry for BAT, PSES, and PSNS limits.

This proposed clause would not affect the BPT variance clause which EPA promulgated for the steam electric industry at 43 FR 44846, September 29, 1978. That clause continues to appear in the BPT regulations in the proposed regulatory section below. Nor would it apply to NSPS because of the Supreme Court ruling in *duPont* v. *Train*, 430 U.S. 112 (1977).

Those commenting on extending 40 CFR 125.30–32 to the steam electric industry for BAT and pretreatment purposes should consider the preamble discussion accompanying the promulgation of that clause. It appears at 44 FR 32893–94.

In addition to the FDF variance, BAT limitations *for non-toxic pollutants* (such as TRC) are subject to modifications under Sections 301(c) and 301(g). Under Section 301(1), these statutory modifications are not applicable to "toxic" pollutants. Likewise, limitations on conventional and nonconventional pollutants used as "indicators" for toxic pollutants are not subject to Section 301(c) or Section 301(g) modifications, unless the discharger demonstrates that a waste stream does not contain any of the toxic pollutants for which the "indicator" was designed to demonstrate removal.

Pretreatment standards for existing sources are also subject to the credits for pollutants removed by POTW's. See 40 CFR §§ 403.7, 403.13; 43 *FR* 27736 (June 26, 1978). Pretreatment standards for new sources are subject only to the credits provision in 40 CFR § 403.7.

XII. Non-Water Quality Aspects of Pollution Control

The elimination or reduction of one form of pollution may aggravate other environmental problems. Therefore, Sections 304(b) and 306 of the Act require the Agency to consider the non-water quality environmental impacts (including energy requirements) of certain regulations. In compliance with these provisions, the Agency has considered the effect of these regulations on air pollution, solid waste generation, water scarcity, and energy consumption. This proposal was circulated to and reviewed by Agency personnel responsible for non-water quality environmental programs. While it is difficult to balance pollution problems against each other and against energy use, the Agency is proposing regulations that it believes best serve often competing national goals.

The following are the non-water quality environmental impacts (including energy requirements) associated with the proposed regulations:

A. Air Pollution—Applications of NSPS using dry fly ash handling may cause a higher dust loading in certain localized areas unless a baghouse or other type of filter is placed on the vent from the silo. The cost of installing such a system is included in the economic analysis. Dry fly ash landfill sites must be watered down in arid climates to control dust emissions.

B. Solid Waste—No additional solids are expected from the proposed regulations.

C. Consumptive Water Loss—None of the requirements will cause significant evaporative water loss.

D. Energy Requirement—Energy requirement for the proposed regulations is restricted primarily to the pumping of dechlorination chemicals. These requirements are insignificant compared to the power generation.

XIII. Costs, Effluent Reduction Benefits, and Economic Impact

The Agency's economic impact assessment is set forth in *Economic Analysis of Proposed Effluent Limitations Guidelines, New Source Performance Standards and Pretreatment Standards for the Steam Electric Power Generating Point Source Category*, EPA August, 1980. This report details the investment and annualized costs for the steam electric power generating industry as a whole and for model plants covered by the proposed regulations. The data underlying the analysis were obtained from the Development Document.

On a national basis, the total capital expenditures required to bring existing plants into compliance with the proposed regulations for the period 1980–1985 equals $120 million. This represents 0.05 percent of the total anticipated capital expenditures for the industry during the same period. With the addition of operation and maintenance costs, this means that the average electric bill for consumers would increase approximately 0.04 percent. Additionally, the estimated capital expenditures for plants coming on line between 1985 to 1995 are $80 million.

Individual plants affected by the regulations may experience somewhat larger cost increases than the 0.04 percent. For example, the costs of generating electricity at an old 25 MW plant are expected to rise 3.5 percent, and at an old 100 MW plant, 1.3 percent.

A zero cost figure was attributed to fly ash handling systems at new plants because the system required by these regulations costs no more than alternative systems utilities may have installed in the absence of these regulations.

Finally, the proposed regulations will not place an economic burden on indirect dischargers. That is, the costs for complying with the alternative cooling tower chemical additives requirement is considered to be negligible. Furthermore, the Agency does not anticipate any of the new power plants to discharge their fly ash transport waters to POTWs.

The discrepancies between the percentage increase in costs on the national level and those on the plant level can be explained by the fact that the affected population of plants represents only a portion of the entire electric utility industry. That is, many utilities generate power from plants that are either not emcompassed in this rulemaking (e.g., hydroelectric plants) or that incur only small cost increases (e.g., large nuclear plants).

Although data are scarce, preliminary estimates indicate that the proposed regulations will result in the following reduction or elimination of pollutants by waste stream types:

(1) Once Through Cooling Water: 17.4 million pounds per year of total residual chlorine.

(2) Cooling Tower Blowdown:

(a) 30,000 lbs/yr of total residual chlorine;

(b) 157,000 lbs/yr of toxics (chromium, zinc, chlorinated phenolics, others).

XIV. Best Management Practices (BMP's)

Section 304(e) of the Clean Water Act authorizes the Administrator to prescribe "best management practices" ("BMP's). The Agency intends to develop BMP's that are: (1) applicable to all industrial sites; (2) applicable to a designated industrial category; and (3) offer guidance to permit authorities in establishing BMP's required by unique circumstances at a given plant.

Although BMP's are not being proposed at this time, the Agency may consider developing BMP's specific to the Steam Electric Industry in the future.

XV. Upset and Bypass Provisions

A recurring issue has been whether industry guidelines should include provisions authorizing noncompliance with effluent limitations during periods of "upset" or "bypass". An upset, sometimes called an "excursion," is unintentional noncompliance occurring for reasons beyond the reasonable control of the permittee. Upset provisions have been called necessary because such upsets may occur due to limitations even in properly operated control equipment. On the other hand, because technology-based limitations can require only what technology can achieve, it is claimed that liability for such situations is improper. When confronted with this issue, courts have been divided on the question of whether an explicit upset or excursion exemption is necessary, or whether upset or excursion incidents may be handled through the Agency's exercise of enforcement discretion. Compare *Marathon Oil Co.* v. *EPA*, 564 F.2d 1253 (9th Cir. 1977) with *Weyerhaeuser* v. *Costle, supra* and *Corn Refiners Association, et al.* v. *Costle*, No. 7801069 (8th Cir., April 2, 1979). See also *American Petroleum Institute* v. *EPA*, 540 F.2d 1023 (10th Cir. 1976); *CPC International, Inc.* v. *Train*, 540 F.2d 1320 (8th Cir. 1976); *MMC Corp.* v. *Train*, 539 F.2d 973 (4th Cir. 1976).

While an upset is an unintentional episode during which effluent limits are exceeded, a bypass is an act of intentional noncompliance to circumvent waste treatment facilities during emergency situations. Bypass provisions have been included in NPDES permits.

The Agency has decided to include both upset and bypass provisions in NPDES permits, and has promulgated NPDES regulations that include upset and bypass permit provisions. See 44 FR 32854, 32862–3 (June 7, 1979). The upset provision establishes an upset as an affirmative defense to prosecution for violation of technology-based effluent limitations. The bypass provision authorizes bypassing to prevent loss of life, personal injury, or severe property damage. Consequently, although permittees in the steam electric power generating industry will be entitled to upset and bypass provisions in NPDES permits, these proposed regulations do not address these issues.

XVI. Relationship to NPDES Permits

The BPT, BAT, and NSPS limitations in these regulations will be applied to individual steam electric plants through NPDES permits issued by EPA or approved state agencies under § 402 of the Act. A preceding section of this preamble discussed the binding effect of these regulations on NPDES permits, except where variances and modifications are expressly authorized. This section describes several other aspects of the interaction of these regulations and NPDES permits.

One subject that has received different judicial rulings is the scope of NPDES permit proceedings in the absence of effluent limitations guidelines and standards. Under current EPA regulations, states and EPA Regions issuing NPDES permits prior to promulgation of these regulations or July 1, 1981, whichever is sooner, must include a "re-opener clause", providing for permits to be modified to incorporate "toxics" regulations when they are promulgated. See 40 CFR 122.62(c), 45 FR 33449, May 19, 1980. To avoid cumbersome modification procedures, the Agency has adopted a policy of issuing short-term permits, with a view toward issuing long-term permits only after promulgation of these and other BAT regulations, or July 1, 1981, whichever is sooner. The Agency has published rules designed to encourage states to do the same. See 40 CFR 122.62(a), 45 FR 33452. In the event that the Agency or state finds it necessary to issue long-term permits prior to promulgation of BAT regulations, both EPA and state offices will follow essentially the same procedures used in many cases of initial permit issuance. The appropriate technology levels and limitations will be assessed by the permit issuer on a case-by-case basis on consideration of the statutory factors. See *U.S. Steel Corp.* v. *Train*, 556 F.2d 822, 844, 854 (7th Cir. 1977). In these situations, EPA documents and draft documents (including these proposed regulations and supporting documents) are relevant evidence, but not binding, in NPDES permit proceedings. See 44 32854, 32893 (June 7, 1979).

Another issue is the effect of these regulations on the powers of NPDES permit-issuing authorities. The promulgation of these regulations does not restrict the power of any permit-issuing authority to act in any manner that is consistent with law on these or any other EPA regulations, guidelines, or policy. For example, the fact that these regulations do not control a particular pollutant does not preclude the permit issuer from limiting such pollutant on a case-by-case basis, when necessary to carry out the purposes of the Act. In addition, to the extent that state water quality standards or other provisions of state or Federal law require limitation of pollutants not covered by these regulations (or require more stringent limitations on covered pollutants), such limitations *must* be applied by the permit-issuing authority.

One additional topic that warrants discussion is the operation of the Agency's NPDES enforcement program, many aspects of which have been considered in developing these regulations. The Agency wishes to emphasize that although the Clean Water Act is a strict liability statute, the initiation of enforcement proceedings by EPA is discretionary. The Agency has exercised and intends to exercise that discretion in a manner that recognizes and promotes good faith compliance efforts and conserves enforcement resources for those who fail to make good faith efforts to comply with the Act.

XVII. Summary of Public Participation

In September 1978, the Agency circulated a draft technical development document to a number of interested parties, including the Utility Water Act Group (UWAG), the Natural Resources Defense Council (NRDC), Regional EPA offices, and affected state and local authorities. This document did not include recommendations for specific effluent limitations and pretreatment standards. Instead it presented the technical basis for the proposed regulations. A brief summary of major written comments and EPA responses is presented below.

(1) Comment—A number of reviewers expressed concern about the limited amount of data available to the Agency for establishing BAT limitations, especially for toxic pollutants.

Response—The Agency recognizes that the data base for toxic pollutants is limited. This results from a history of infrequent monitoring or regulation, and the high costs and limited technical capabilities for toxic pollutant analyses. The limitations of the available data are a major reason for not proposing the zero discharge of ash transport water at this time. Further, the Agency is reserving regulations for flue gas desulfurization system discharges and ash pile, construction area, and chemical handling area runoff because of inadequate data. The Agency is considering conducting a sampling program to remedy this data deficiency.

(2) Comment—Two reviewers questioned the analytical data establishing effluent concentrations in

wastewater streams on the basis that the precision of the Agency's analytical methods have not been proven in interlaboratory testing.

Response—The Agency has established a protocol for securing and analyzing samples. This protocol is based on the best analytical methods available at the time the program began. The Draft Development Document includes further discussion of EPA's analytical methods.

(3) Comment—One reviewer was concerned that characterization of the industry was inadequate due to improper use or interpretation of "308" data, particularly in identifying the elimination of ash transporting waters.

Response—The data from the 1976 "308" questionnaires have been used only as a screening tool, not as a means of defining specific technologies or specific practices. In cases where existing plants are used to define the extent of usage of a given technology, the Agency has used only information confirmed by direct contact with plant or company personnel.

(4) Comment—Two reviewers noted that in many cases individual wastewater discharges from some power plants do not contain significant concentrations of the regulated pollutants. The new regulations should exclude such wastewaters from monitoring.

Response—Monitoring requirements are established by individual permit writers, who can impose more or less stringent monitoring requirements depending upon their evaluation of the situation. Relaxation of monitoring requirements must be obtained on a case-by-case basis through the permit water.

(5) Comment—Two reviewers noted that the development document does not address the use of refuse or biomass as fuel. These reviewers expressed the opinion that such fuels should be considered in terms of their impact on water quality.

Response—The fuel categories for the steam electric industry as provided in 40 CFR 423.10 are defined as fossil-type fuel gas, oil, and coal or nuclear fuel. Refuse and biomass as fuel sources are not included in this definition; in addition, the use of these fuel types is not a major factor affecting power generation at present. If or when such fuels do become prevalent, the Agency may consider them for wastewater quality impact and may accordingly amend its regulations.

(6) Comment—One reviewer noted that the section on cost, energy, and non-water quality aspects does not include additional disposal requirements made necessary by regulations under the Resource Conservation and Recovery Act (RCRA). The reviewer felt that these factors should be included.

Response—As noted above, no additional solids are anticipated from the proposed regulation.

(7) Comment—One reviewer noted that there are several steam plants in the country with the same basic equipment and wastewaters as steam electric plants. These plants supply steam for heating as opposed to electricity. The reviewer expressed the opinion that these plants should be included in the regulations.

Response—EPA has defined the industrial coverage for each industry in previous rulemakings. This regulation covers steam electric plants and does not apply to plants which produce steam for use outside the plant boundaries.

XVIII. Solicitation of Comments

The Agency invites and encourages public participation in this rulemaking. The Agency asks that any claimed deficiencies in the record of this proposal be addressed specifically and supported by data.

The Agency particularly requests additional comments and data on the following issues:

(1) The Agency solicits comments on all aspects of the sampling data base, specifically as they are applied in determining the presence and magnitude of toxic pollutants from power plant effluents. The Agency invites power companies to submit their own data which may be relevant to the proposed regulations.

(2) In order to compare the Agency's cost data with the industry's cost data, EPA is requesting detailed information on salient design and operating characteristics; actual installed cost (not estimates of replacement costs) for each unit treatment operation or piece of equipment; the date of installation and the amount of installation labor provided by plant personnel; and the actual cost of operation and maintenance, broken down into units of usage and cost for energy (kilowatt hours or equivalent), chemicals, and labor (work-years or equivalent).

(3) The Agency is requesting that POTWs receiving wastewaters from steam electric plants submit data documenting the occurrence of interference with collection system and treatment plant operations; permit violations; sludge disposal difficulties; or other incidents attributable to the pollutants contained in POTW influent.

(4) Some parties are concerned that operating problems associated with the proposed technology options may hinder compliance with regulations, particularly dry fly ash transport systems. The Agency is soliciting data supporting this claim. Of particular interest is information from plants that have retrofitted this dry fly ash transport system. For those plants that failed to achieve this end, the specific reasons for such failure and the data supporting these conclusions are solicited.

(5) The Agency is soliciting information on the net discharge of priority pollutants from the following waste streams for steam electric plants:

(a) fly ash pond discharge;
(b) recirculating cooling water;
(c) once-through cooling water;
(d) bottom ash sluice water discharge;
(e) coal pile and chemical storage runoff;
(f) low volume wastes; and
(g) flue gas desulfurization.

(6) One of the technology options considered was partial to complete recirculation of ash transport water. Data available to the Agency at this time indicate that the concentration of toxic materials does not increase significantly with recirculation. The Agency is soliciting all available data on the effect of recirculation of fly ash and bottom ash wastewater on the discharge of priority inorganic pollutants, in particular the heavy metals.

(7) The Agency is considering additional sampling and industry profile development to attempt to clarify the uncertainty regarding quantities of toxic pollutants in fly ash and bottom ash effluent and intake water. The Agency is soliciting information in these areas and comments on the usefulness and extent of such an effort. In particular the following issues are under consideration and the Agency would benefit from comments on these points:

(a) Should both fly ash and bottom ash be included?

(b) How many plants should be sampled and what are the selection criteria?

(c) How many samples should be taken?

(d) What pollutants would be analyzed for and which analytical methods should be used?

Dated: October 3, 1980.

Douglas M. Costle,
Administrator.

Appendix A—

Abbreviations, Acronyms, and other Terms Used in this Notice

Act—The Clean Water Act.

Agency—The U.S. Environmental Protection Agency.

BAT—The best available technology economically achievable, applicable to effluent limitations to be achieved by July 1, 1984, for industrial discharges to surface waters, as defined by Section 304(b)(2)(B) of the Act.

BCT—The best conventional pollutant control technology, applicable to discharges of conventional pollutants from existing industrial point sources, as defined by Section 304(b)(4) of the Act.

BMP—Best management practices, as defined by Section 304(e) of the Act.

BPT—The best practicable control technology currently available, applicable to effluent limitations to be achieved by July 1, 1977, for industrial discharges to surface waters, as defined by Section 304(b)(1) of the Act.

Classical pollutants—A general term used to refer to the pollutants of primary concern before the "conventional, nonconventional, and toxic pollutant" designations set forth in the Act as amended.

Clean Water Act—The Federal Water Pollution Control Act Amendments of 1972 (33 U.S.C. 1251 et seq.), as amended by the Clean Water Act of 1977 (Pub. L. 95-217).

Conventional pollutants—Constituents of wastewater as determined by Section 304(a)(4) of the Act, including, but not limited to, pollutants classified as biological oxygen demand, suspended solids, oil and grease, fecal coliform, and pH.

Development Document—Development Document for Proposed Effluent Limitations Guidelines, New Source Performance Standards, and Pretreatment Standards for the Textile Mills Point Source Category, prepared by the Effluent Guidelines Division of EPA.

Direct discharger—An industrial discharger that introduces wastewater to a receiving body of water or land, with or without treatment by the discharger.

Economic analysis—Economic Impact Analysis of Proposed Effluent Limitations Guidelines, New Source Performance Standards, and Pretreatement Standards for the Textile Mills Point Source Category, prepared by the Office of Analysis and Evaluation of EPA.

Effluent limitation—A maximum amount per unit of production (or other unit) of each specific constituent of the effluent that is subject to limitation from an existing point source.

Federal Water Pollution Control Act Amendments of 1972—Public Law 92-500, which provides the legal authority for current EPA water pollution abatement projects, regulations, and policies. The Federal Water Pollution Control Act was amended further in 1977 in legislation referred to as the Clean Water Act.

Indicator pollutants—A group of pollutants, including, but not limited to, BOD5, COD, and TSS, which can serve as a basis for limitations on toxic pollutants, which in themselves are very difficult to monitor and expensive to analyze.

Indirect discharger—An industrial discharger that introduces wastewater to a publicly-owned collection system.

In-plant control technologies—Controls or measures applied within the manufacturing process to reduce or eliminate pollutant and hydraulic loadings of raw wastewater. Typical in-plant control measures include chemical substitution, material reclamation, water reuse, water reduction, and process changes.

Internal subcategorization—Divisions within a subcategory to group facilities that, while producing related products from similar raw materials, have differing raw waste characteristics due to the complexity of manufacturing processes employed.

New source—Industrial facilities from which there is, or may be, a discharge of pollutants, and whose construction is begun after the publication of the proposed regulations.

Nonconventional pollutants—Parameters selected for use in developing effluent limitation guidelines and new source performance standards which have not been previously designated as either conventional pollutants or toxic pollutants.

Non-Water environmental quality impact—Deleterious aspects of control and treatment technologies applicable to point source category wastes, including, but not limited to, air pollution, noise, radiation, sludge and solid waste generation, and energy usage.

NPDES—National Pollutant Discharge Elimination System, a Federal program requiring industry and municipalities to obtain permits to discharge plant effluents to the nation's water courses, under Section 402 of the Act.

NSPS—New source performance standards, applicable to industrial facilities whose construciton is begun after the publication of the proposed regulations, as defined by Section 306 of the Act.

Performance standards—A maximum weight discharged per unit of production for each constituent that is subject to limitations. Performance standards are applicable to new sources, as opposed to existing sources, which are subject to effluent limitations.

Point source category—A collection of industrial sources with similar function or product, established by Section 306(b)(1)(A) of the Federal Water Pollution Control Act, as amended for the purpose of establishing Federal standards for the disposal of wastewater.

Pollutant loading—Ratio of the total daily mass discharge of a particular pollutant to the total daily wet production of a mill expressed in terms of (kg pollutant)/(kkg wet production).

POTW—Publicly owned treatment works, facilities that collect, treat, or otherwise dispose of wastewaters, owned and operated by a village, town, county, authority, or other public agency.

Pretreatment standard—Industrial wastewater effluent quality required for discharge to a publicly-owned treatment works.

PSES—Pretreatment standards for existing sources of indirect discharges, under Section 307(b) of the Act.

PSNS—Pretreatment standards for new sources of indirect discharges, under Section 307 (b) and (c) of the Act.

RCRA—Resource Conservation and Recovery Act (PL 94-580) of 1976, Amendments to Solid Waste Disposal Act.

Revised Settlement Agreement—A rewritten form of the Settlement Agreement which described provisions authorizing the exclusion from regulation, in certain instances, of toxic pollutants and industry subcategories.

Settlement Agreement—Agreement entered into by EPA with the Natural Resources Defense Council and other environmental groups and approved by the U.S. District Court for the District of Columbia on June 7, 1976. One of the principal provisions of the Settlement Agreement was to direct EPA to consider an extended list of 65 classes of pollutants in 21 industrial categories, including Textile Mills, in the development of effluent limitations guidelines and new source performance standards.

SIC—Standard Industrial Classification, a numerical categorization scheme used by the U.S. Department of Commerce to denote segments of industry.

Toxic pollutants—All compounds specifically named or referred to in the Settlement Agreement, as well as recommended specific compounds representative of the nonspecific or ambiguous groups or compounds named in the agreement. This list of pollutants was developed based on the use of criteria such as known occurrence in point source effluents, in the aquatic environment, in fish, in drinking water, and through evaluations of carcinogenicity, other chronic toxicity, bioaccumulation, and persistence.

Water use—Ratio of the spent water from a manufacturing operation to the total wet production by the mill, expressed in terms of (liters of wastewater/day)/(Kilogram of wet production/day).

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Table XI - X

PRIORITY POLLUTANTS DETECTED IN THE SAMPLING PROGRAM BY WASTE STREAM SOURCES

Priority Pollutant	Waste Stream Source						
	Once Through Cooling Water	Cooling Tower Blowdown	Combined Ash Sluice Water	Bottom Ash Sluice Water	Fly Ash Sluice Water	Low Volume Waste	Coal Pile Runoff *
Acenaphthene	O	O	O	O	O	O	O
Acrolein	O	O	O	O	O	O	O
Acrylonitrile	O	O	O	O	O	O	O
Benzene	X	X	X	O	O	X	O
Benzidene	O	O	O	O	O	O	O
Carbon Tetrachloride	O	O	O	O	O	O	O
Chlorobenzene	O	O	O	O	O	X	O
1,2,4-Trichlorobenzene	O	O	O	O	O	O	O
Hexachlorobenzene	O	O	O	O	O	O	O
1,2-Dichloroethane	O	O	O	O	O	X	O
1,1,1-Trichloroethane	X	O	O	O	X	X	O
Hexachloroethane	O	O	O	O	O	O	O
1,1-Dichloroethane	O	O	O	O	O	O	O
1,1,2-Trichloroethane	O	O	O	O	O	X	O
1,1,2,2-Tetrachloroethane	O	O	O	O	O	O	O
Chloroethane	O	O	O	O	O	O	O
Bis(Chloromethyl) Ether	O	O	O	O	O	O	O
Bis(2-Chloroethyl) Ether	O	O	O	O	O	O	O
2-Chloroethyl Vinyl Ether (Mixed)	O	O	O	O	O	O	O
2-Chloronaphthalene	X	O	O	O	O	O	O
2,4,6-Trichlorophenol	O	O	O	O	O	O	O
Parachlorometa Cresol	O	O	O	O	O	O	O
Chloroform	X	X	X	O	O	X	O
2-Chlorophenol	O	O	O	O	O	X	O
1,2-Dichlorobenzene	X	O	O	O	O	X	O
1,3-Dichlorobenzene	O	O	O	O	O	O	O

Table XI-X (Continued)

PRIORITY POLLUTANTS DETECTED IN THE SAMPLING PROGRAM BY WASTE STREAM SOURCES

Priority Pollutant	Waste Stream Source						
	Once Through Cooling Water	Cooling Tower Blowdown	Combined Ash Sluice Water	Bottom Ash Sluice Water	Fly Ash Sluice Water	Low Volume Waste	Coal Pile Runoff *
1,4-Dichlorobenzene	O	O	X	O	O	X	O
3,3-Dichlorobenzidine	O	O	O	O	O	O	O
1,1-Dichloroethylene	X	X	X	O	O	O	O
1,2-Trans-Dichloroethylene	O	O	O	O	O	X	O
2,4-Dichlorophenol	X	X	O	O	O	X	O
1,2-Dichloropropane	O	O	O	O	O	O	O
1,3-Dichloropropene	O	O	O	O	O	O	O
2,4-Dimethylphenol	O	O	O	O	O	O	O
2,4-Dinitrotoluene	O	O	O	O	O	O	O
2,6-Dinitrotoluene	O	O	O	O	O	O	O
1,2-Diphenylhydrazine	O	O	O	O	O	O	O
Ethylbenzene	X	O	X	O	O	X	O
Fluoranthene	O	O	O	O	O	O	O
4-Chlorophenyl Phenyl Ether	O	O	O	O	O	O	O
4-Bromophenyl Phenyl Ether	O	O	O	O	O	O	O
Bis(2-Chloroisopropyl) Ether	O	O	O	O	O	O	O
Bis(2-Chloroethoxy) Methane	O	O	O	O	O	O	O
Methylene Chloride	X	O	X	O	X	X	O
Methyl Chloride	O	O	O	O	O	O	O
Methyl Bromide	O	O	O	O	O	O	O
Bromoform	X	O	O	O	O	X	O
Dichlorobromomethane	O	O	O	O	O	X	O
Trichlorofluoromethane	O	X	X	O	O	O	O
Dichlorodifluoromethane	O	O	O	O	O	O	O
Chlorodibromomethane	X	O	O	O	O	X	O
Hexachlorobutadiene	O	O	O	O	O	O	O

Table XI -X (Continued)

PRIORITY POLLUTANTS DETECTED IN THE SAMPLING PROGRAM BY WASTE STREAM SOURCES

Priority Pollutant	Waste Stream Source						
	Once Through Cooling Water	Cooling Tower Blowdown	Combined Ash Sluice Water	Bottom Ash Sluice Water	Fly Ash Sluice Water	Low Volume Waste	Coal Pile Runoff *
Hexachlorocyclopentadiene	0	0	0	0	0	0	0
Isophorone	0	0	0	0	0	0	0
Naphthalene	0	0	0	0	0	0	0
Nitrobenzene	0	0	0	0	0	X	0
2-Nitrophenol	0	0	0	0	0	0	0
4-Nitrophenol	0	0	0	0	0	0	0
2,4-Dinitrophenol	0	0	0	0	0	0	0
4,6-Dinitro-O-Cresol	0	0	0	0	0	0	0
N-Nitrosodimethylamine	0	0	0	0	0	0	0
N-Nitrosodiphenylamine	0	0	0	0	0	0	0
N-Nitrosodi-N-Propylamine	0	0	0	0	0	0	0
Pentachlorophenol	X	0	0	0	0	0	0
Phenol	X	X	X	X	X	X	0
Bis(2-Ethylhexyl) Phthalate	X	X	X	0	X	0	0
Butyl Benzyl Phthalate	X	0	0	0	0	X	0
Di-N-Butyl Phthalate	X	0	0	0	X	0	0
Di-N-Octyl Phthalate	0	0	0	0	0	X	0
Diethyl Phthalate	X	0	0	0	0	0	0
Dimethyl Phthalate	0	0	X	0	0	0	0
Benzo(A)Anthracene	0	0	0	0	0	0	0
Benzo(A)Pyrene	0	0	0	0	0	0	0
Benzo(B)Fluoranthene	0	0	0	0	0	0	0
Benzo(K)Fluoranthene	0	0	0	0	0	0	0
Chrysene	0	0	0	0	0	0	0
Acenaphthylene	0	0	0	0	0	0	0
Anthracene	0	0	0	0	0	0	0
Benzo(G,H,I)Perylene	0	0	0	0	0	0	0

Table XI - X (Continued)

PRIORITY POLLUTANTS DETECTED IN THE SAMPLING PROGRAM BY WASTE STREAM SOURCES

Priority Pollutant	Waste Stream Source						
	Once Through Cooling Water	Cooling Tower Blowdown	Combined Ash Sluice Water	Bottom Ash Sluice Water	Fly Ash Sluice Water	Low Volume Waste	Coal Pile Runoff *
Fluorene	0	0	0	0	0	0	0
Phenanthrene	0	0	0	0	0	0	0
Dibenzo(A,H)Anthracene	0	0	0	0	0	0	0
Indeno(1,2,3,-C,D)Pyrene	0	0	0	0	0	0	0
Pyrene	0	0	0	0	0	0	0
Tetrachloroethylene	X	X	X	0	0	X	0
Toluene	X	X	X	0	0	X	0
Trichloroethylene	X	0	0	0	0	X	0
Vinyl Chloride	0	0	0	0	0	0	0
Aldrin	0	0	0	0	0	0	0
Dieldrin	0	0	0	0	0	0	0
Chlordane	0	0	0	0	0	0	0
4,4-DDT	0	0	0	0	0	0	0
4,4-DDE	0	0	0	0	0	0	0
4,4-DDD	0	0	X	0	0	X	0
Endosulfan-Alpha	0	0	0	0	0	0	0
Endosulfan-Beta	0	0	0	0	0	0	0
Endosulfan Sulfate	0	0	0	0	0	0	0
Endrin	0	0	0	0	0	0	0
Endrin Aldehyde	0	0	0	0	0	0	0
Heptachlor	0	0	0	0	0	0	0
Heptachlor Epoxide	0	0	0	0	0	0	0
BHC-Alpha	0	0	0	0	0	0	0
BHC-Beta	0	0	0	0	0	0	0
BHC(Lindane)-Gama	0	0	0	0	0	0	0
BHC-Delta	0	0	0	0	0	0	0
PCB-1242 (Arochlor 1242)	0	0	0	0	0	0	0
PCB-1254 (Arochlor 1254)	0	0	0	0	0	0	0

Table XI -X (Continued)

PRIORITY POLLUTANTS DETECTED IN THE SAMPLING PROGRAM BY WASTE STREAM SOURCES

Priority Pollutant	Waste Stream Source						
	Once Through Cooling Water	Cooling Tower Blowdown	Combined Ash Sluice Water	Bottom Ash Sluice Water	Fly Ash Sluice Water	Low Volume Waste	Coal Pile Runoff *
PCB-1221 (Arochlor 1221)	O	O	O	O	O	O	O
PCB-1232 (Arochlor 1232)	O	O	O	O	O	O	O
PCB-1248 (Arochlor 1248)	O	O	O	O	O	O	O
PCB-1260 (Arochlor 1260)	O	O	O	O	O	O	O
PCB-1016 (Arochlor 1016)	O	O	O	O	O	O	O
Toxaphene	O	O	O	O	O	O	O
Antimony (Total)	X	X	X	X	X	X	O
Arsenic (Total)	X	X	X	X	X	X	O
Asbestos(Total-Fibers/Liter)	O	X	O	O	O	O	O
Beryllium (Total)	O	X	X	X	X	O	X
Cadmium (Total)	X	X	X	X	X	X	X
Chromium (Total)	X	X	X	X	X	X	X
Copper (Total)	X	X	X	X	X	X	X
Cyanide (Total)	O	X	X	O	O	X	O
Lead (Total)	X	X	X	X	X	X	X
Mercury (Total)	X	X	X	X	X	X	O
Nickel (Total)	X	X	X	X	X	X	X
Selenium (Total)	X	X	X	X	X	X	O
Silver (Total)	X	X	X	O	O	X	O
Thallium (Total)	X	X	X	O	X	X	O
Zinc (Total)	X	X	X	X	X	X	X
2,3,7,8-Tetrachlorodibenzo-P-Dioxin	O	O	O	O	O	O	O

Note:
X = Present in greater concentration in the effluent than in the influent at least once.
O = Never present in greater concentration in the effluent than in the influent.
* = Since coal pile runoff has no influent stream (except rainfall), this column reflects whether or not the pollutant was ever detected in the coal pile effluent stream.

BILLING CODE 6560-29-C

1. It is hereby proposed to revise Part 423 of Title 40 in its entirety to read as follows:

PART 423—STEAM ELECTRIC POWER GENERATING POINT SOURCE CATEGORY

Authority: Sections 301; 304 (b), (c), (e), and (g); 306 (b) and (c); 307 (b) and (c); and 501 of the Clean Water Act (the Federal Water Pollution Control Act Amendments of 1972, as amended by the Clean Water Act of 1977) (the "Act"; 33 United States c. 1311; 1314 (b), (c), (e), and (g); 1316 (b) and (c); 1317 (b) and (c); and 1361; 86 Stat. 816, Pub. L. 92-500; 91 Stat. 1567, Pub. L. 95-217).

§ 423.10 Applicability.

The provisions of this part are applicable to discharges resulting from the operation of a generating unit by an establishment primarily engaged in the generation of electricity for distribution and sale which results primarily from a process utilizing fossil-type fuel (coal, oil, or gas) or nuclear fuel in conjunction with a thermal cycle employing the steamwater system as the thermodynamic medium.

§ 423.11 General definitions.

In addition to the definitions set forth in 40 CFR 401, the following definitions apply to this part:

(a) The term "total residual chlorine" (or total residual oxidants for intake water with bromides) means the value obtained using the amperometric method for total residual chlorine described in "Standard Methods for the Examination of Water and Waste Water," p. 112 (13th edition).

(b) The term "low volume waste sources" means, taken collectively as if from one source, wastewater from all sources except those for which specific limitations are otherwise established in this part. Low volume wastes sources include, but are not limited to: wastewaters from wet scrubber air pollution control systems, ion exchange water treatment system, water treatment evaporator blowdown, laboratory and sampling streams, boiler blowdown, floor drains, cooling tower basin cleaning wastes, and recirculating house service water systems, and (for BPT only) non-chemical metal cleaning waste. Sanitary and air conditioning wastes are not included.

(c) The term "chemical metal cleaning waste" means any wastewater resulting from the cleaning of any metal process equipment with chemical compounds, including, but not limited to, boiler tube cleaning.

(d) The term "metal cleaning waste" means any wastewater resulting from cleaning of (with or without chemical cleaning compounds) any metal process equipment including, but not limited to, boiler tube cleaning, boiler fireside cleaning, and air preheater cleaning.

(e) The term "fly ash" means the ash that is carried out of the furnace by the gas stream and collected by mechanical precipitators, electrostatic precipitators, and/or fabric filters.

(f) The term "bottom ash" means the ash that drops out of the furnace gas stream in the furnace and in the economizer sections.

(g) The term "once through cooling water" means water passed through the main cooling condensers in one or two passes for the purpose of removing waste heat.

(h) The term "recirculated cooling water" means water which is passed through the main condensers for the purpose of removing waste heat, passed through a cooling device for the purpose of removing such heat from the water and then passed again, except for blowdown, through the main condenser.

(i) The term "10 year, 24/hour rainfall event" means a rainfall event with a probable recurrence interval of once in ten years as defined by the National Weather Service in Technical Paper No. 40. "Rainfall Frequency Atlas of the United States," May 1961, and subsequent amendments, or equivalent regional or State rainfall probability information developed therefrom.

(j) The term "blowdown" means the minimum discharge of recirculating water for the purpose of discharging materials contained in the water, the further buildup of which would cause concentration in amounts exceeding limits established by best engineering practices.

(k) The term "average concentration" as it relates to chlorine discharge means the average of analyses made over a single period of chlorine release which may not exceed two hours per discharge point.

(l) The term "free available chlorine" shall mean the value obtained using the amperometric titration method for free available chlorine described in "Standard Methods for the Examination of Water and Wastewater," page 112 (13th edition).

§ 423.12 Effluent limitations guidelines representing the degree of effluent reduction attainable by the application of the best practicable control technology currently available (BPT).

(a) In establishing the limitations set forth in this seciton, EPA took into account all information it was able to collect, develop and solicit with respect to factors (such as age and size of plant, utilization of facilities, raw materials, manufacturing processes, non-water quality environmental impacts, control and treatment technology available, energy requirements and costs) which can affect the industry subcategorization and effluent levels established. It is, however, possible that data which would affect these limitations have not been available and, as a result, these limitations should be adjusted for certain plants in this industry. An individual discharger or other interested person may submit evidence to the Regional Administrator (or to the State, if the State has the authority to issue NPDES permits) that factors relating to the equipment or facilities involved, the process applied, or other such factors related to such discharger are fundamentally different from the factors considered in the establishment of the guidelines. On the basis of such evidence or other available information, the Regional Administrator (or the State) will make a written finding that such factors are or are not fundamentally different for that facility compared to those specified in the Development Document. If such fundamentally different factors are found to exist, the Regional Administrator or the State shall establish for the discharger effluent limitations in the NPDES permit either more or less stringent than the limitations established herein, to the extent dictated by such fundamentally different factors. Such limitations must be approved by the Administrator of the Environmental Protection Agency. The Administrator may approve or disapprove such limitations, specify other limitations, or initiate proceedings to revise these regulations. In accordance with the decision in *Appalachian Power Co.* v. *Train,* 545 F.2d 1351, 1358–60 (4th Cir. 1976). EPA's legal interpretation appearing at 39 FR 30073 (1974) shall not apply to this paragraph. The phrase "other such factors" appearing above may include significant cost differentials and the factors listed in section 301(c) of the Act. In no event may a discharger's impact on receiving water quality be considered as a factor under this paragraph.

(b) The following limitations establish the quantity or quality of pollutants or pollutant properties, controlled by this section, which may be discharged by a point source subject to the provisions of this subpart after application of the best practicable control technology currently available (BPT):

(1) The pH of all discharges, except once through cooling water, shall be within the range of 6.0–9.0.

(2) There shall be no discharge of polychlorinated biphenyl compounds such as those commonly used for transformer fluid.

(3) The quantity of pollutants discharged from low volume waste sources shall not exceed the quantity determined by multiplying the flow of low volume waste sources times the concentration listed in the following table:

[Milligrams per liter]

Pollutant or pollutant property	BPT effluent limitations	
	Maximum for any 1 day	Average of daily values for 30 consecutive days shall not exceed—
TSS	100.0	30.0
Oil and grease	20.0	15.0

(4) The quantity of pollutants discharged in fly ash and bottom ash transport water shall not exceed the quantity determined by multiplying the flow of fly ash and bottom ash transport water times the concentration listed in the following table:

[Milligrams per liter]

Pollutant or pollutant property	BPT effluent limitations	
	Maximum for any 1 day	Average of daily values for 30 consecutive days shall not exceed—
TSS	100.0	30.0
Oil and grease	20.0	15.0

(5) The quantity of pollutants discharged in chemical metal cleaning wastes shall not exceed the quantity determined by multiplying the flow of chemical metal cleaning wastes times the concentration listed in the following table:

[Milligrams per liter]

Pollutant or pollutant property	BPT effluent limitations	
	Maximum for any 1 day	Average of daily values for 30 consecutive days shall not exceed—
TSS	100.0	30.0
Oil and grease	20.0	15.0
Copper, total	1..0	1.0
Iron, total	1:0	1.0

(6) The quantity of pollutants discharged in once through cooling water shall not exceed the quantity determined by multiplying the flow of once through cooling water sources times the concentration listed in the following table:

Pollutant of pollutant property	BPT effluent limitations	
	Maximum concentration	Average concentration
Free available chlorine	0.5 mg/l	0.2 mg/1

(7) The quantity of pollutants discharged in cooling tower blowdown shall not exceed the quantity determined by multiplying the flow of cooling tower blowdown sources times the concentration listed in the following table:

Pollutant of pollutant property	BPT effluent limitations	
	Maximum concentration	Average concentration
Free available chlorine	0.5 mg/l	0.2 mg/1

(8) Neither free available chlorine nor total residual chlorine may be discharged from any unit for more than two hours in any one day and not more than one unit in any plant may discharge free available or total residual chlorine at any one time unless the utility can demonstrate to the regional administrator or State, if the State has NPDES permit issuing authority, that the units in a particular location cannot operate at or below this level of chlorination.

(9) Subject to the provisions of paragraph (10) of this section, the following effluent limitations shall apply to the point source discharges of coal pile runoff:

Pollutant of pollutant property	BPT effluent limitations
	Maximum concentration for any time
TSS	50 (mg/l)

(10) Any untreated overflow from facilities designed, constructed, and operated to treat the volume of coal pile runoff which results from a 10 year, 24 hour rainfall event shall not be subject to the limitations in paragraph (9) of this section.

(11) In the event that waste streams from various sources are combined for treatment or discharge, the quantity of each pollutant or pollutant property controlled in paragraphs (b)(1) through (b)(10) of this section attributable to each controlled waste source shall not exceed the specified limitations for that waste source.

§ 423.13 Effluent limitations guidelines representing the degree of effluent reduction attainable by the application of the best available technology ecnomically achievable (BAT).

Except as provided in 40 CFR §§ 125.30–.32, any existing point source subject to this part must achieve the following effluent limitations:

(a) There shall be no discharge of polychlorinated biphenyl compounds such as those commonly used for transformer fluid.

(b) There shall be no discharge of total residual chlorine (or total residual oxidants) from once through cooling water.

(c) Nothwithstanding 423.13(b), a facility may, upon showing the Regional Administrator (or the State if the State has the NPDES program) that the facility must use chlorine for condenser biofouling control, discharge the minimum amount of total residual chlorine necessary to operate the facility. Such a showing must be made in accordance with Appendix A.

(d) Upon a successful showing under 423.13(c), the discharge of total residual chlorine is permitted under the following conditions:

(1) The quantity of pollutants discharged in once through cooling water from each discharge point shall not exceed the quantity determined by

multiplying the flow of once through cooling water from each discharge point times the concentration listed in the following table:

Pollutant of pollutant property	BAT effluent limitations
	Maximum concentration for any time
Total residual chlorine	0.14 mg/l

(2) Total residual chlorine may not be discharged from each once through cooling water point source for more than two hours per day unless it is required for crustacean control. Multi-unit chlorination is permitted.

(e) The quantity of pollutants discharged in cooling tower blowdown shall not exceed the quantity determined by multiplying the flow of cooling tower blowdown times the concentration listed below:

Pollutant of pollutant property	BAT effluent limitations
	Maximum concentration for any time
Total residual chlorine	0.14 mg/l

(f) There shall be no discharge of cooling tower maintenance chemicals which contain the 129 priority pollutants (Appendix B).

(g) The quantity of pollutants discharged in metal cleaning wastes shall not exceed the quantity determined by multiplying the flow of metal cleaning wastes times the concentration listed in the following table:

Pollutant of pollutant property	BAT effluent limitations
	Maximum concentration for any time
Copper	1.0 mg/l
Iron	1.0 mg/l

(h) In the event that waste streams from various sources are combined for treatment or dicharge, the quantity of each pollutant or pollutant property controlled in paragraphs (a) through (g) of this section attributable to each controlled waste source shall not exceed the specified limitation for that waste source.

§ 423.14 Effluent limitations guidelines representing the degree of effluent reduction attainable by the application of the best conventional pollutant control technology (BCT).

Except as provided in 40 CFR 125.30–125.32, any existing point source subject to this subpart must achieve the following effluent limitations representing the degree of effluent reduction attainable by the application of the best conventional pollutant control technology (BCT):

(a) The limitations for coal pile runoff are the same as those specified in §§ 423.12(b) (9) and (10).

(b) The quantity of pollutants discharged from low volume waste sources shall not exceed the quantity determined by multiplying the flow of low volume waste sources times the concentration listed in the following table:

[Milligrams per liter]

Pollutant or pollutant property	BCT effluent limitations	
	Maximum for any 1 day	Average of daily values for 30 consecutive days shall not exceed—
TSS	100.0	30.0
Oil and grease	20.0	15.0

(c) The quantity of pollutants discharged from fly ask and bottom ash transport water shall not exceed the quantity determined by multiplying the flow of fly ash and bottom ash transport water times the concentration listed in the following table:

[Milligrams per liter]

Pollutant or pollutant property	BCT effluent limitations	
	Maximum for any 1 day	Average of daily values for 30 consecutive days shall not exceed—
TSS	100.0	30.0
Oil and grease	20.0	15.0

(d) The quantity of TSS and oil and grease discharged from metal cleaning wastes shall not exceed the quantity determined by multiplying the flow of metal cleaning wastes times the concentration listed in the following table:

[Milligrams per liter]

Pollutant or pollutant property	BCT effluent limitations	
	Maximum for any 1 day	Average of daily values for 30 consecutive days shall not exceed—
TSS	100.0	30.0
Oil and grease	20.0	15.0

(e) The pH of all discharges, except once through cooling water, shall be within the range of 6.0–9.0.

(f) In the event that waste streams from various sources are combined for treatment or discharge, the quantity of each pollutant or pollutant property controlled in paragraphs (a) through (e) of this section attributable to each controlled waste source shall not exceed the specified limitation for that waste source.

§ 423.15 New source performance standards (NSPS).

The following standards of performance establish the quantity or quality of pollutants or pollutant properties, controlled by this section, which may be discharged by a new source subject to the provisions of this subpart:

(a) The pH of all discharges, except once through cooling water, shall be within the range of 6.0–9.0.

(b) There shall be no discharge of polychlorinated biphenyl compounds such as those commonly used for transformer fluid.

(c) The quantity of pollutants discharged from low volume waste sources shall not exceed the quantity determined by multiplying the flow of low volume waste sources times the concentration listed in the following table:

[Milligrams per liter]

Pollutant or pollutant property	NSPS effluent limitations	
	Maximum for any 1 day	Average of daily values for 30 consecutive days shall not exceed—
TSS	100.0	30.0
Oil and grease	20.0	15.0

(d) The quantity of pollutants discharged in metal cleaning wastes shall not exceed the quantity determined by multiplying the flow of metal cleaning wastes times the concentration listed in the following table:

[Milligrams per liter]

Pollutant or pollutant property	NSPS effluent limitations	
	Maximum for any 1 day	Average of daily values for 30 consecutive days shall not exceed—
TSS	100.0	30.0
Oil and grease	20.0	15.0
Copper, total	1.0	1.0
Iron, total	1.0	1.0

(e) The quantity of pollutants discharged in bottom ash transport water shall not exceed the quantity determined by multiplying the flow of the bottom ash transport water times the concentration listed in the following table:

[Milligrams per liter]

Pollutant or pollutant property	NSPS effluent limitations	
	Maximum for any 1 day	Average of daily values for 30 consecutive days shall not exceed—
TSS	100.0	30.0
Oil and grease	20.0	15.0

(f) There shall be no discharge of copper, nickel, zinc, arsenic and selenium from fly ash transport water.

(g) There shall be no discharge of total residual chlorine (or total residual oxiduants) from once through cooling water.

(h) Notwithstanding 423.15(g), a facility may upon showing the Regional Administrator (or the State if the State has the NPDES program) that the facility must use chlorine for condenser biofouling control, discharge the minimum amount of total residual chlorine necessary to operate the facility. Such a showing must be made in accordance with Appendix A.

(i) Upon successful showing as required under 423.15(h), the discharge of total residual chlorine is permitted under the following conditions:

(1) The quantity of pollutants discharged in once through cooling water from each discharge point shall not exceed the quantity determined by multiplying the flow of once through cooling water from each discharge point times the concentration listed in the following table:

Pollutant or pollutant property	NSPS effluent limitations
	Maximum concentration for any time
Total residual chlorine	0.14 mg/1

(2) Total residual chlorine may not be discharged from each once through cooling water point source discharge for more than two hours per day unless it is required for crustacean control. Multi-unit chlorination is permitted.

(j) The quantity of pollutants discharged in cooling tower blowdown shall not exceed the quantity determined by multiplying the flow of cooling tower blowdown times the concentration listed below:

Pollutant or pollutant property	NSPS effluent limitations
	Maximum concentration for any time
Total residual chlorine	0.14 mg/1

(k) There shall be no discharge of cooling tower maintenance chemicals which contain the 129 priority pollutants (Appendix B).

(l) Subject to the provisions of 423.15(m), the quantity or quality of pollutants or pollutant parameters discharged in coal pile runoff shall not exceed the limitations specified below:

Pollutant or pollutant property	NSPS effluent limitations
	Maximum concentration for any time
TSS	50 (mg/1)

(m) Any untreated overflow from facilities designed, constructed, and operated to treat the coal pile runoff which results from a 10 year, 24 hour rainfall event shall not be subject to the limitations in 423.15(l).

(n) In the event that waste streams from various sources are combined for treatment or discharge, the quantity of each pollutant or pollutant property controlled in paragraphs (a) through (m) of this section attributable to each controlled waste source shall not exceed the specified limitation for that waste source.

§ 423.16 Pretreatment standards for existing sources (PSES).

Except as provided in 40 CFR § 403.13, any existing source subject to this subpart which introduces pollutants into a publicly owned treatment works must comply with 40 CFR 403 and achieve the following pretreatment standards for existing sources (PSES):

(a) There shall be no discharge of polychlorinated biphenol compounds such as those used for transformer fluid:

(b) The pollutants discharged in metal cleaning water shall not exceed the concentration listed in the following table:

Pollutant or pollutant property	PSES pretreatment standards (mg/1)
	Maximum for 1 day
Copper, total	1.0

(c) The pollutants discharged in cooling tower blowdown shall not exceed the concentration listed in the following table:

Pollutant or pollutant property	PSES pretreatment standards
	Maximum for any time
Chemicals added for cooling tower maintenance which contains the 129 priority pollutants.	No detectable amount..

§ 423.17 Pretreatment standards for new sources (PSNS).

Any new source subject to this part which introduces pollutants into a publicly owned treatment works must comply with the general pretreatment regulations in 40 CFR Part 403 and the following pretreatment standards:

(a) There shall be no discharge of polychlorinated biphenyl compounds such as those used for transformer fluid.

(b) The pollutants discharged in metal cleaning wastes water shall not exceed the concentration listed in the following table:

Pollutant or pollutant property	PSNS pretreatment standards (mg/1)
	Maximum for 1 day
Copper, total	1.0

(c) The pollutants discharged in cooling tower blowdown shall not exceed the concentration listed in the following table:

Pollutant or pollutant property	PSNS pretreatment standards
	Maximum for any time
Chemicals added for cooling tower maintenance which contains the 129 priority pollutants.	No detectable amount.

(d) There shall be no discharge of copper, nickel, zinc, arsenic, and selenium from fly ash transport water.

§ 125.30 [Amended]

2. It is hereby proposed to amend 40 CFR 125.30(a) by amending the last sentence thereof to read as follows:

(a) * * * This subpart applies to all national limits promulgated under Sections 301, 304 and 307(b) of the Act, except for the BPT limits contained in 40 CFR Part 423 (steam electric generating point source category).

* * * * *

Appendix A—Chlorine Minimization Program for Once-Through Cooling Water

Purpose

The purpose of chlorine minimization is to reduce the discharge of chlorine or its related compounds to receiving waters. This description is intended to explain what a chlorine minimization program is and how to develop and implement one. Anticipated situational factors and how to approach them are also presented.

Background

Chlorine is commonly added to condenser cooling water of steam electric facilities in order to control the growth of various organisms (algae, bacteria, barnacles, clams) that would otherwise attach to surfaces in the condenser, cooling towers, or to other components of the cooling system and prevent the system from functioning properly.

The attachment of these various organisms to the cooling water system is called biofouling. Since the control method using chlorine involves creating a residual dose of reactive chlorine, some of the chlorine used to control biofouling is still present when the cooling water is discharged from the plant. It is desirable to minimize the discharge of free and combined residual chlorine from steam electric powerplants due to the toxicity these compounds have on aquatic life.

Various power plants have undertaken some type of program to reduce the use of chlorine. The results of these programs indicate that significant chlorine reduction can be achieved in many cases. Some of the plants found that chlorination is not required at all while others have found that the amount of chlorine added can be significantly reduced, especially during the winter months.

General Approach

In order to determine the minimum amount of chlorine a specific powerplant requires, a chlorine minimization study must be undertaken. A detailed approach to chlorine minimization is presented in the Draft Development Document for the Steam Electric Industry. A chlorine minimization study should last at least a full year, during which each of the following three variables is controlled at various levels until the minimum value that permits proper plant performance is determined:

1. *Dose* of chlorine added—where dose is defined as the total amount of chlorine added per unit volume of cooling water.

2. *Duration* of chlorine addition—where duration is defined as the length of time between the start and end of a single period of chlorine addition.

3. *Frequency* of chlorination—where frequency is defined as the number of periods of chlorine addition per day or week.

During the trials of various combinations of dose, duration, and frequency, data on plant performance must be collected. These data may include turbine back pressure, condenser back pressure and the temperature drop across the condenser. The performance data can be analyzed to determine if proper plant performance is being maintained. Different plants will necessarily employ different measures of performance to ensure that conditions specific to that plant are taken into account. If plant performance is not adequate, dose, duration, or frequency is increased until proper performance is again achieved. At the end of a full year of study, which takes into account seasonal variations in water quality and biological organisms, data are available to define the minimum dose, duration and frequency. These minimum values then define the proper chlorination procedure to be used for future operations. Performance data on the system must be taken periodically to check the adequacy of the procedure and to enable any needed changes to be made.

The level of sophistication taken in the development of such a program is highly variable. At the discretion of plant operators, the chlorine dose may be related to physical or chemical properties of the cooling water. At this level of sophistication, considerable water quality data must be taken. The advantage of such an approach is that dose can be controlled directly by monitoring one water quality parameter.

In addition to the general considerations presented, specific factors that must be considered include the following:

(a) The portion of the cooling system which would require chlorine for biofouling control, and

(b) Other methods, besides chlorine minimization, that would achieve the same end result of reducing the discharge of chlorine and its related compounds.

With regard to the first of these factors, biofouling is frequently not a problem in many portions of the cooling system. Although biological growth occurs in all segments of the cooling system, the most sensitive portion is usually the condenser. Biological growth in the other segments does not generally impair the operation and efficiency of the plant with the exception of plants with incrustaceans (barnacles, clams) in the intake water. The relocation of the point of chlorine addition to the condenser inlet box can result in significant reduction in the quantity of chlorine required to achieve the necessary level of free available chlorine at the condenser. Chlorine addition, however, is required in the cooling water intake structure and other sections of the cooling system for plants with crustacean fouling problems.

Most experience has demonstrated that the continuous application of chlorine to obtain a free residual (normally a very low level would be adequate) in the condenser discharge is necessary to gain control of both larval and adult forms of the incrustaceans where they occur on the intake structure, intake tunnels, intake water boxes and discharge structure. Chlorine minimization in such instances involves applying chlorine only during the growing season and at the lowest concentrations necessary to achieve control. Visual inspection is the most usual and reliable method of measuring the chlorine effectiveness. For new facilities, the option of utilizing heat treatment to resolve this problem should be explored. The benefits and costs of chlorine reduction would have to be balanced with the utilization of heat treatment.

With regard to the second of the specific factors, many other means of controlling biofouling in cooling water systems are available. Already mentioned were heat treatment and relocation of the points of chlorine injection. Another alternative is the use of a mechanical condenser antifouling device (mechanical cleaning). Most plants using mechanical cleaning do not chlorinate at all, but the need for chlorine addition is not always eliminated. For existing plants, the retrofitting of a mechanical cleaning system may be expensive. For new plants, costs of a mechanical cleaning system are lower since no retrofit is needed. New plants should seriously consider the use of a condenser mechanical cleaning system.

Systematic Approach for Determining Minimum Amount of Chlorine Addition

As explained in the preceeding discussion, the control variables are dose, duration, and frequency. During the program development stage, these factors must be varied in order to determine the optimum program. Throughout this period the operating integrity of the plant must be protected. To accomplish this, plant operators will need to establish some absolute means of monitoring condenser (or other critical part of the cooling system) performance. If at all possible, provisions should be made to enable visual inspection of the condenser elements following a test period. The actual condition of the system in terms of biofouling can then be directly compared to the indirect means of monitoring performance (condenser back pressure, temperature drop, etc.). Actual inspection of the condenser or other part of the cooling system (which requires plant closure or loading reduction) should not be considered to be a 'routine' method of evaluating the effectiveness of the chlorine addition program as unit downtime to make such inspections is costly and highly undesirable from a boiler operator's standpoint.

The specifics of implementation are presented below according to:

1. Required capabilities,
2. Test program elements, and
3. Implementation plan.

1. *Required Capabilities.*—a. A means of measuring the apparent waterside condenser tube fouling. This should include visual inspections and biofouling sampling at some point in the test program. Inspection should include condenser intake and discharge water boxes, and, if needed, the cooling water intake structure. Other measurements may be substituted with caution such as deviation from expected condenser pressure drop, etc. The substitute measurements all have serious problems of ambiguity since many factors other than biofouling film growth in the condenser tubes affect these measurements.

b. A means of relating the periodic inspection result or other measurements to condenser performance.

c. A means of gathering grab samples from condenser inlet, outlet, and NPDES discharge point.

d. A means of measuring free available chlorine (FAC) and total residual chlorine (TRC) on samples without delay once collected. The test method to be employed in ASTM D 1253 Chlorine in Water, Method A, Direct Amperometric Titration.

e. A means of controlling and measuring with appropriate accuracy the addition of chlorine to the cooling water to the unit or condenser under study. The arrangement for adding chlorine varies considerably from plant-to-plant. The physical differences may influence the minimization strategy and may require physical modification of the existing system in order to properly implement the program.

f. General chemical analytical capability for properties or substances in water.

g. A means of determining short-term chlorine demand of the inlet water either in the laboratory or the difference between applied chlorine concentration and the free chlorine residual found at the condenser inlet.

2. *Test program elements.*—a. Establish a baseline of condenser performance associated with the condenser for each seasonal period of plant operation (winter, summer, etc.). This may involve an initial offline chemical or mechanical leaning. It is necessary that these baseline conditions be used to evaluate the results of the various chlorination strategies. Data needed to establish baseline conditions will be available at most facilities, and thus, will not require a delay in systematic testing of minimization strategies.

b. Conduct screening tests for a length of time to be determined by plant operators. Different plant cooling water and chlorine feed configurations may require alterations in the selection of the minimization strategies Plants with several units with similar tube metal, intake water, transit times, temperature gradient across the condensers and cooling water velocity may allow parallel trials of the minimization strategies on several units while maintaining other units on the dose, frequency and duration found effective in past experience. The duration of plant chlorination should be restricted to a maximum of two hours per day.

There are three basic ways to institute a chlorine minimization program: (i) reduce the dose, (ii) reduce the duration, or (iii) change the frequency. For some facilities, it may be desirable to conduct all three alternatives prior to selecting the most suitable. In most cases, the operator can choose one alternative based on previous experience. The three alternative approaches are explained in detail as follows:

(i) *Reduction of Dose:* Establish a desired outlet concentration for TRC. Maintain the frequency and duration found effective in past experience but reduce the dose of chlorine until the desired effluent concentration is not exceeded. Closely monitor condenser performance parameters during this period. If the system shows signs of biofouling, increase the dose. Test periods of about two months should be used for evaluating effectiveness of each new dose used.

(ii) *Reduction of Duration:* Decrease the duration of chlorine feed while maintaining the dose and frequency found effective in past experience. Again, test periods of two months are probably adequate to evaluate a particular duration strategy.

(iii) *Change the Frequency:* Frequency changes with the goal of minimization can be made in two ways: (1) reduce the frequency while keeping dose and duration at baseline values; or (2) increase the frequency but simultaneously decrease the duration. (for example, increase frequency from one to three times per day while reducing duration from one hour to 10 minutes). Test periods of two months are probably adequate to evaluate a particular change in frequency.

The entire test program, from start to finish, should not require more than one year. Selection of which minimization strategies to be attempted (reduction of dose, duration, or frequency) may be limited by the one year time constraint. In such cases, previous operational experience should be called upon to decide which strategy shows the most promise for success and testing efforts should be placed on that strategy.

3. *Implementation Plan.*—a. The information obtained in the test plan above should serve as the guidelines for a permanent chlorine minimization program. The most successful approach (the method that provides for adequate plant performance while minimizing chlorine discharge) should be implemented.

b. The implementation program should take into account seasonal variations in water quality. For example, as was done in the minimization testing program, each season of the year should be approached as a new set of operating conditions. Different combinations of dose, duration, and frequency should be applied in each season. The optimum combinations for each season being those defined by the chlorine minimization study during that season.

c. Monitoring of condenser performance indicators (condenser back pressure, etc.) should continue during the implementation plan. This is necessary to prevent serious biofouling (and potential plant shutdown) in the event that the influent cooling water quality or plant operating characteristics undergo a sudden change that increases the plant's susceptibility to biofouling.

Appendix B—List of 129 Priority Pollutants

001 Acenapthene
002 Acrolein
003 Acrylonitrile
004 Benzene
005 Benzidine
006 Carbon tetrachloride (tetrachloromethane)
007 Chlorobenzene
008 1,2,4-trichlorobenzene
009 Hexachlorobenzene
010 1,2-dichloroethane
011 1,1,1-trichlorethane
012 Hexachloroethane
013 1,1-dichloroethane
014 1,1,2-trichlorethane
015 1,1,2,2-tetrachloroethane
016 Chloroethane
017 Bis (chloromethyl) ether
018 Bis (2-chloromethyl) ether
019 2-chloroethyl vinyl ether (mixed)
020 2-chloronaphthalene
021 2,4,6-trichlorophenol
022 Parachlorometa cresol
023 Chloroform (trichloromethane)
024 2-chlorophenol
025 1,2-dichlorobenzene
026 1,3-dichlorobenzene
027 1,4-dichlorobenzene
028 3,3-dichlorobenzidine
029 1,1-dichloroethylene
030 1,2-trans-dichloroethylene
031 2,4-dichlorophenol
032 1,2-dichloropropane
033 1,2-dichloropropylene (1,3-dichloropropene)
034 2,4-dimethylphenol
035 2,4-dinitrotoluene
036 2,6-dinitrotoluene
037 1,2-diphenylhydrazine
038 Ethylbenzene
039 Fluoranthene
040 4-chlorophenyl phenyl ether
041 4-bromophenyl phenyl ether
042 Bis(2-chloroisopropyl) ether
043 Bis(2-chloroethoxy) methane
044 Methylene chloride (dichloromethane)
045 Methyl chloride (dichloromethane)
046 Methyl bromide (bromomethane)
047 Bromoform (tribromomethane)
048 Dichlorobromomethane
049 Trichlorofluoromethane
050 Dichlorodifluoromethane
051 Chlorodibromomethane
052 Hexachlorobutadiene
053 Hexachloromyclopentadiene
054 Isophorone
055 Naphthalene
056 Nitrobenzene
0057 2-nitrophenol
058 4-nitrophenol
059 2,4-dinitrophenol
060 4,6-dinitro-o-cresol
061 N-nitrosodimethylamine
062 N-nitrosodiphenylamine
063 N-nitrosodi-n-propylamine
064 Pentachlorophenol
065 Phenol
066 Bis(2-ethylhexyl)phthalate
067 Butyl benzyl phthalate
068 Di-N-Butyl Phthalate
069 Di-n-octyl phthalate
070 Diethyl Phthalate
071 Dimethyl phthalate
072 1,2-benzanthracene (benzo(a)anthracene)

073 Benzo(a)pyrene (3,4-benzopyrene)
074 3,4-Benzofluoranthene (benzo(b)fluoranthene)
075 11,12-benzofluoranthene (benzo(b)fluoranthene)
076 Chrysene
077 Acenaphthylene
078 Anthracene
079 1,12-benzoperylene (benzo(ghi)perylene)
080 Fluorene
081 Phenanthrene
082 1,2,5,6-dibenanthracene (dibenzo(,h)anthracene)
083 Indeno(1,2,3-cd) pyrene (2,3-o-pheynylene pyrene)
084 Pyrene
085 Tetrachloroethylene
086 Toluene
087 Trichloroethylene
088 Vinyl chloride (chloroethylene)
089 Aldrin
090 Dieldrin
091 Chlordane (technical mixture and metabolites)
092 4,4-DDT
093 4,4-DDE (p,p-DDX)
094 4,4-DDD (p,p-TDE)
095 Alpha-endosulfan
096 Beta-endosulfan
097 Endosulfan sulfate
098 Endrin
099 Endrin aldehyde
100 Heptachlor
101 Heptachlor epoxide (BHC-hexachlorocyclohexane)
102 Alpha-BHC
103 Beta-BHC
104 Gamma-BHC (lindane)
105 Delta-BHC (PCB-polychlorinated biphenyls)
106 PCB-1242 (Arochlor 1242)
107 PCB-1254 (Arochlor 1254)
108 PCB-1221 (Arochlor 1221)
109 PCB-1232 (Arochlor 1232)
110 PCB-1248 (Arochlor 1248)
111 PCB-1260 (Arochlor 1260)
112 PCB-1016 (Arochlor 1016)
113 Toxaphene
114 Antimony
115 Arsenic
116 Asbestos
117 Beryllium
118 Cadmium
119 Chromium
120 Copper
121 Cyanide, Total
122 Lead
123 Mercury
124 Nickel
125 Selenium
126 Silver
127 Thallium
126 Silver
128 Zinc
129 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD)

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