COMMENTS BY ECO POWER SOLUTIONS (USA) CORPORATINON

ON

FEDERAL IMPLEMENTATION PLANS TO REDUCE INTERSTATE TRANSPORT OF FINE PARTICULATE MATTER AND OZONE; PROPOSED RULE (FEDERAL REGISTER VOL. 75, NO. 147, AUGUST 2, 2010 AT 45210 et seq.)

EPA DOCKET ID NO. EPA-HQ-OAR-2009-0491

Eco Power Solutions (USA) Corp. (hereafter "Eco Power" or "Eco Power Solutions") has developed innovative technology for the reduction of sulfur dioxide ("SO_2") and various oxides of nitrogen ("NO_x") that is at least as effective as conventional Wet Flue Gas Desulfurization ("wet FGD") scrubbers for SO_2 and Selective Catalytic Reduction ("SCR") for NO_x while significantly reducing the effluent problems normally associated with the use of wet FGD scrubbers. In non-Electric Generating Unit ("non-EGU") applications, Eco Power's technology also captures waste heat, resulting in capital cost payback in five years or less. Because, according to the analyses EPA has relied upon, capital costs are a major element of costs in the non-EGU applications, EPA needs to reconsider its conclusion that for the non-EGU sector, control technology is not available below the cost-thresholds that EPA has identified (75 Federal Register No. 147 at 45289-90).

EPA has specifically sought comment on its preliminary conclusion not to require the non-EGU sector to control SO_2 and NO_x because of the cost of conventional technologies and comment on the specific control measures that would serve as the basis for those reductions (*Ibid*). These comments are Eco Power's response to that request. More information about Eco Power and its COMPLY 2000® technology, including test data from the Brookhaven National Laboratories may be found at http://www.ecopowersolutions.com/.

Additionally, to the extent that the voluntary "opt-in" method for the non-EGU sector is to be encouraged, the "opt-out" provisions of the proposed rule need to be simplified. The current proposal creates an unnecessary "lock in" for four years and a risk of a further "lock in" that will likely discourage many in the non-EGU sector from participating on a voluntary "opt-in" basis. Finally, the proposed rule wisely provides the Agency with flexibility to adapt monitoring strategies to new technology. That flexibility should be retained in any final rule.

Background – the Proposed Transport Rule Cost Thresholds

In order to determine "significant contribution" to downwind nonattainment and "interference with maintenance" problems and therefore determine which states should be regulated under the proposed rule, EPA has indicated that it looks at multiple criteria including air quality thresholds and maximum cost thresholds (*Id.* at 45233-34).

As to SO_2 Group 1 states (those states with more stringent limits), EPA in the draft rule determines for SO_2 that emissions budgets for 2014 should use reductions achieved at $2,000/ton or less to determine a state's significant contribution to downwind contamination (*Id.* at 45289-90). For 2012 NO_x budgets, EPA determined that emissions reductions achieved for $500/ton or less should be considered a state's significant contribution (*Id.* at 45290). EPA has also indicated that it considered NO_x compliance under the 1997 Ozone regulations (*Id.* at 45220). It did not consider the more stringent 2008 Ozone regulations which are themselves being reconsidered (apparently with a view toward further tightening) (See *Id.* at 45221).[1] Similarly, EPA did not consider the 2010 SO_2 rules (it did consider the annual and 24-hour $PM_{2.5}$ NAAQS which indirectly limit SO_2). Tighter standards will likely mean higher cost thresholds. Since both EGUs and non-EGUs have to make significant investment decisions regarding emission

[1] The Ozone NAAQS primarily targets NO_x and volatile organic compounds ("VOC") emissions.

control equipment, it is important that realistic cost thresholds be established. EPA has indicated that it expects to adopt a final Ozone rule "on or about the end of October 2010"[2]

A fact sheet released by the EPA about the Transport Rule states that EPA anticipates the use of the following control technologies in order for EGUs to come into compliance based on the 1997 Ozone regulations and the less stringent SO_2 regulations: Low NO_x Burners, SCR, or Scrubbers (wet FGD). Power plants may also decide to use low sulfur coal to achieve sufficient reductions ("Proposed Transport Rule Would Reduce Interstate Transport of Ozone and Fine Particle Pollution," U.S. Environmental Protection Agency, www.epa.gov/airtransport/pdfs/FactsheetTR7-6-10.pdf).

EPA, however, did not consider innovative technology such as Eco Power's COMPLY 2000® units. The combination of higher cost thresholds and the dramatically lower capital costs for Eco Power's technology in non-EGU applications (due to heat recapture) would likely result in a reconsideration of the decision not to require compliance by non-EGUs as to SO_2 and a potential reconsideration as to NO_x, depending on the stringency of the final Ozone rule. The cost issues are discussed in more detail below.

Non-EGU Control Technologies

Industrial, Commercial and Institutional ("ICI") boilers constitute part of the largest emitting categories of non-EGUs for both NO_x stationary source emissions and SO_2 emissions (75 Federal Register No. 147 at 45289-90). Furthermore, they are relatively uncontrolled compared to EGUs. According to a 2008 study by NESCAUM (Northeast States for Coordinated Air Use Management) very few units surveyed had NO_x controls and no units had

[2] EPA's status report, August 20, 2010 in State of Mississippi v. USEPA, D.C. Cir. No. 08-1200 and consolidated cases.

SO_2 controls (NESCAUM Applicability and Feasibility of NOX, SO2, and PM Emissions Control Technologies for ICI Boilers. NESCAUM, November 2008, 6-1).

Upon review of the currently available information EPA has proposed to determine that "…substantial SO_2 and NO_x reductions from EGUs are available at a cost per ton that is lower than the cost per ton of non-EGU controls" (75 Federal Register No. 147 at 45300). Additionally, the preamble of the proposed rule states, "The EPA has not identified SO_2 reductions for sources other than EGUs at $2,000/ton or less (in year 2006 $)" (*Id.* at 45289). Similarly, EPA also asserts that, as to NO_x reductions, it "has not identified additional non-EGU controls that can be achieved at $500/ton or less" (*Id.* at 45290). In making these determinations, EPA refers multiple times to a 2008 study (revised in 2009) conducted by NESCAUM (Northeast States for Coordinated Air Use Management) (*Id.* at 45289-90). That study, which updated an earlier 2000 NESCAUM study, among other things explored the cost/ton of NO_x and SO_2 emissions control technologies for ICI boilers. EPA states, "Regarding flue gas desulfurization, a recent report prepared by NESCAUM suggests scrubber costs are typically well above $2,000/ton for ICI boilers" (*Id.* at 45289) and "[f]or industrial boilers, a recent report prepared by NESCAUM suggests NO_x control costs are typically well above $500/ton for ICI boilers (*Id.* at 45290)." It is largely based on this study and studies referenced therein that EPA comes to the conclusion that non-EGUs cannot reduce SO_2 or NO_x emissions below its cost-effective thresholds (*Id.* at 45289-90).

NESCAUM 2008 Study

The study performed by NESCAUM used the CUECost model, initially developed by EPA to estimate costs of selected control technology for NO_x, SO_2, PM for large coal-fired EGU boilers. NESCAUM attempted to adapt the model to assess ICI boiler control costs. The

modeling results for ICI boiler control costs were, according to NESCAUM, consistent with published values of capital costs for air pollution control devices for small boiler sizes (coal, oil and natural gas-fired) (NESCAUM Applicability and Feasibility of NO_X, SO_2, and PM Emissions Control Technologies for ICI Boilers. NESCAUM, November 2008, 6-1).

While these results may be reasonably accurate for conventional technologies such as SCR and wet FGD, EPA and NESCAUM, did not consider newer technologies such as Eco Power Solutions' technology which is much more cost-effective in the non-EGU context than the conventional technology that NESCAUM considered.

NESCAUM's Estimated NO_x Control Costs

In the non-EGU sector NESCAUM's 2008 study produced a cost per ton of reduction of NO_x of $4,763 and $6,668 with SCR on a 250 MMBtu/hr and 100 MMBtu/hr coal-fired boiler respectively (with 80% NO_x removal rate) (*Id.* at 5-5).

Similarly, in the non-EGU context, the 2008 NESCAUM study provides a cost per ton of reduction of NO_x of $3,972 and $5,805 with SCR on a 250 MMBtu/hr and 100 MMBtu/hr oil-fired boiler respectively (with 80% NO_x removal rate) (*Id.* at 5-5).

Finally, the 2008 NESCAUM study provides a cost per ton of reduction of NO_x of $4,673 and $6,777 with SCR on a 250 MMBtu/hr and 100 MMBtu/hr natural gas-fired boiler respectively (with 80% NO_x removal rate) (*Id.* at 5-5).

NESCAUM's Estimated SO_2 Control Costs

NESCAUM's 2008 study produced a cost per ton of reduction of SO_2 of $4,427 and $9,547 with wet FGD on a 250 MMBtu/hr and 100 MMBtu/hr coal-fired boiler respectively (with 95% SO_2 removal rate) (*Id.* at 5-6).

In addition, the 2008 NESCAUM study provides a cost per ton of reduction of SO_2 range equal to $5,713 and $12,510 with wet FGD on a 250 MMBtu/hr and a 100 MMBtu/hr oil-fired boiler respectively (with 95% SO_2 removal rate) (*Id.* at 5-6).

Eco Power's Technology

Eco Power's technology, which is now operating at a state of the art demonstration facility in Louisville, Kentucky, can remove pollutants from a variety of EGU and non-EGU sources, including: coal, oil, and natural gas-fired boilers for industrial manufacturing (one of the highest emitting categories of non-EGU SO_2 and NO_x emissions) (75 Federal Register No. 147 at 45289-90). Recent COMPLY 2000® SO_2 removal data is Attachment A to these comments. The COMPLY 2000® equipment is also capable of attaining in the range of 10% or more CO_2 removal without sequestration, a feature that has important implications in potential upcoming CO_2 regulations.[3]

As noted above, Eco Power Solutions' technology has a heat recapture feature in non-EGU applications that causes the capital cost of installation to be offset in 5 years or less. A table showing energy recapture by COMPLY 2000® technology is Attachment B to these comments.[4] NESCAUM used, among other things, a fifteen year life expectancy and a 40% loan at 7.5% interest in its 2000 study as part of its cost calculations (NESCAUM 2000, Table III -1). It apparently used similar assumptions in its 2008 study. Because interest is normally computed on the basis of a declining loan balance, the loan balance in the first five years would decline far more quickly with heat recapture than without. Additionally, there would be no loan, interest or capital costs at all in years five through fifteen. It is not possible for a third party to easily re-run NESCAUM's model with these changes. It is clear, however, that in most non-EGU

[3] In cooler weather CO_2 reductions as high as 18% have been observed.
[4] The energy recapture analysis is based on exhaust flue gas temperatures and flow rates supplied by leading industrial companies and engineering designs developed by Eco Power.

applications, the cost for Eco Power's equipment will likely be far lower than those estimated by NESCAUM for wet FGD or SCR that have comparable removal rates. Additionally, Eco Power's demonstration facility is showing salable byproducts with retail values of $80 to $300 per ton. Thus it is likely that, at least as to SO_2 removal, the cost per ton of the COMPLY 2000® equipment for many non-EGU units will be below the $2,000/ton threshold that EPA has established as a measure of cost-effective removal technology.[5] With respect to NO_x, after adoption of the new Ozone regulations the NO_x threshold of $500/ton for non-EGU units will almost certainly increase. Thus, the cost-effective issue as to COMPLY 2000® technology would have to also be reconsidered in light of any new NO_x removal threshold that is established.

What Should EPA Do?

In light of the foregoing, EPA has at least two options. First, it could simply reconsider its decision not to include non-EGUs. Since EPA did not in the original proposed rule give notice that it intended to regulate non-EGUs, it would likely have to give at least 60 days notice of its potential intention to do so. This would provide non-EGUs with an opportunity to comment on whether, in light of the availability of new more cost-effective technology, non-EGUs should be included in the Air Transport rule. Consideration would also have to be given to establishing the timing and structure for full integration of ICI boilers and potentially other industrial component sources in the context of the new Ozone rule and SO_2 rule.

[5] In some instances NESCAUM apparently relied only on capital costs, and in other instances it attempted to factor in for some purposes estimated operating costs. Eco Power believes that operating costs for its COMPLY 2000® units will be comparable to wet FGD or SCR on comparably sized units except that the useful byproducts will have a much higher value than the gypsum that is the normal byproduct of conventional technology (gypsum typically sells for under $10 per ton. To the extent that only capital costs are considered, costs for Eco Power equipment are expected to be less than a third of the cost of conventional control technology (comparable initial capital cost, no capital costs in years 5 through 15 (due to heat recapture), lower interest costs in years 1 through 5, and lower net operating costs because of the value of its byproducts).

A second alternative would be to not only allow non-EGUs to "opt-in" to one or more of the proposed trading programs (as EPA has already proposed to do) but also to encourage such voluntary "opt-in" actions through liberalized "opt out" rules that would avoid the risk of a "lock in". Since the COMPLY 2000® costs for non-EGUs to control NO_x and SO_2 would be far less than EPA has estimated, non-EGUs might still want to "opt-in" because they will eventually need to reduce SO_2 and NOx to conform to the newly adopted SO_2 standards and the new proposed more stringent ozone regulations that EPA has said it will finalize in October 2010. And the salable SO_2 and NO_x credits from voluntary reductions made before final compliance dates would help reduce the potentially high cost to industry of implementing a new more stringent ozone rule. The more non-EGUs that voluntarily "opt-in" the sooner non-EGU emissions will be reduced.

The "Opt-Out" Rules Should be Changed to Avoid Deterring "Opt-In" Decisions

The proposed rule established four "opt-in" and "opt-out" provisions for NO_x Annual, NO_x Seasonal, SO_2 Group 1 states, and SO_2 Group 2 states. The provisions are essentially comparable except that the NO_x Seasonal "opt-out" year-end date is September 30 rather than December 31. All four "opt-out" provisions have the same fundamental flaw- the right to "opt-out" is limited and conditioned in a way that is both unnecessary and risks deterring units from "opting-in" for fear that they will be "locked in".

The decision of a company to seek to "opt-in" is by its very nature voluntary. Once a company makes that decision it is required to fill out an application and obtain admission into the program (See proposed rule Sec. 97.441 at 75 Fed. Register at 45389-90) (as to NO_x Annual).

However, under Sec. 97.442 (*Id.* at 45390-91) of the proposed rule withdrawal can occur "only if…the Administrator issues written approval of the request." No request may be

submitted for the first four years after entry into the program and withdrawal is conditioned on (1) "the TR [Transport Rule] NO_x Annual opt-in unit must meet the requirement to hold TR [Transport Rule] NO_x Annual allowances…and cannot have any excess emissions" (*Id.* at 45390); and (2) the Administrator is to deduct from the compliance account of the source allowances equal in amount to the opt-in unit and if there are no units at the source the Administrator will close the compliance account. "If the requirements for withdrawal under…this section are not met, the Administrator will issue a written disapproval of the request to withdraw. The unit covered by the request shall continue to be a TR NO_x Annual opt-in unit." (*Id.* at 45391) The same basic structure is followed in the sections dealing with the NO_x Seasonal, SO_2 Group 1 and SO_2 Group 2 (Sec. 97.542, Sec. 97.642, and Sec. 97.742).

As shown below the four year "lock in" and the first of these requirements are both harsh and unnecessary. The second of these requirements is dependent on actions of the Administrator which may be delayed or not completed for reasons completely out of the control of the NO_x Annual unit (e.g. insufficient Administrator personnel staffing, Administrator budgeting issues, computer problems, etc.). There is no reasonable justification for locking in a unit that wishes to exit what is supposed to be a voluntary program. Providing for ninety days advanced written notice (as is done in the proposed rule) is appropriate for the orderly administration of the program and requiring a company to complete the year in which it "opted-in" is reasonable. But deterring companies by a four year "lock in" serves no useful purpose and delays acceleration of emission reductions that would otherwise occur if units were encouraged to "opt-in".

Similarly, the requirement that a unit hold emission allowances "and cannot have any excess emissions" is unreasonable in light of the acknowledgement by the Agency that year-to-year emissions will vary significantly based on a range of operating conditions that cannot

always be determined precisely in advance. The purpose of ensuring that adequate emission allowances are held at year end and are cancelled thereafter can be addressed not by restricting a company's ability to "opt-out" but by monetizing the problem and requiring a company to pay for any shortfall in emission allowances (based on the then current market price) and, in addition, to pay a penalty of two times the market price of the allowance shortfall (i.e. in effect a form of treble damages). Such amounts would be due and payable within a reasonable period of time (e.g. sixty or ninety days) after the effective date of the termination. Failure to make timely payment would be a violation of the Clean Air Act subjecting the violator to daily penalties pursuant to Title 42 U.S.C. Sec. 7413(a) (3) and under subsections (c), (d), and (e) of that section.

In other words the decision to "opt-out" like the decision to apply to "opt-in" should be solely that of the applicant in a voluntary program. There should be no "lock in" period (except for the initial year in which the applicant has entered the program) and there should be no approval required of the Administrator to leave the program. The ninety-day notice by the applicant should be binding on the Administrator and the Administrator should have no authority to limit or condition withdrawal after the first year so long as a ninety-day notice is given. If the NO_x Annual "opt-in" party did not have sufficient allowances at year end it would simply pay for the shortfall plus pay the penalty. Companies would be encouraged to come as close as possible to having the correct number of allowances so as to minimize their final payment. The same approach should be followed in the NO_x Seasonal, and SO_2 Group 1 and Group 2 sections of the regulations.

What EPA has Done Right and Should Not Change From the Proposed Rule

In the proposed rule EPA has preserved for itself flexibility to consider petitions under Sec. 75.66 to approve alternatives to conventional continuous monitoring systems (See Sec. 97.435 as to the NO_x Annual program, Sec. 97.535 as to the NO_x Seasonal program, Sec. 97.635 as to the SO_2 Group 1 program, and Sec 97.735 as to the SO_2 Group 2 program). That flexibility is essential in adjusting to new technologies that, among other things, may use different chemical reactions than conventional technologies and therefore may need to be monitored differently.

Thus, for example, most chemical analyzers on the market measuring NO_x work on a principle called Chemiluminescence which measures the presence of NO_x by the illumination from a chemical reaction. The reaction is essentially between NO and ozone which produces light that is measured by a photomultiplier tube ("PMT"). A leading manufacturer of this type of equipment, Teledyne Technologies, Inc., has advised that this conventional measuring technology will not reliably measure NO_x in the context of innovative technology using an ozone based reaction to neutralize NO_x. This is because ozone from the NO_x removal process provides excess ozone to the NO measuring reaction.

Workable solutions to this problem are in the process of being developed but this is only one example of many situations that may arise in which innovative emissions control technologies may require somewhat different monitoring strategies than are currently assumed to be applicable in other provisions of the proposed Transport Rule. In the event the Agency receives any comments suggesting that those sections that provide this needed flexibility be restricted or eliminated, those comments should be rejected because they would limit the ability of the Agency to consider and approve alternative compliance strategies that may prove necessary in the context of innovative technologies as they emerge over the coming years.

We appreciate the opportunity that the Agency has given to provide comments and if the Agency has any questions about these comments or about COMPLY 2000® technology, please contact Tom Thompson, Chief Executive Officer, Eco Power Solutions, 1266 Furnace Brook Parkway Suite 401, Quincy, MA 02169, (617) 706-2656, tom.thompson@ecopowersolutions.com or Norman W. Bernstein, Member, N.W. Bernstein & Associates LLC, 800 Westchester Ave Suite N319, Rye Brook, NY 10573, (914) 358-3500, nwbernstein@nwbllc.com

Attachment A

Attachment A reflects a test run on September 22, 2010 of a COMPLY 2000® unit treating SO_2 emissions from a coal-fired boiler at Eco Power's Louisville, Kentucky demonstration facility. All values are in ppmv. The top line in the graph (blue) represents SO_2 inlet concentrations, the second line (red) represents SO_2 outlet concentrations and the third line (green) represents percent reduction.[1]

[1] Data as to NO_x removal will be reported separately after sensor reliability issues noted on pp. 10-11of these comments are resolved.

VantagePoint Trend - [Trend 1]

File View Trace Time Period Axes Shape Tools Window Help

Items - [Tags]

Options Views

- MyEnterprise
  - Public
    - Reports
    - Tags
    - Trends
- System
  - Applications
  - Common
  - License
  - Security
  - Services
  - Solutions
  - Sources

Item Name	Description
AC_245	Conductivity Controll
CIT_200A	Stack O2
CIT_200B	Stack NOx
CIT_200BX	Stack NOx Percent R
CIT_200C	Stack CO2
CIT_200CX	Stack CO2 Percent R
CIT_200D	Stack O3
CIT_200E	Asperator O2
CIT_200F	Asperator NOx
CIT_200G	Aperator CO2
CIT_200H	Asperator SOx
CIT_200I	Stack SOx
CIT_200IX	Stack SOx Percent R
COAL_COMPLY_FLOW_...	Coal Comply Flow Se
COAL_COMPLY_MAN_SP	Coal Comply Manual
DPIT_216	Diff Pressure Across

Items | Types

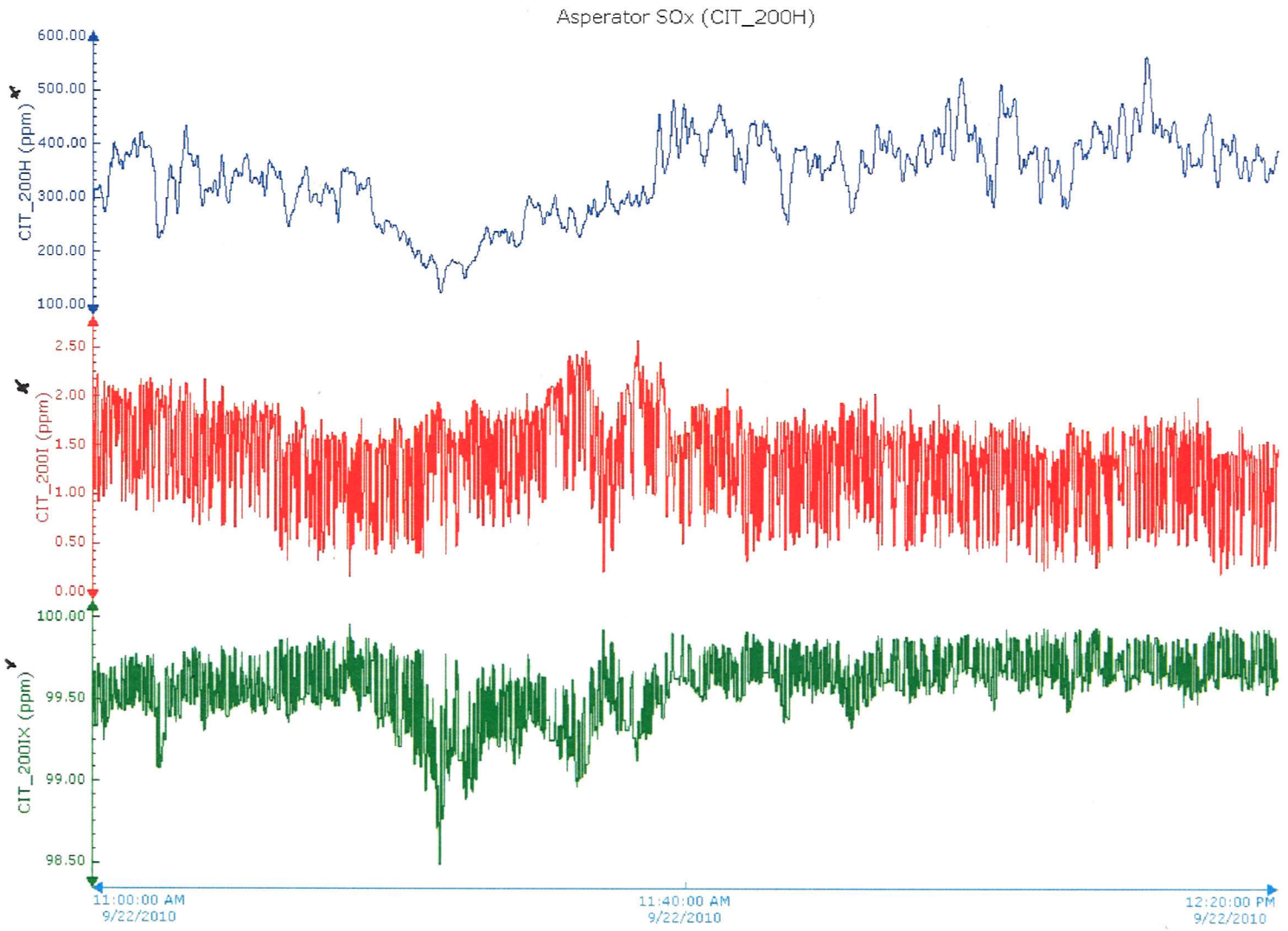
Security

Sources

System

9/22/2010 11:00:00 AM | 9/22/2010 12:20:00 PM | 0 days and 01:20:00

Automatic



Tag	Description	Properties	Min	Max	Unit	Precision	Format	IO Address
...ise.Public.Tags.CIT_200H	Asperator SOx		0	100	ppm	2	Decimal	EcoPower:RSLinx Enterprise:
...rise.Public.Tags.CIT_200I	Stack SOx		0	100	ppm	2	Decimal	EcoPower:RSLinx Enterprise:
...se.Public.Tags.CIT_200IX	Stack SOx Percent Removal		0	100	ppm	2	Decimal	EcoPower:RSLinx Enterprise:

Portal URL: http://histserver/VantagePointPortal/

* By volume (ppmv)

Attachment B

Attachment B represents energy recapture analyses related to steel, glass, and aluminum industry units, coal-fired boilers and a combined cycle power plant based on data supplied by leading industrial companies as noted in footnote 4 to these comments.

ECO POWER SOLUTIONS (USA) CORP.
COMPLY 2000® TECHNOLOGY
ENERGY RECOVERY AND EMISSION REDUCTIONS

	Steel	Glass	Aluminum	Coal-Fired Boiler	Combined Cycle Power Plant
Flue Gas Flow (lbm/hr)	124,620	55,032	310,042	1,494,549	2,705,402
Flue Gas Temp (^{o}F)	1,200	800	1,300	309	295
Waste Heat Boiler + COMPLY 2000®					
Flue Gas Temp Out	105	110	110	110	110
Heat Recovery (MMBtu/hr)	30.02	8.35	81.17	65.43	110.11
Steam Production (lb/hr)	30,021	8,354	81,169		
Power Output (MW)	3.00	0.84	8.12		

Notes:

1. Virtually all recaptured heat can advantageously be utilized in an appropriate design. One of many possible examples would include by heating feedwater for the economizer so as to increase steam production because more heat is available in the front section of the boiler.

2. As the above examples show, effective utilization of Eco Power's technology can reduce the exhaust flue gas temperatures to near ambient, thereby recovering most of the available heat that can be utilized to increase overall plant efficiency.