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August 8, 2011

Mr. Alan Newman
Washington Department of Ecology
Air Quality Program
P.O. Box 47600
300 Desmond Drive
Lacey, WA 98504-7600

Re: TransAlta Centralia Generation LLC's Comments on Proposed Revisions to BART Order to Address SNCR

Dear Mr. Newman:

TransAlta Centralia Generation LLC ("TransAlta") has reviewed the Department of Ecology's proposed revisions to the Implementation Order that was issued in June of 2010 ("BART Order") and we would like to provide the following comments. The issues of concern are described in this letter and suggested changes to address these concerns are made in attached red-line version of the draft BART Order.

<u>Nitrogen Oxides Limit (Condition 1.1.1)</u>
The draft Order proposes a nitrogen oxides ("NOx") emission limit of 0.18 lb/MMBtu based on a presumed reduction factor of 25% of the Flex Fuels Project emission rate. However, for the following reasons, the 25% factor does not necessarily apply and is unlikely to be achieved in practice.

As background, the CH2M Hill "BART Analysis for Centralia Power Plant," p.3-6 (rev. July 2008) cites a study by Harmon (1998) concluding that tangentially fired boilers are able to achieve a 20 to 25 percent reduction with the application of SNCR. Based on the study and other information, CH2M Hill's 2008 BART Analysis applied the high end of the range, 25 percent, to the baseline emission rate of 0.30 lb/MMBtu to derive an estimated emission rate of 0.228 or 0.23 lb/MMBtu for the purpose of modeling visibility benefits from SNCR. (See Case 3 SNCR estimated emissions of 0.228 in 2008 BART Analysis).

Ecology's BART Determination Support Document (rev. April 2010) concurred that the 25 percent reduction factor was a reasonable assumption. TransAlta's May 2008 response to Ecology's comments on the January 2008 BART Analysis report reiterated the Harmon findings and implicitly acknowledged that the high end of the range from adding SNCR to existing LNC3 and Flex Fuels is 25%:

> "The control effectiveness of SNCR is a function of many variables including the uncontrolled emissions concentrations, physical conditions, and operational conditions. The greatest control effectiveness is generally achieved with high uncontrolled NOx concentrations, on new units that have been specifically designed for SNCR, and at a specific load … In addition, a study by Harmon indicates that a large coal fired tangentially fired unit equipped with a low NOx SNCR has the potential to reduce NOx emissions by only 20-25 percent with an ammonia slip of less than 10 ppm…."

The conclusion that 25 percent reduction is highest likely reduction is supported by PGE's "Alternative BART Analysis for the Boardman Power Plant," p. 3-4 (Aug. 27, 2010) concludes that SNCR achieves "emissions reduction levels of 15 to 25 percent for retrofit applications." At Ecology's request, in March 2010 TransAlta modeled the visibility benefits from adding SNCR to Flex Fuels. Based on the previous 25 percent reduction factor from the 2008 BART Analysis report, the 2010 visibility modeling assumed an emission rate of 0.18 lb/MMBtu based on the Flex Fuel Project rate of 0.24 lb/MMBtu. It is important to note that the 25 percent assumption was not based on an engineering study or a vendor estimate. The emission reduction was not intended to be relied upon as a potential enforceable limit but only as an approximation of the visibility benefits.

TransAlta did not begin to develop SNCR emission rates for use as an enforceable BART limit until the passage of SB 5769 earlier this year. In recent months TransAlta selected and is currently working with a SNCR system vendor to determine what NOx reduction efficiency and emission rates will be achievable with the proposed SNCR systems when they are installed on the TransAlta units. A computational fluid dynamics (CFD) model of each of the two Centralia furnaces must be generated as the first step in designing the optimal emissions reduction systems. This modeling and design must be completed before a construction contract for the systems can be issued and a warranty for the projected NOx reduction efficiency is obtained from the vendor.

The creation and verification of CFD models allow the vendor's technical experts to predict temperature distribution, gas flow paths and concentration and distribution of constituents including O2, CO, NOx, and unburned carbon within the boilers. The model is used to select the size, location and design of the SNCR system components and capabilities. The first step in the CFD modeling process is to generate a model based on the Plant's engineering drawings for each boiler. The next step is to develop a baseline simulation at low & high boiler loads on each Centralia unit. This requires gathering operational data on temperature distribution, gas flow paths and concentration and distribution of constituents including O2, CO, NOx, and unburned carbon during operation of the units at different production levels. Since both units were off-line from early March through late July, the testing to gather the required data is currently scheduled for August 2011.

The data gathered in August will be used to calibrate the CFD models developed for each unit and estimate potential NOx reductions achievable over the anticipated operating range of the units. The information obtained from the CFD modeling will allow the selected vendor to finalize the design of the SNCR system equipment and warranty the design NOx removal efficiency of the SNCR systems in October 2011.

Prior to completion of the CFD modeling and based on current information, the limit that can be achieved with reasonable assurance would be 0.22 lb/MMBtu, which is already a reduction of more than 25% from the pre-BART baseline emission levels. The study by Srivastava et al, Table 3, cited in the draft Determination Support Document lists 20 plants with SNCR that had emission rates ranging from 0.274 to 0.755, significantly higher than the 0.22 lb/MMBtu rate that TransAlta is proposing for Centralia. Although the removal rates may be higher, TransAlta understands that SNCR has diminishing efficiency at lower levels of baseline emissions, such as the Flex Fuel Project rates of the Centralia Plant.

An emission rate of 0.22 lb/MMBtu is substantially lower than the median emission rate of 0.27 for all the SNCR systems proposed as BART in the Western United States (see attached table). The attached table and the Department's own draft BART Determination Support Document show that no coal-fired plant in the Western United States has been determined to be capable of achieving a BART emission rate less than 0.19 lb/MMBtu with SNCR technology and LNC3 combustion controls combined.

Based on the foregoing information and TransAlta's operating experience with LNC3 technology, an emission rate of 0.22 lb/MMBtu should be achievable with the addition of SNCR technology to the current LNC3 technology and an ammonia slip of less than 5 ppm. This would result in a greater than 25 percent reduction from the pre-BART emissions. Operating experience will determine whether an additional emission reduction to a level of 0.20 lb/MMBtu (a 33% reduction from 0.30 and 17% reduction from 0.24) is achievable with optimization of an SNCR system. However, as explained in the CH2M Hill BART Analysis, the reduction achievable depends upon many factors, including higher ammonia slip than the proposed limit. Achieving the Department's proposed emission rate of 0.18 is considered very unlikely (see attached discussion). A discussion of the unique factors that influence NOx the installation of SNCR for NOx reduction in the TransAlta units is attached in the letter from the Centralia Plant engineer.

In conclusion, it is necessary to complete the study required by Section 5 of the order to determine the lowest level that SNCR can reasonably achieve before a limit lower than 0.22 lb/MMBtu is set. TransAlta proposes that, at the conclusion of the study required by Section 5, a lower emission limit (as low as 0.20 lb/MMBtu) will be requested if it is shown to be achievable by the result of the study. If the plant is able to optimize the systems to reach 0.20 lb/MMBtu, this level would be among the lowest achieved by any plant in the Western U.S. utilizing SNCR with LNC3 technology.

Ammonia Emissions Limit

Compliance with the ammonia emissions limit must be determined on the same 30-day rolling average time frame as the NOx limit. Without the flexibility to adjust ammonia addition rates as needed to operate the SNCR system optimally, we cannot assure that we can achieve compliance with the 0.22 lb/MMBtu NOx limit.

Ammonia Emissions Monitoring

We have not been able to find any CEMS for ammonia that will provide the required accuracy and repeatability on our plants when controlled by SNCR. A recent review of the technology confirms this (http://www.ladco.org/about/general/Emissions_Meeting/Greaves_032510.pdf). NDIR/FTIR ammonia analyzers have proven to be unreliable and inaccurate for measuring ammonia slip in the 5 ppm range. UV ammonia analyzers have also proven to be inaccurate for measuring ammonia slip in the desired range. TDLAS in-situ analyzers cannot be used on the saturated stack following the SO_2 scrubber.

The Differential NOx/NH3 Converter Method described on slide 8 of the presentation is the only technology that might be effective; however this type of system only works accurately when NOx emissions are at very low levels. For our process with SNCR the full scale of the analyzers must be set at levels approximately 200 ppm. The allowable 2.5% daily drift on an analyzer with a full scale of 200 ppm is 5 ppm. Since two analyzers are used to determine the ammonia concentration, the allowable drift of the two analyzers could compound the potential error to 10 ppm which is double the proposed limit for ammonia and would be unable to pass the proposed certification requirements. Based upon this review, it has been determined that monitors for ammonia that can be certified as CEMS are not available for our units.

While we intend to install some type of process monitoring equipment on the SNCR system to provide necessary ammonia data for optimizing the SNCR operation, as we described above, the current technology cannot meet requirement for use as a CEMS. We therefore propose removing the ammonia monitoring requirements from the Order and replacing them with an annual compliance test. Once we determine the best system to monitor ammonia levels for the ammonia optimization study and where it can be installed to provide the most useful information (with assistance from the SNCR system supplier), we will include that information in the study plan required by condition 5.2.

Greenhouse Gas Emissions

Including SB 5769's greenhouse gas (GHG) emission limitations is inappropriate. The GHG requirements are unrelated to the BART Order and the requirements of the Regional Haze SIP. SB 5769 provides that these requirements will be incorporated in an enforceable agreement between TransAlta and the State. There is no implication in the statute that the GHG limits should be incorporated in a BART determination. To the extent necessary to support the timelines used for the cost benefit calculations in the BART determination Support Document, State law establishes the enforceability of those timelines for EPA.

TransAlta believes that completely removing this section is appropriate; however, we have proposed alternative language if the Department cannot rely on State law to establish the enforceability of the timelines. The proposed language utilizes the language "cease burning coal" similar to the EPA approved Oregon BART language.

Operating Days and Startup/Shutdown (Section 8.3)
Removal of the 360 MW minimum operating rate references in the BART Order has essentially eliminated the startup/shutdown allowance from the existing Order. There must be an allowance for partial operating days or startups and shutdowns in the Order because the limits are based upon operation of the SNCR systems. These systems cannot operate under startup and shutdown conditions. EPA concurs that BART determinations may take into account higher emissions during startup and shutdown. (Letter from EPA Region 8 to South Dakota Department of Environment and Natural Resources, Sept. 13, 2010, p. 2, attached). If Ecology does not concur with the 360 MW minimum operating rate approach, then one alternative would be that an operating day with less than 8 hours of operation would have to be eliminated from the 30-day average since it will represent either startup or shutdown conditions. We propose that section 8.3 reflect that only days with 8 or more hours of firing coal would be averaged into the 30-day average. This is similar to the 8-hour startup allowance in our Title V permit condition M9 and we believe would exclude a portion of emissions that occur only during the beginning of a startup or ending of a shutdown from the 30-day average.

BART Determination Support Document (Section 4.2 and Appendix I)
We request that Ecology leave the BART determination as LNC3 and Flex Fuels. The installation of SNCR could be based on the technology needed to meet the State's Visibility Reasonable Progress goals. This approach would avoid the need to issue a new BART Order but would still accomplish the goal of setting a lower enforceable limit to improve visibility.

Please contact Brian Brazil or Rick Griffith if you have any questions regarding these comments.

Sincerely,

Bob Nelson
Director, Centralia Operations
TransAlta Centralia Generation LLC

cc: Clint Lamoreaux, Southwest Clean Air Agency
Rick Griffith

SNCR BART/RFP Determinations for Western Coal Plant Sources					
Emission Unit	**Assumed NOx Control Type**	**NOx Emission Limit**	**Assumed SO_2 Control Type**	**SO_2 Emission Limit**	**Reasonable Progress NOx Controls**
Alaska (http://www.dec.state.ak.us/air/anpms/rh/rhdoc/Section III.K.6.pdf)					
GVEA Healy Unit 1	existing LNB with OFA, SNCR required to be added	**0.20 lb/MMBtu**	existing dry sorbent injection system	0.30 lb/MMBtu	Will be evaluated if not shut down by 2024
Colorado (http://www.cdphe.state.co.us/ap/regionalhaze.html)					
CENC Unit 5	new LNB with SOFA, and SNCR	**0.19 lb/MMBtu Or** 0.26 lb/MMBtu Average for Units 4 & 5 (30-day rolling)	None	1.0 lb/MMBtu (30-day rolling)	no
TSG&T Craig Unit 1	new SNCR System	0.28 lb/MMBtu (30-day rolling)	Wet Limestone scrubber	0.11 lb/MMBtu (30-day rolling)	**BART is 0.27**, 0.28 allowed with SCR on Unit 2
TSG&T Craig Unit 2	(SNCR is BART) new SCR System for RP	0.08 lb/MMBtu (30-day rolling)	Wet Limestone scrubber	0.11 lb/MMBtu (30-day rolling)	**BART is 0.27,** 0.08 required for reasonable progress goal
Nevada (http://deq.state.wy.us/aqd/308 SIP/309(g) SIP 1-7-11 Clean Final.pdf)					
NVE Reid Gardner Units 1 & 2	ROFA with Rotamix	**0.20 lb/MMBtu** (12-month rolling)	existing wet soda ash FGD	0.15 lb/MMBtu (24-hr)	no
NVE Reid Gardner Unit 3	ROFA with Rotamix	**0.28 lb/MMBtu** (12-month rolling)	existing wet soda ash FGD	0.15 lb/MMBtu (24-hr)	no
North Dakota (http://www.ndhealth.gov/AQ/RegionalHaze/Regional Haze Link Documents/Main SIP Sections 1-12.pdf)					
BEPC Leland Olds Unit 1	new LNB with SOFA and SNCR	**0.19 lb/MMBtu** (30-day rolling)	new Wet Limestone scrubber	0.15 lb/MMBtu (30-day rolling)	no
BEPC Leland Olds Unit 2	new LNB with ASOFA and SNCR	**0.35 lb/MMBtu** (30-day rolling)	new Wet Limestone scrubber	0.15 lb/MMBtu (30-day rolling)	no
GRE Stanton Unit 1	new LNB with OFA and SNCR	0.29 or **0.23 lb/MMBtu** (30-day rolling)	new Wet Limestone scrubbers	0.24 or 0.16 lb/MMBtu (30-day rolling)	Note: limits on lignite and subbituminous
MPC Milton R.Young Unit 1	new LNB with ASOFA and SNCR	**0.36 lb/MMBtu** (30-day rolling)	new Wet Limestone scrubber	0.15 lb/MMBtu (30-day rolling)	no
MPC Milton R.Young Unit 2	new LNB with ASOFA and SNCR	**0.35 lb/MMBtu** (30-day rolling)	existing Wet Limestone scrubber	0.15 lb/MMBtu (30-day rolling)	no

Average SNCR BART Limit	0.26 lb/MMBtu
Median SNCR BART Limit	0.27 lb/MMBtu
Lowest SNCR BART Limit	0.19 lb/MMBtu

TransAlta

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July 28, 2011

Mr. Brian Brazil

Re: Selective Non Catalytic Reduction (SNCR) Technology implementation at Centralia Plant

Brian:

Station #1 & #2 boilers were retrofitted with Low NOx Burners (LNB) in 2002 and 2001, respectively. This modification, which included installation of Separate Over Fire Air (SOFA) and Close Coupled Over Fire Air (CCOFA) injection ports, allowed the NOx emissions to be lowered to 0.30 lbs/mm BTU. In 2008 as part of conversion to PRB fuels which are inherently lower in nitrogen content, and additional fine tuning of the boilers, the achievable NOx level was further reduced to 0.24 lbs/mm BTU.

Earlier this year, we embarked on installation of SNCR technology on both boilers for additional reduction of NOx. In SNCR systems, a reagent is injected into the flue gas in the furnace within an appropriate temperature window. The reagent generates ammonia and the process reaction converts NOx to nitrogen and water vapor. The performance of an SNCR system depends on a variety of factors such as the furnace baseline oxygen and carbon monoxide concentrations, injected reagent quantity and distribution, residence time, and flue gas temperature.

The influence of these parameters can have a significant impact on the performance of an SNCR system. The theoretical reduction for SNCR reaction is one mole of NOx to one mole of ammonia. However, experience has shown that a portion of ammonia can exit the boiler and cause numerous environmental and operational concerns such as formation of detached plumes, corrosion and boiler component pluggages. The unreacted ammonia reacts with other compounds in the flue gas to form ammonia compound such as NH4 HSO4 or NH4 Cl. These compounds are corrosive and can create blockages of the air preheater baskets that will lead to forced unit outages. Free ammonia also has the potential to contaminate the captured fly ash and the station SO2 control system's by-products creating additional problem.

Since the PRB fuels conversion at the plant we have had numerous issues unique to our boilers. These fireboxes, which were originally designed for combusting the native fuel from the mine next door, are too short to allow sufficient heat adsorption from PRB fuels which generate higher radiant heat. This has resulted in excessive furnace exit gas temperature leading to non stratified isothermal planes. The excessive heat also generates fluid slag (due to high sodium PRB ash) on the walls that plug up observation ports and instrumentation taps on the boiler walls. The SOFA injection can also create pocket of high CO gas and unpredictable mixing zones for the reaction between the SNCR reagent and the NOx in the flue gas stream. These issues would significantly affect the performance of SNCR systems relying on injection above the furnace.

The SNCR systems using multi nozzle lances injecting at the superheater pendant positions, rely on rotary insertion systems identical to our long lance IK soot blowers. These lances are unreliable, experience routine failures from clinker falls, and remain out of service on a regular basis. The long term viability of any SNCR system relying on multi nozzle lances is questionable.

We have had multiple conversations with potential suppliers of SNCR technology and there appears to be a significant reluctance to offer an ironclad guarantee regarding the removal efficiency and the free ammonia slip stream at the boiler outlet. One of the contributors to this issue is the fact that we are already operating with extremely low NOx levels (0.24 lbs/mm BTU) that the actual realized system performance may be hard to predict.

We are currently working with a SNCR system vendor to determine what NOx reduction efficiency and emission rates will be achievable with their proposed design of SNCR systems. We have also retained the services of an independent consulting firm specializing in modeling of SNCR components and their interaction with various parameters within a boiler. The outcome of these models will provide additional insight as to the performance of the SNCR system.

The above mentioned concerns and due to the fact that the actual long term performance of any SNCR system can only be verified by post commissioning optimization, we do not anticipate to be able to achieve more than 19-20% NOX removal efficiency. However, it is our intention to push our system to its highest sustainable capability.

Please feel free to contact me if you have any questions regarding these comments.

Sincerely,

Jim Khorsand, P.E.
Plant Lead Engineer

cc: Trevor Ebl

Implementation of NH3 measurement on Post Combustion NOx Reduction Systems.

LADCO WORKSHOP

March 24-25th, 2010

Ammonia Slip Measurement

Post Combustion NO_x Reduction:

- Selective non-catalytic reduction (SNCR)
- Selective catalytic reduction (SCR)
- Common requirement: introduction of NH_3

$$4NO + 4NH_3 + O_2 \rightarrow 4N_2 + 6H_2O$$

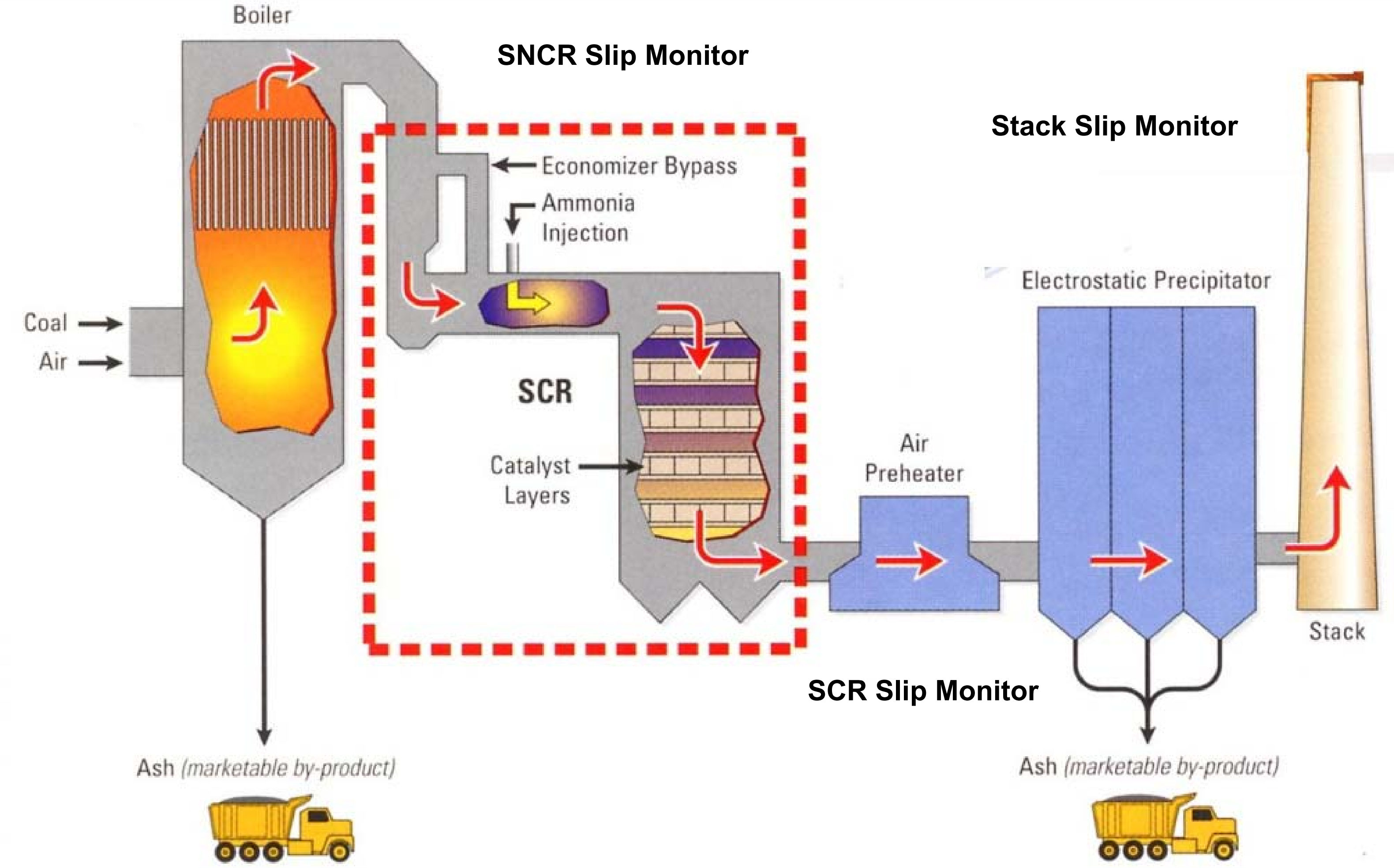
$$2NO_2 + 4NH_3 + O_2 \rightarrow 3N_2 + 6H_2O$$

Ammonia Slip Measurement

Consequences of Ammonia Slip:

- If over-titrated NH_3 escapes – pollutes and wastes
- Violates permit limit if applicable
- If due to incomplete mixing – NO_x escapes
- With high sulfur fuels ammonia sulfate and bisulphate formed – can foul air pre-heater
- Ammonia contaminates fly ash making it hazardous

Ammonia Slip Measurement



Ammonia Slip Measurement

Monitoring Methods:

- FULLY EXTRACTIVE (DRY BASIS)
- FULLY EXTRACTIVE (HOT-WET BASIS)
- DILUTION EXTRACTIVE (WET BASIS)
- IN-SITU (CROSS STACK or PROBE)

Measurement Types:

- Chemiluminescence ,UV Absorption, FTIR, DOAS,
- (TDLAS)

Ammonia Slip Measurement

- **Analyzer Glossary**
- **Chemiluminescence:** (Chemical Light) a measurement technique for NO/NOx that measures the light given off as a result of the reaction between NO and Ozone. The light output is proportional to the concentration of NO. NO_2 is converted to NO using a high temperature catalytic converter. NO_2 does not react with Ozone so it must be converted to NO.
- **UV Absorption:** a measurement technique that uses a UV spectrometer to measure a particular wavelength where the gas of interest absorbs (measurement) and a wavelength where the gas of interest does not absorb (reference). Most often used for SO_2 measurement in high concentrations.
- **Tunable Diode Laser Absorption Spectroscopy (TDLAS):**By scanning across a very narrow bandwidth in the IR region where no cross interferences occur, the absorption of the IR source by the targeted gas is proportional to the target gas concentration.
- **Fourier Transform-Infrared Spectroscopy (FTIR):** This technique measures the absorption of infrared radiation by the sample gas versus wavelength. The infrared absorption bands identify molecular components.
- **Differential Optical Absorption Spectroscopy (DOAS):** is a method to determine concentrations of trace gases by measuring their specific narrow band absorption structures in the UV and visible spectral region

Ammonia Slip Measurement

Inlet/Outlet Differential NOx Method

- First method is based on the calculation of ammonia slip using the inlet/outlet differential NOx method along with ammonia flow rate and stack flow calculation. This method has been employed successfully in many EPA permitted CEMS, the SCAQMD and many other AQMD's for control and compliance monitoring. This method is reliable and low in cost for sources where SCR inlet monitoring is a requirement.

- The inlet/outlet method is used where SCR control is also a requirement since both the SCR inlet NOx and SCR outlet NOx are measured on a continuous basis. The outlet measurement is usually the CEMS compliant system. The inlet system requires a second probe mounted on the duct before the SCR and a second NOx analyzer.

- The NOx and NH_3 react on a 1:1 basis. Therefore, the amount of NH_3 reacted is equal to the amount of NOx reduced in the SCR. The simplified formula is:

$$NH_3 \text{ slip} = NH_3 \text{ fed} - (NOx \text{ in} - NOx \text{ out})$$

Ammonia Slip Measurement

Differential NOx/NH3 Converter Method:

- An alternate ammonia method using direct measurement of differential NOx on the stack. This method utilizes two (2) NOx analyzers on the outlet (stack) CEMS. An ammonia converter is included at the stack probe which converts NH3 slip to NOx. The sample line includes an additional sample tube to transport the NH3 converted sample stream to an additional NOx analyzer.
- One analyzer is used to measure NOx emissions and the second is installed to measure the converted stream which includes the NOx and ammonia converted to NOx for the ammonia slip calculations. The NOx analyzers are identical – range, manufacturer, model number.
- A special probe Is used to catalytically convert NH3 into NOx. The increase in NOx that results is NH3 slip. The probe contains an electrically heated oxidation catalyst where NH3 is oxidized with oxygen on the catalyst surface into nitric oxide (NO) and water, as follows:

$$4\ NH_3 + 5\ O_2 = 4\ NO + 6\ H_2O$$

- The NH3 conversion process has an efficiency of 90-98% depending on the sample flowrates, age of converter, and NH3 concentrations. Conversion efficiencies of 95%+ can be expected on typical combustion turbine applications.

NH3 slip (ppm) = NOx (ppm) (total converted) – NOx (ppm) (unconverted)

Ammonia Slip Measurement

Direct measurement of NH3:

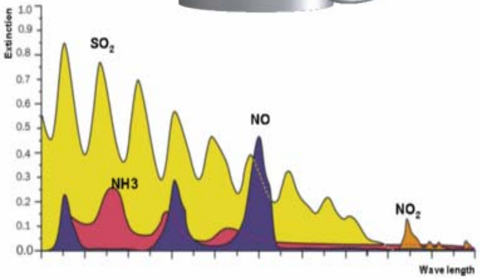
- This can be done using several methods, both across the stack or duct measurement or Insitu probe type systems.
- Typical across duct measurements use the Tunable Diode Laser method, or DOAS monitor.

Ammonia Slip Measurement

In-Situ…Advantages:

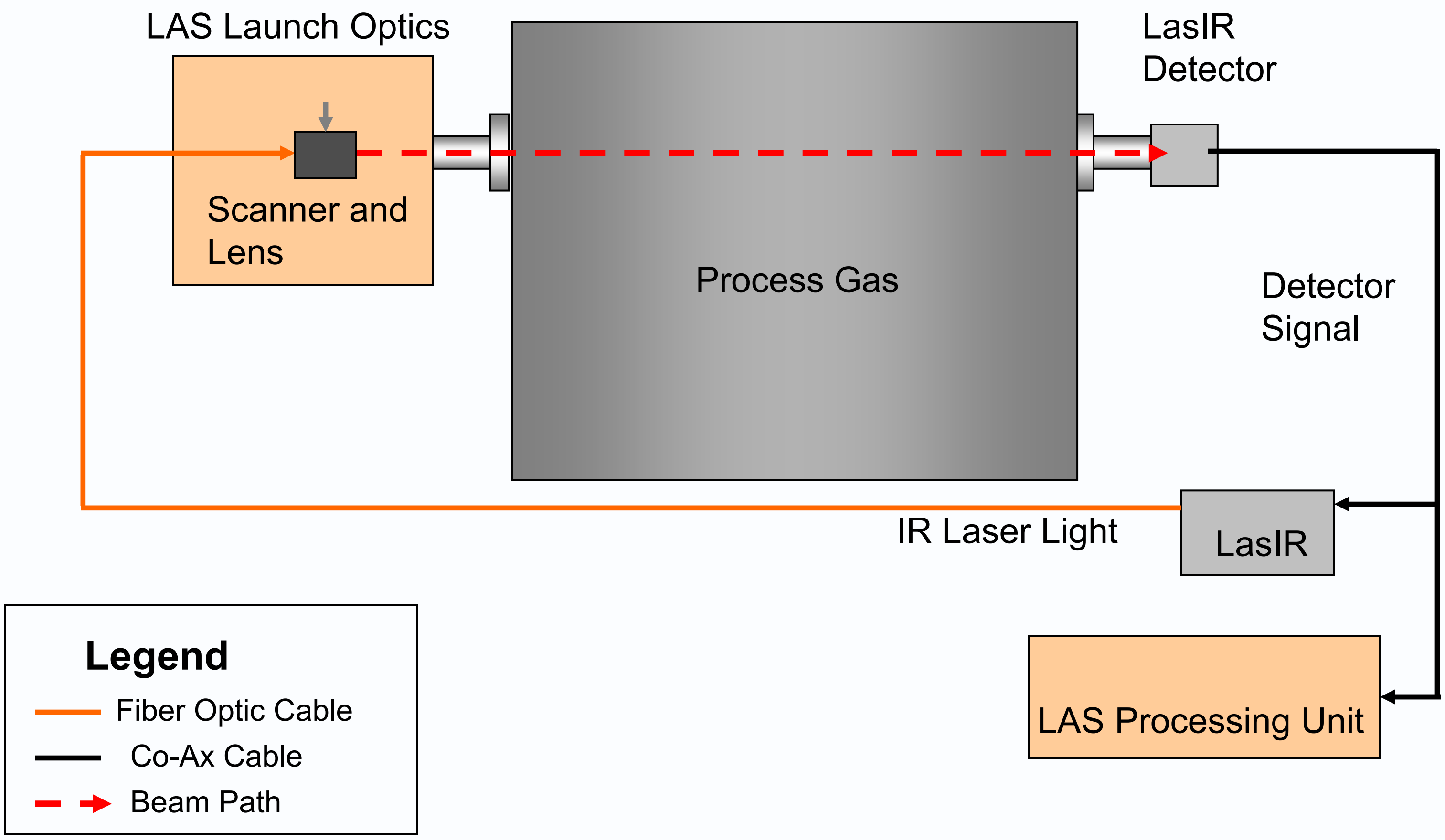
No gas transport
- Fast response time
- No loss of components in a sample system
- No filters, sample lines, pumps to clean

Lower planning expenses
- Support for heated sample gas lines
- Analysis container
- Disposal of sample gas and condensate



Lower installation and operation cost
- No Heated sample gas lines ($50/ft)
- Larger component Inventory and Replacement requirements
- Cost for shelter or space in existing analyzer rooms.

Ammonia Slip Measurement



Tunable Diode Laser Analyzer

Ammonia Slip Measurement

TDLAS Ammonia slip Monitoring:

- In-situ measurement avoids loss of sample integrity, to Minimize NH3 Slip
- Single Indicator of direct measurement of Slip for compliance or performance of DeNOx system
- Fast response better then 60 seconds allows better feedback for control, less violations.

Ammonia Slip Measurement

EXTRACTIVE :

- Sample delivered to analyzer mounted in typical cabinet , possibly integrated with CEMS.
- Useful for Dirty Applications such as certain Coal Fired Plants.
- Measurement type: Chemiluminescence, UV Absorption, FTIR
- Minimal performance at low concentrations
- Easy to calibrate, since standard calibration gas procedures are incorporated.
- Not the most cost effective when equipment, install and maintenance costs are accounted for.

Ammonia Slip Measurement

UV photometer

DEFOR

For measurement of

1 to 3 UV components

Includiing O_2

Public Review Draft

Ammonia Slip Measurement

Certification of NH3 Slip Measurements

- There are no performance standards against which NH3 monitors can be certified, and there are no adopted methodologies for the certification of continuous NH3 monitoring.
- CTM-027 defines how best to obtain representative stack test samples for verification of stack conditions, against which any analyzer system would be referenced,.
- In addition, there are no NIST traceable Protocol calibration gases for NH3 at lower levels. The most accurate calibration gas for NH3 is a working class gas with an accuracy of +/- 5%. Also, the lowest level that can be commercially obtained is 7 ppm.
- Spiking is an accepted method by which relative accuracy data can be obtained but once again no standards are set on how to achieve this.
- Most Insitu analyzers have built in calibration standards either by filters or calibration gas cells. All have the ability to do self check zero and span, and most can be checked against a standard gas at a higher value working class

Ammonia Slip Measurement

SUMMARY:

- Until a clear acceptable method for accurate measurement of NH_3 at the lowest concentrations now seen (less than 2ppm) is commercially available, and one that can be applied to all applications, then Industry must rely on the vendors to assist in meeting their needs whether it be permit verification or process optimization.
- Insitu while giving the best accuracy will be considered the front runner for most applications, but without the ability to do all applications at the low level measurements will struggle for acceptability.
- Extractive surrogate measurements will continue to dominate the Utility market for now because of the ease of acceptability as part of a CEMS.
- Tunable Diode Laser technology is proving to be the most accurate method, but will have to wait until a suitable calibration method has been defined and accepted.