Utility Water Act Group

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VIA ELECTRONIC MAIL

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RE: March 8 Meeting with UWAG on Steam Electric Effluent Limitation Guidelines

Dear Ms. Higgins and Mr. Laity:

Thank you for meeting with the Utility Water Act Group (UWAG) on March 8 to discuss EPA's Clean Water Act rulemaking to revise the steam electric effluent limitation guidelines in 40 C.F.R. Part 423. We appreciate your time and your consideration in quickly rescheduling the meeting after a snow storm disrupted our original plans.

During the meeting we touched on our most significant issues based on preliminary information about the rule that EPA has released for purposes of consultations with local governments and tribes. EPA appears poised to issue a rule that, if promulgated without significant changes, will affect a very large portion of the steam electric industry and will impose stringent requirements on a wide array of waste streams. We urge you to work with EPA to ensure that the proposal adopts feasible and cost-effective options. Also, to the extent that you find the rule not supported by sound analyses and data, we request that you work with EPA to revise the proposal prior to its release.

As we indicated during the meeting, we are very concerned that many of the options under consideration are not cost effective or feasible. We believe EPA has developed its draft rule based on very limited data, and therefore has not appropriately evaluated the potential impact of the rule.

Our preliminary analysis demonstrates that dry handling of bottom ash is not cost effective based on EPA's traditional measure of cost effectiveness, *i.e.*, the cost per toxic weighted pounds equivalent (TWPE) removed. Similarly, the likely technologies to be applied to flue gas desulfurization (FGD) wastewater (physical/chemical, physical/chemical plus biological treatment, and full thermal zero liquid discharge systems) are not cost effective. In addition, the maintenance and operational problems that attend both biological treatment systems and full thermal ZLD systems renders them infeasible as a basis for a national rule.

Furthermore, some waste streams that EPA proposes to address through this rulemaking involve coal combustion residuals (CCRs) that EPA has also addressed in a proposed rule under the Resource Conservation and Recovery Act (RCRA). EPA should not move ahead with the steam electric effluent guidelines rule without very careful consideration of, and coordination with, the CCR rule. It makes no sense to require companies to undertake major changes to comply with the new effluent guidelines rule for waste streams that face separate and potentially conflicting requirements under RCRA.

In addition, we are concerned that EPA is not adequately considering the cumulative impacts of the effluent guidelines and CCR rules and the Agency's numerous other rules. EPA's recent and pending rules dealing with mercury, particulates, regional haze, greenhouse gases, and cooling water intake structures already are imposing or are likely to impose major new requirements, many of which are now being implemented or will soon be implemented. This barrage of regulation makes it increasingly difficult for facilities to plan efficient improvements. Steam electric facilities are capital intensive and complex, and they are integral components of our nation's electric energy supply. To impose substantial new requirements on facilities already undergoing significant transitions – without fully evaluating the costs, environmental necessity, and timing of further changes – is ill advised and not in keeping with Executive Order 13610 on reducing regulatory burdens, including cumulative effects of multiple regulations.

Below we provide an overview of our major concerns with the proposed rule.

I. Dry Handling of Bottom Ash is Not Cost Effective

EPA may seek to prohibit the discharge of bottom ash transport water, thereby requiring facilities to retrofit dry bottom ash handling systems or closed-loop bottom ash sluicing systems. This would not be a cost effective choice of technologies. During our meeting, we provided Attachment A, which summarizes our preliminary analysis of bottom ash toxic weighted pounds equivalent (TWPEs) removed, capital costs, and costs per TWPE. The following sections describe how we conducted our analyses of various bottom ash transport water data.

A. UWAG's Bottom Ash Transport Water Data and TWPE Estimates Demonstrate that Dry Bottom Ash Handling is not Cost Effective

To address a shortage of data on bottom ash transport water, UWAG collected 20 representative bottom ash transport water data sets from member facilities. The bottom ash transport water data collected includes bottom ash produced from the combustion of both bituminous and subbituminous coals. We requested that members provide only analyses of bottom ash transport water that was not mixed with any other wastewater type. We further requested that the members use appropriate analytical methods (*e.g.*, Methods 200.7 or 200.8 for metals, and Method 1631 for mercury) to test the samples for all of the parameters that EPA used in its detailed study of the industry. We also verified that none of the samples collected represented boiler slag, which is typically generated by cyclone boilers and is more inert than bottom ash. We included all sample data meeting these criteria in the UWAG bottom ash transport water data set.

After compiling the 20 data sets, we identified median values for each parameter. We selected ten megawatt (MW) ranges to use as model plants. Since the Electric Power Research Institute (EPRI) collected partial data from EPA's 2010 effluent guidelines information collection request (ICR), we obtained bottom ash sluice flow rates and days of operation from EPRI and computed median flow rates and days of operation for each model plant range. We used this information to establish median bottom ash flow rates for each model plant tier.

To establish representative capital costs, we requested bottom ash retrofit costs and the associated megawatt level from industry members. A few members supplied actual retrofit costs, while others provided retrofit costs based on engineering estimates. Based on data points from 13 facilities, we developed a cost curve. Using this curve, we estimated bottom ash retrofit capital costs across the range of model plants.

We then computed costs per TWPE removed in both 2012 and 1981 dollars. Our calculations show that the cost in 1981 dollars per TWPE range from $890 to almost $16,000 (see Attachment A) and from $2,214 to $39,596 in 2012 dollars. We believe these costs per TWPE are much higher than EPA has found acceptable in any past effluent limitations guidelines rulemaking.

Our preliminary analysis does not include costs for operation and maintenance of dry bottom ash retrofit systems, costs of transporting the dry bottom ash generated to a landfill, or costs of constructing, operating and maintaining new landfill space to receive ash. These costs would be very large. For example, EPRI has estimated that the capital costs of developing a new 100-acre landfill average $489,000 per acre for the initial phase (sized to accommodate fill for 3-5 years) and $361,000 per acre for later phases. EPRI also estimates operations and maintenance for the landfill to be approximately $772,000 per year including contingency. When these costs are added to the capital costs, the cost per TWPE will be substantially higher than our current estimates.

B. EPA's Bottom Ash Transport Water Data Also Indicates Dry Bottom Ash Handling is Not Cost Effective

To our knowledge, EPA collected only one non-commingled bottom ash transport water grab sample. That sample is from the Homer City power plant. Using EPA's characterization data for that sample and UWAG's flow rates and capital costs, we generated the second table on Attachment A. The costs per TWPE using EPA's Homer City data are slightly lower than those generated using UWAG's own characterization data from 20 bottom ash samples. For instance, for the 200-300 MW model plant, using UWAG's data results in a cost per TWPE in 1981 dollars of $2,069. Using EPA's Homer City data, the cost per TWPE in 1981 dollars is $1,853.[1]

C. PISCES Bottom Ash Transport Water Data Also Indicates Dry Bottom Ash Handling is Not Cost Effective

Our confidence in the UWAG bottom ash transport water characterization data set and cost-effectiveness numbers is increased because UWAG's numbers are reasonably consistent with the EPRI Power Plant Integrated Systems Chemical Emission Studies (PISCES) bottom ash transport water data, summarized below.

Preliminary Pollutant Reductions and Costs: PISCES Data

PISCES Characterization Studies - Median Data

Capacity	Bottom Ash Sluice Flow (Mgal/year)	TWPE/Year Removed	Annualized Capital (M$) 2012 $	$/TWPE Removed 2012 $	Annualized Capital (M$) 1981$	$/TWPE Removed 1981$
<50 MW	9.8	14	0.71	$50,016	0.28	$20,107
50-100 MW	18.6	27	0.77	$28,696	0.31	$11,536
100-150 MW	88.8	128	0.90	$7,041	0.36	$2,831

[1] As shown on Attachment A, UWAG questions EPA's result for nitrites/nitrates at Homer City. UWAG's split of the same sample provided a result of 5.92 ppm as compared to EPA's 37 ppm. UWAG's result is more consistent with the results of other data sets. For example, the median value for nitrites/nitrates using the PISCES data is 0.23 ppm. Substituting the UWAG Homer City nitrites/nitrates value (5.92 ppm) for EPA's (37 ppm) would result in a cost per TWPE of $3,124 for the 200-300 MW model plant.

Capacity	Bottom Ash Sluice Flow (Mgal/year)	TWPE/Year Removed	Annualized Capital (M$) 2012 $	$/TWPE Removed 2012 $	Annualized Capital (M$) 1981$	$/TWPE Removed 1981$
150-200 MW	256	370	1.03	$2,796	0.42	$1,124
200-300 MW	131	189	1.23	$6,507	0.49	$2,616
300-400 MW	153	220	1.49	$6,774	0.60	$2,723
400-500 MW	142	204	1.76	$8,585	0.71	$3,451
500-700 MW	276	399	2.15	$5,384	0.86	$2,164
700-900 MW	273	394	2.67	$6,781	1.07	$2,726
>900 MW	249	359	3.20	$8,900	1.29	$3,578

To develop this table, we used only actual bottom ash transport water samples collected during the PISCES studies. EPRI collected bottom ash transport water samples from the end of the sluicing pipe before the transport water entered the receiving surface impoundment. After allowing the samples to settle, EPRI then analyzed the decant or supernatant. This technique simulates the settling of bottom ash within a surface impoundment. The cost per TWPE removed for the EPRI data ranges from $1,124 to $20,107 ($1981). This is reasonably close to the UWAG results of $890 to almost $16,000 per TWPE.

D. Summary

In summary, UWAG evaluated EPA's Homer City bottom ash transport water data, EPRI's PISCES data, and UWAG's own bottom ash transport water data. For each of these data sets, the costs per TWPE removed are comparable, as shown below:

Data Set	Capital Costs per TWPE Range, $1981
UWAG bottom ash data	$890 to $15,918
EPA Homer City bottom ash data	$796 to $14,242
PISCES bottom ash data	$1,124 to $20,107

Given that these costs reflect only capital costs, the total costs per TWPE would be much higher. Even without additional costs, the capital costs alone far exceed EPA's typical thresholds for costs per TWPE, and therefore bottom ash retrofits requiring no discharge of transport water are not cost effective.

Surface impoundments containing ash sluice water have a low risk of structural failure. EPA undertook a multi-year effort to inspect every CCR impoundment in the country using independent contractors. The contractors found no impoundments that ranked “unsatisfactory” (that is, in imminent danger of structural failure), and those ranked “poor” did so mostly because of missing records rather than physical problems with the impoundments. All problems found during the inspections were addressed in plans voluntarily adopted by the facilities.

II. Flue Gas Desulfurization Wastewater

EPA is likely to propose multiple technology options for FGD wastewater including: (1) chemical precipitation, (2) chemical precipitation followed by biological treatment, and (3) chemical precipitation plus a full thermal ZLD system (*i.e.*, a brine concentrator followed by a crystallizer). Based on our preliminary analysis, *none* of these technologies is cost effective, and the latter two present serious feasibility concerns.

As we have said to EPA on many occasions, we remain concerned that EPA is deriving limits for FGD wastewater without a robust data set. EPA collected four consecutive daily samples and one sample per month for four months at seven plants. EPA then supplemented these samples with process data from one company. Process data generally are not subject to all the quality assurance/quality controls that would be used for compliance monitoring data, and so they should be used with caution. This limited data set is very unlikely to represent the significant variability of FGD wastewater across the industry and is inadequate for assessing the likely operational difficulties of the technology options.

Nonetheless, even using the limited data that EPA has collected, the candidate technologies are not cost effective.

A. The Likely FGD Technology Options are Not Cost Effective

We focused our cost effectiveness analysis for FGD wastewater on chemical precipitation and chemical precipitation followed by biological treatment. Our model plants are based on flow rates ranging from 50 gallons per minute (gpm) to 800 gpm. In our preliminary analysis, for chemical precipitation using organosulfide, the cost per TWPE ranges from $1,279 to $5,365 in 2012 dollars and from $514 to $2,157 in 1981 dollars.

The incremental costs for biological treatment range from $1,777 to $8,682 ($2012) and from $714 to $3,490 ($1981). Chemical precipitation must be used prior to biological treatment, therefore the costs for chemical precipitation must be included when evaluating biological treatment costs. The total costs for a full thermal ZLD system would be much higher than the ranges for chemical precipitation and incremental biological treatment.

B. Biological Treatment and ZLD Also Raise Feasibility Concerns

Biological treatment systems are unpredictable compared to chemical precipitation systems, which involve predictable chemical reactions. The bacteria used in biological treatment systems are sensitive to temperature and changes in FGD wastewater composition. For example, the bacteria cannot tolerate chloride levels greater than 20,000 parts per million (ppm). Also, uncontrollable changes in the oxidizing conditions in the FGD absorber can affect the bacteria. High ORP (oxidation-reduction potential) conditions can cause oxidizing compounds to form in the treatment system, which can kill the bacteria. In addition, these systems require weather protection in most of the country to prevent the microorganisms from dying off in cold weather.

A full ZLD system (chemical precipitation plus evaporation and crystallization) is even less justifiable as best available technology. It is not a fully demonstrated technology. There is only one operational FGD ZLD wastewater treatment system in the United States with a brine concentrator and a crystallizer, and it is at a small plant with very low flows, and the system has not been operating for long and has already experienced problems.

Our concerns with this system include:

- scaling issues in the brine concentrator,
- disposal of an unstable hygroscopic salt (mostly NaCl),
- large amount of chemicals needed,
- large amount of sludge produced,
- extremely high capital costs, and
- high parasitic load

In short, the potential use of brine concentrators with crystallizers for FGD wastewater treatment has too many unresolved problems. It is not a technology that should be the basis of a national rule. Moreover, any consideration of biological or ZLD systems for FGD wastewater treatment should account for outages due to unanticipated system failures. If a failure of the wastewater treatment system triggers shut down of a baseload plant, disruption of the grid could occur.

III. EPA Has Not Justified Imposing New Requirements For Nonchemical Metal Cleaning Wastes

In the few materials about the effluent guidelines rulemaking that EPA has made public, EPA said it might "clarify" the definitions of "metal cleaning waste" and "chemical metal cleaning waste." We presume this means EPA intends to further regulate nonchemical metal cleaning wastes, which are generated by washing metal process equipment with water only. If so, this would be more than a "clarification." Under longstanding regulatory guidance, many plants are authorized to handle nonchemical metal cleaning wastes as low volume wastes. The 1982 final steam electric guidelines endorsed this guidance (for facilities that had relied on it), and it is therefore part of the current regulation.

If EPA were to change this longstanding practice and begin to regulate nonchemical metal cleaning wastes as it regulates chemical metal cleaning wastes, many facilities would incur large costs. Plants would have to separate nonchemical metal cleaning wastes from other low volume wastes and construct new treatment facilities. Preliminary estimates for segregation and treatment of nonchemical metal cleaning wastes indicate the costs can be as much as $6 to $10 million for some facilities. The low level of pollutants in these wash waters does not justify the expense.

IV. EPA Needs to Provide Reasonable Compliance Schedules and Coordinate the Rulemaking with its CCR Rulemaking

Reasonable compliance schedules are crucial to the facilities subject to this rule. EPA appears poised to require retrofits for dry handling of fly ash and bottom ash, and that means many more landfills will be needed to receive the ash. A three- or four-year compliance schedule would grossly underestimate the time needed to comply. Siting, permitting, and construction of new solid waste landfills often takes eight or more years.

The ELG rule also should be closely coordinated with the CCR rule, because the rulemakings involve several of the same waste streams (fly ash, bottom ash, and FGD wastes). The requirements of both rules must be coordinated to ensure that compliance is operationally efficient and cost effective.

Determining a reasonable compliance schedule requires considering several factors, including the type of technologies that will have to be installed, the number of facilities that will have to install them, the number of facilities competing for the same resources, and how much time it will take to permit and license the technologies. If more than one technology is needed, the implementation time to site, design, and construct is a minimum of eight to ten years. A staggered schedule will be necessary due to the limited supply of experienced engineering and construction companies.

V. The Comment Period Must be Sufficient to Allow for Analysis of the Massive Record

The comment period for the draft rule must be long enough to enable parties to evaluate the large amount of data that EPA has accumulated through its 2010 ICR (which was sent to more than 700 facilities) and other means. EPA has been collecting and analyzing information since well before the Final Detailed Study Report in October 2009 and so has had more than five years to prepare what we expect will be an extensive record. The ICR alone was massive (well over 300 pages) and cannot be adequately analyzed in 60 or 90 days. The amount of data in the record merits a minimum 150-day comment period.

VI. Cumulative Impacts

The steam electric industry is facing major regulatory compliance challenges from multiple air regulations, the CCR rule, and the 316(b) intake structure rule. We urge EPA to evaluate the cumulative impact of these regulations as part of its assessment of the proposed effluent guidelines rule. Executive Order 13610 requires EPA to consider the cumulative effects of regulations and seek to reduce overlapping and inconsistent requirements.

Again, thank you for meeting with us. Please let me know if you need additional information of any kind.

Yours very truly,

Donna B. Hill
Chair, UWAG Effluent Guidelines Committee

Attachment

cc: Ronald P. Jordan, EPA

<u>**Attachment A**</u>

Preliminary Pollutant Reductions and Costs for Bottom Ash Retrofit to ZLD

UWAG Bottom Ash Data

Model Plant Capacity	BAS Flow (Mgal/year)	*TWPE/Year Removed	Total Capital Cost 2012 $	**$/TWPE Removed 2012 $	**$/TWPE Removed 1981 $
<50 MW	9.8	18	$6,430,000	$39,596	$15,918
50-100 MW	18.6	34	$7,030,000	$22,726	$9,136
100-150 MW	88.8	162	$8,220,000	$5,573	$2,240
150-200 MW	256	467	$9,420,000	$2,214	$890
200-300 MW	131	239	$11,200,000	$5,147	$2,069
300-400 MW	153	278	$13,600,000	$5,363	$2,156
400-500 MW	142	258	$16,000,000	$6,801	$2,734
500-700 MW	276	504	$19,600,000	$4,268	$1,716
700-900 MW	273	498	$24,400,000	$5,378	$2,162
>900 MW	249	454	$29,100,000	$7,038	$2,829

***Of the TWPE/year removed, approximately 41% is attributed to the source water (river) used for sluicing.**

**** O&M costs are not included and would be substantial. O&M costs would include maintenance costs associated with the dry bottom ash handling equipment, costs of transporting the dry bottom ash generated to a landfill, and costs of constructing, operating and maintaining new landfill space.**

EPA Homer City Data

Model Plant Capacity	BAS Flow (Mgal/year)	TWPE/Year Removed	Total Capital Cost 2012 $	$/TWPE Removed 2012 $	$/TWPE Removed 1981 $	*Revised $/TWPE Removed 1981 $
<50 MW	9.8	20	$6,430,000	$35,429	$14,242	$24,014
50-100 MW	18.6	38	$7,030,000	$20,327	$8,171	$13,778
100-150 MW	88.8	181	$8,220,000	$4,988	$2,005	$3,381
150-200 MW	256	522	$9,420,000	$1,980	$796	$1,342
200-300 MW	131	267	$11,200,000	$4,610	$1,853	$3,124
300-400 MW	153	311	$13,600,000	$4,799	$1,929	$3,253
400-500 MW	142	289	$16,000,000	$6,082	$2,445	$4,122
500-700 MW	276	564	$19,600,000	$3,814	$1,533	$2,585
700-900 MW	273	557	$24,400,000	$4,803	$1,931	$3,256
>900 MW	249	507	$29,100,000	$6,304	$2,534	$4,273

*** EPA's nitrate/nitrite result is 37 ppm. UWAG's split of the same sample (5.92 ppm) is more consistent with the UWAG median value of 1 ppm and the PISCES median value of 0.23 ppm. The UWAG median is based on 8 samples and the PISCES median is based on 37 samples. The revised EPA Homer City $/TWPE (1981$) is based on all EPA data except the UWAG nitrate/nitrite value is substituted for EPA's value.**