Analytical Laboratory

13339 Hagers Ferry Road
Huntersville, NC 28078-7929
McGuire Nuclear Complex - MG03A2
Phone: 980-875-5245 Fax: 980-875-4349

Order Summary Report

Order Number:	**J13050477**
Project Name:	WWTS FGD-Routine 2013
Customer Name(s):	Bill Kennedy, Wayne Chapman, Melonie Martin
Customer Address:	3195 Pine Hall Rd Mailcode: Belews Steam Station Belews Creek, NC 28012
Lab Contact:	Jason C Perkins Phone: 980-875-5348

Report Authorized By: (Signature) MAO5125 (154363) 2013.06.17 10:05:31 -04'00' **Date:** 6/14/2013

Jason C Perkins

Program Comments:

Please contact the Program Manager (Jason C Perkins) with any questions regarding this report.

Data Flags & Calculations:

Any analytical tests or individual analytes within a test flagged with a Qualifier indicate a deviation from the method quality system or quality control requirement. The qualifier description is found at the end of the Certificate of Analysis (sample results) under the qualifiers heading. All results are reported on a dry weight basis unless otherwise noted. Subcontracted data included on the Duke Certificate of Analysis is to be used as information only. Certified vendor results can be found in the subcontracted lab final report. Duke Energy Analytical Laboratory subcontracts analyses to other vendor laboratories that have been qualified by Duke Energy to perform these analyses except where noted.

Data Package:

This data package includes analytical results that are applicable only to the samples described in this narrative. An estimation of the uncertainty of measurement for the results in the report is available upon request. This report shall not be reproduced, except in full, without the written consent of the Analytical Laboratory. Please contact the Analytical laboratory with any questions. The order of individual sections within this report is as follows:

Job Summary Report, Sample Identification, Technical Validation of Data Package, Analytical Laboratory Certificate of Analysis, Analytical Laboratory QC Reports, Sub-contracted Laboratory Results, Customer Specific Data Sheets, Reports & Documentation, Customer Database Entries, Test Case Narratives, Chain of Custody (COC)

Certification:

The Analytical Laboratory holds the following State Certifications : North Carolina (DENR) Certificate #248, South Carolina (DHEC) Laboratory ID # 99005. Contact the Analytical Laboratory for definitive information about the certification status of specific methods.

Sample ID's & Descriptions:

Sample ID	Plant/Station	Collection Date and Time	Collected By	Sample Description
2013012163	BELEWS	24-May-13 7:30 AM	TRAVIS THORNTON	FGD Purge Eff
2013012164	BELEWS	24-May-13 7:35 AM	TRAVIS THORNTON	EQ Tank Eff
2013012165	BELEWS	24-May-13 7:40 AM	TRAVIS THORNTON	BioReactor 1 Inf
2013012166	BELEWS	24-May-13 7:45 AM	TRAVIS THORNTON	BioReactor 2 Inf
2013012167	BELEWS	24-May-13 7:50 AM	TRAVIS THORNTON	BioReactor 2 Eff
2013012168	BELEWS	24-May-13 8:00 AM	TRAVIS THORNTON	Filter Blk
2013012169	BELEWS	21-May-13 10:30 AM	CPK	TRIP BLANK

7 Total Samples

Technical Validation Review

Checklist:

COC and .pdf report are in agreement with sample totals and analyses (compliance programs and procedures).	☑ Yes	☐ No
All Results are less than the laboratory reporting limits.	☐ Yes	☑ No
All laboratory QA/QC requirements are acceptable.	☑ Yes	☐ No

Report Sections Included:

- ☑ Job Summary Report
- ☑ Sample Identification
- ☑ Technical Validation of Data Package
- ☑ Analytical Laboratory Certificate of Analysis
- ☐ Analytical Laboratory QC Report
- ☑ Sub-contracted Laboratory Results
- ☐ Customer Specific Data Sheets, Reports, & Documentation
- ☐ Customer Database Entries
- ☑ Chain of Custody
- ☑ Electronic Data Deliverable (EDD) Sent Separately

Reviewed By: DBA Account Date: 6/14/2013

Certificate of Laboratory Analysis

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Order # J13050477

Site: FGD Purge Eff | **Sample #: 2013012163**

Collection Date: 24-May-13 7:30 AM | Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
NITRITE + NITRATE (COLORIMETRIC)								
Nitrite + Nitrate (Colorimetric)	**16**	mg-N/L		0.1	10	EPA 353.2	06/03/2013 12:06	BGN9034
INORGANIC IONS BY IC								
Bromide	**110**	mg/L		5	50	EPA 300.0	06/03/2013 16:33	JAHERMA
MERCURY (COLD VAPOR) IN WATER								
Mercury (Hg)	**239**	ug/L		5	100	EPA 245.1	05/31/2013 12:59	AGIBBS
TOTAL RECOVERABLE METALS BY ICP								
Boron (B)	**226**	mg/L		0.5	10	EPA 200.7	06/07/2013 12:12	DJSULL1
DISSOLVED METALS BY ICP-MS								
Selenium (Se)	**298**	ug/L		10	10	EPA 200.8	06/12/2013 11:33	KRICHAR
TOTAL RECOVERABLE METALS BY ICP-MS								
Arsenic (As)	**207**	ug/L		10	10	EPA 200.8	06/12/2013 14:04	KRICHAR
Cadmium (Cd)	**< 10**	ug/L		10	10	EPA 200.8	06/12/2013 14:04	KRICHAR
Chromium (Cr)	**259**	ug/L		10	10	EPA 200.8	06/12/2013 14:04	KRICHAR
Copper (Cu)	**119**	ug/L		10	10	EPA 200.8	06/12/2013 14:04	KRICHAR
Nickel (Ni)	**243**	ug/L		10	10	EPA 200.8	06/12/2013 14:04	KRICHAR
Selenium (Se)	**3180**	ug/L		10	10	EPA 200.8	06/12/2013 14:04	KRICHAR
Silver (Ag)	**< 10**	ug/L		10	10	EPA 200.8	06/12/2013 14:04	KRICHAR
Zinc (Zn)	**262**	ug/L		10	10	EPA 200.8	06/12/2013 14:04	KRICHAR
SELENIUM SPECIATION - (Analysis Performed by Applied Speciation and Consulting, LLC)								
Vendor Parameter	**Complete**					Vendor Method		V_AS&C

Site: EQ Tank Eff | **Sample #: 2013012164**

Collection Date: 24-May-13 7:35 AM | Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
MERCURY (COLD VAPOR) IN WATER								
Mercury (Hg)	**215**	ug/L		2.5	50	EPA 245.1	05/31/2013 13:01	AGIBBS
TOTAL RECOVERABLE METALS BY ICP								
Boron (B)	**215**	mg/L		0.5	10	EPA 200.7	06/07/2013 12:15	DJSULL1
DISSOLVED METALS BY ICP-MS								
Selenium (Se)	**234**	ug/L		10	10	EPA 200.8	06/12/2013 11:37	KRICHAR

Certificate of Laboratory Analysis

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Order # J13050477

Site: EQ Tank Eff | **Sample #: 2013012164**

Collection Date: 24-May-13 7:35 AM | Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
TOTAL RECOVERABLE METALS BY ICP-MS								
Arsenic (As)	**202**	ug/L		10	10	EPA 200.8	06/12/2013 14:08	KRICHAR
Cadmium (Cd)	**< 10**	ug/L		10	10	EPA 200.8	06/12/2013 14:08	KRICHAR
Chromium (Cr)	**248**	ug/L		10	10	EPA 200.8	06/12/2013 14:08	KRICHAR
Copper (Cu)	**114**	ug/L		10	10	EPA 200.8	06/12/2013 14:08	KRICHAR
Nickel (Ni)	**226**	ug/L		10	10	EPA 200.8	06/12/2013 14:08	KRICHAR
Selenium (Se)	**3120**	ug/L		10	10	EPA 200.8	06/12/2013 14:08	KRICHAR
Silver (Ag)	**< 10**	ug/L		10	10	EPA 200.8	06/12/2013 14:08	KRICHAR
Zinc (Zn)	**242**	ug/L		10	10	EPA 200.8	06/12/2013 14:08	KRICHAR

Site: BioReactor 1 Inf | **Sample #: 2013012165**

Collection Date: 24-May-13 7:40 AM | Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
NITRITE + NITRATE (COLORIMETRIC)								
Nitrite + Nitrate (Colorimetric)	**16**	mg-N/L		0.1	10	EPA 353.2	06/03/2013 12:07	BGN9034
Mercury by EPA 200.8 - (Analysis Performed by Applied Speciation and Consulting, LLC)								
Vendor Parameter	**Complete**	ug/l				Vendor Method		V_AS&C
TOTAL RECOVERABLE METALS BY ICP								
Boron (B)	**191**	mg/L		0.5	10	EPA 200.7	06/07/2013 12:19	DJSULL1
DISSOLVED METALS BY ICP-MS								
Selenium (Se)	**177**	ug/L		10	10	EPA 200.8	06/12/2013 11:40	KRICHAR
TOTAL RECOVERABLE METALS BY ICP-MS								
Arsenic (As)	**< 10**	ug/L		10	10	EPA 200.8	06/12/2013 14:11	KRICHAR
Cadmium (Cd)	**< 10**	ug/L		10	10	EPA 200.8	06/12/2013 14:11	KRICHAR
Chromium (Cr)	**< 10**	ug/L		10	10	EPA 200.8	06/12/2013 14:11	KRICHAR
Copper (Cu)	**< 10**	ug/L		10	10	EPA 200.8	06/12/2013 14:11	KRICHAR
Nickel (Ni)	**< 10**	ug/L		10	10	EPA 200.8	06/12/2013 14:11	KRICHAR
Selenium (Se)	**167**	ug/L		10	10	EPA 200.8	06/12/2013 14:11	KRICHAR
Silver (Ag)	**< 10**	ug/L		10	10	EPA 200.8	06/12/2013 14:11	KRICHAR
Zinc (Zn)	**< 10**	ug/L		10	10	EPA 200.8	06/12/2013 14:11	KRICHAR
SELENIUM SPECIATION - (Analysis Performed by Applied Speciation and Consulting, LLC)								
Vendor Parameter	**Complete**					Vendor Method		V_AS&C

Certificate of Laboratory Analysis

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Order # J13050477

Site: BioReactor 2 Inf — **Sample #: 2013012166**

Collection Date: 24-May-13 7:45 AM — Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
Mercury by EPA 200.8 - (Analysis Performed by Applied Speciation and Consulting, LLC)								
Vendor Parameter	**Complete**	ug/l				Vendor Method		V_AS&C
TOTAL RECOVERABLE METALS BY ICP								
Boron (B)	**192**	mg/L		0.5	10	EPA 200.7	06/07/2013 12:23	DJSULL1
TOTAL RECOVERABLE METALS BY ICP-MS								
Arsenic (As)	**< 10**	ug/L		10	10	EPA 200.8	06/12/2013 14:15	KRICHAR
Cadmium (Cd)	**< 10**	ug/L		10	10	EPA 200.8	06/12/2013 14:15	KRICHAR
Chromium (Cr)	**< 10**	ug/L		10	10	EPA 200.8	06/12/2013 14:15	KRICHAR
Copper (Cu)	**< 10**	ug/L		10	10	EPA 200.8	06/12/2013 14:15	KRICHAR
Nickel (Ni)	**< 10**	ug/L		10	10	EPA 200.8	06/12/2013 14:15	KRICHAR
Selenium (Se)	**13.9**	ug/L		10	10	EPA 200.8	06/12/2013 14:15	KRICHAR
Silver (Ag)	**< 10**	ug/L		10	10	EPA 200.8	06/12/2013 14:15	KRICHAR
Zinc (Zn)	**< 10**	ug/L		10	10	EPA 200.8	06/12/2013 14:15	KRICHAR

Site: BioReactor 2 Eff — **Sample #: 2013012167**

Collection Date: 24-May-13 7:50 AM — Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
NITRITE + NITRATE (COLORIMETRIC)								
Nitrite + Nitrate (Colorimetric)	**< 0.01**	mg-N/L		0.01	1	EPA 353.2	06/03/2013 12:08	BGN9034
INORGANIC IONS BY IC								
Bromide	**89**	mg/L		5	50	EPA 300.0	06/03/2013 16:52	JAHERMA
Mercury by EPA 200.8 - (Analysis Performed by Applied Speciation and Consulting, LLC)								
Vendor Parameter	**Complete**	ug/l				Vendor Method		V_AS&C
TOTAL RECOVERABLE METALS BY ICP								
Boron (B)	**182**	mg/L		0.5	10	EPA 200.7	06/07/2013 12:26	DJSULL1
TOTAL RECOVERABLE METALS BY ICP-MS								
Arsenic (As)	**< 5**	ug/L		5	5	EPA 200.8	06/12/2013 14:18	KRICHAR
Cadmium (Cd)	**< 5**	ug/L		5	5	EPA 200.8	06/12/2013 14:18	KRICHAR
Chromium (Cr)	**< 5**	ug/L		5	5	EPA 200.8	06/12/2013 14:18	KRICHAR
Copper (Cu)	**< 5**	ug/L		5	5	EPA 200.8	06/12/2013 14:18	KRICHAR
Nickel (Ni)	**< 5**	ug/L		5	5	EPA 200.8	06/12/2013 14:18	KRICHAR
Selenium (Se)	**< 5**	ug/L		5	5	EPA 200.8	06/12/2013 14:18	KRICHAR
Silver (Ag)	**< 5**	ug/L		5	5	EPA 200.8	06/12/2013 14:18	KRICHAR
Zinc (Zn)	**< 5**	ug/L		5	5	EPA 200.8	06/12/2013 14:18	KRICHAR

Certificate of Laboratory Analysis

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Order # J13050477

Site: BioReactor 2 Eff — **Sample #: 2013012167**

Collection Date: 24-May-13 7:50 AM — Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
SELENIUM SPECIATION - (Analysis Performed by Applied Speciation and Consulting, LLC)								
Vendor Parameter	**Complete**					Vendor Method		V_AS&C
TOTAL DISSOLVED SOLIDS								
TDS	**15000**	mg/L		25	1	SM2540C	06/03/2013 15:03	JDTALLE

Site: Filter Blk — **Sample #: 2013012168**

Collection Date: 24-May-13 8:00 AM — Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
DISSOLVED METALS BY ICP-MS								
Selenium (Se)	**< 1**	ug/L		1	1	EPA 200.8	06/12/2013 10:42	KRICHAR

Site: TRIP BLANK — **Sample #: 2013012169**

Collection Date: 21-May-13 10:30 AM — Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
TOTAL RECOVERABLE METALS BY ICP								
Boron (B)	**< 0.05**	mg/L		0.05	1	EPA 200.7	06/07/2013 11:51	DJSULL1
TOTAL RECOVERABLE METALS BY ICP-MS								
Arsenic (As)	**< 1**	ug/L		1	1	EPA 200.8	06/12/2013 13:44	KRICHAR
Cadmium (Cd)	**< 1**	ug/L		1	1	EPA 200.8	06/12/2013 13:44	KRICHAR
Chromium (Cr)	**< 1**	ug/L		1	1	EPA 200.8	06/12/2013 13:44	KRICHAR
Copper (Cu)	**< 1**	ug/L		1	1	EPA 200.8	06/12/2013 13:44	KRICHAR
Nickel (Ni)	**< 1**	ug/L		1	1	EPA 200.8	06/12/2013 13:44	KRICHAR
Selenium (Se)	**< 1**	ug/L		1	1	EPA 200.8	06/12/2013 13:44	KRICHAR
Silver (Ag)	**< 1**	ug/L		1	1	EPA 200.8	06/12/2013 13:44	KRICHAR
Zinc (Zn)	**< 1**	ug/L		1	1	EPA 200.8	06/12/2013 13:44	KRICHAR

APPLIED SPECIATION AND CONSULTING, LLC

18804 Northcreek Parkway Bothell, WA, 98011
Tel: (425) 483-3300 Fax: (425) 483-9818
www.appliedspeciation.com

June 11, 2013

Jay Perkins
Duke Energy Analytical Laboratory
Mail Code MGO3A2 (Building 7405)
13339 Hagers Ferry Rd.
Huntersville, NC 28078
(704) 875-5245

Project: Belews - FGD WWTS (Bi-Monthly Routine 2013) (LIMS #J13050477)

Mr. Perkins,

Attached is the report associated with four (4) aqueous samples submitted for total mercury and selenium speciation analysis on May 29, 2013. The samples were received in a sealed cooler at -0.3°C on May 31, 2013. Selenium speciation analysis was performed via ion chromatography inductively coupled plasma collision reaction cell mass spectrometry (IC-ICP-CRC-MS). Mercury quantitation was performed via cold vapor inductively coupled plasma mass spectrometry (CV-ICP-MS). Any issues associated with the analysis are addressed in the following report.

If you have any questions, please feel free to contact me at your convenience.

Sincerely,

Russell Gerads
Vice President
Applied Speciation and Consulting, LLC

Applied Speciation and Consulting, LLC

Report prepared for:

Jay Perkins
Duke Energy Analytical Laboratory
Mail Code MGO3A2 (Building 7405)
13339 Hagers Ferry Rd.
Huntersville, NC 28078

Project: Belews - FGD WWTS (Bi-Monthly Routine 2013) (LIMS #J13050477)

June 11 2013

1. Sample Reception

Three (3) aqueous samples in 125mL HDPE bottles (provided by Applied Speciation and Consulting) were submitted for selenium speciation analysis on May 29, 2013. Three (3) additional samples in 40ml borosilicate glass bottles (provided by Applied Speciation and Consulting) were submitted for total mercury quantitation. All samples were received in acceptable condition on May 31, 2013 in a sealed container at -0.3°C.

All samples were received in a laminar flow clean hood, void of trace metals contamination and ultra-violet radiation, and were designated discrete sample identifiers. The 40mL borosilicate glass vials submitted for total mercury were preserved with bromine monochloride (BrCl) solution. The resulting samples were stored in a secure polyethylene container, known to be free from trace metals contamination, until the analyses could be performed.

An aliquot of each sample requiring selenium speciation evaluation was filtered (0.45µm) and each filtrate was stored in a secure, monitored cryofreezer (maintained at a temperature of -80°C) until selenium speciation analysis could be performed via ion chromatography inductively coupled plasma collision reaction cell mass spectrometry (IC-ICP-CRC-MS).

2. Sample Preparation

All sample preparation is performed in laminar flow clean hoods known to be free from trace metals contamination. All applied water for dilutions and sample preservatives are monitored for contamination to account for any biases associated with the sample results.

Total Mercury Quantitation by CV-ICP-MS All samples and preparation blanks for total mercury quantitation were preserved with 2% (v/v) BrCl. The resulting samples were analyzed for mercury via cold vapor inductively coupled plasma mass spectrometry (CV-ICP-MS).

Selenium Speciation Analysis by IC-ICP-CRC-MS Prior to analysis, an aliquot of each sample was filtered with a syringe filter (0.45µm) and injected directly into a sealed autosampler vial. No further sample preparation was performed as any chemical alteration of a sample may shift the equilibrium of the system, resulting in changes in speciation ratios.

3. Sample Analysis

All sample analysis is preceded by a minimum of a five-point calibration curve spanning the entire concentration range of interest. Calibration curves are performed at the beginning of each analytical day. All calibration curves, associated with each species of interest, are standardized by linear regression resulting in a response factor. All sample results are **instrument blank corrected** to account for any operational biases associated with the analytical platform.

Prior to sample analysis, all calibration curves are verified using second source standards which are identified as initial calibration verification standards (ICV).

Ongoing instrument performance is identified by the analysis of continuing calibration verification standards (CCV) and continuing calibration blanks (CCB) at a minimum interval of every ten analytical runs.

Total Mercury Quantitation by CV-ICP-MS The sample fractions for total mercury quantitation were analyzed by cold vapor inductively coupled plasma mass spectrometry (CV-ICP-MS) on May 31, 2013. Aliquots of each sample are reacted with a reductant in-line and transported to a gas-liquid separator. The volatile elemental mercury that is formed is then swept by a stream of argon gas into a radio frequency (RF) plasma where energy-transfer processes cause desolvation, atomization, and ionization. The ions are extracted from the plasma through a differentially-pumped vacuum interface and separated on the basis of their mass-to-charge ratio (m/z) by a mass spectrometer. A solid-state detector detects ions transmitted through the mass analyzer and the resulting current is processed by a data handling system.

Selenium Speciation Analysis by IC-ICP-CRC-MS Each sample for selenium speciation analysis was analyzed by ion chromatography inductively coupled plasma collision reaction cell mass spectrometry (IC-ICP-CRC-MS) on June 6-7, 2013. An aliquot of each sample is injected onto an anion exchange column and mobilized by a basic (pH > 7) gradient. The eluting selenium species are then introduced into a radio frequency (RF) plasma where energy-transfer processes cause desolvation, atomization, and ionization. The ions are extracted from the plasma through a differentially-pumped vacuum interface and travel through a pressurized chamber (CRC) containing a reaction gas which preferentially reacts with interfering ions of the same target mass to charge ratios (m/z). A solid-state detector detects ions transmitted through the mass analyzer and the resulting current is processed by a data handling system.

Retention times for each eluting species are compared to known standards for species identification.

4. Analytical Issues

The overall analyses went well and no significant analytical issues were encountered. All quality control parameters associated with these samples were within acceptance limits.

A miscommunication between the ion chromatography unit and the eluent pump caused a delay in the eluent gradient during the analysis of the matrix spike performed on the sample identified as BioReactor 2 Eff. Consequently the retention time for the selenocyanate peak in the matrix spike duplicate sample was shifted to a larger value (from approximately 10.2 minutes to 11.6 minutes). This shift was confirmed by measurement of an internal standard (roxarsone), which typically falls within the same late eluting retention time range. The roxarsone peak experienced a similar retention time shift due to the delay in the eluent gradient. The selenocyanate peak occurring at 11.6 minutes in the matrix spike sample was integrated and the value produced an acceptable selenocyanate recovery.

The estimated method detection limits (eMDLs) for selenite, selenate, and selenocyanate are generated from replicate analyses of the lowest standard in the calibration curve. Not all selenium species are present in preparation blanks; therefore, eMDL calculations based on preparation blanks are artificially biased low.

The eMDL for methylseleninic acid and selenomethionine is calculated from the average eMDL of selenite, selenate, and selenocyanate. The calibration does not contain methylseleninic acid or selenomethionine due to impurities in these standards which would bias the results for other selenium species.

The eMDL for mercury has been calculated using the standard deviation of the preparation blanks preserved and analyzed concurrently with the submitted samples.

If you have any questions or concerns regarding this report, please feel free to contact me.

Sincerely,

Russell Gerads
Vice President
Applied Speciation and Consulting, LLC

Total Mercury & Selenium Speciation Results for Duke Energy
Project Name: Belews - FGD WWTS (Bi-Monthly Routine 2013)
Contact: Jay Perkins
LIMS #J13050477

Date: June 11, 2013
Report Generated by: Russell Gerads
Applied Speciation and Consulting, LLC

Sample Results

Sample ID	Total Hg	Se(IV)	Se(VI)	SeCN	MeSe(IV)	SeMe	Unknown Se Species (n)
FGD Purge Eff	NR	235	68.6	ND (< 5.0)	ND (< 5.6)	ND (< 5.6)	0 (0)
BioReactor 1 Inf	0.0339	71.0	102	ND (< 1.2)	3.6	ND (< 1.4)	0 (0)
BioReactor 2 Inf	0.0158	NR	NR	NR	NR	NR	NR
BioReactor 2 Eff	0.0049	ND (< 1.3)	ND (< 1.6)	ND (< 1.2)	ND (< 1.4)	ND (< 1.4)	0 (0)

All results reflect the applied dilution and are reported in µg/L
NR = Analysis not requested
ND = Not detected at the applied dilution
SeCN = Selenocyanate
MeSe(IV) = Methylseleninic acid
SeMe = Selenomethionine
Unknown Se Species = Total concentration of all unknown Se species observed by IC-ICP-MS
n = number of unknown Se species observed

Total Mercury & Selenium Speciation Results for Duke Energy
Project Name: Belews - FGD WWTS (Bi-Monthly Routine 2013)
Contact: Jay Perkins
LIMS #J13050477

Date: June 11, 2013
Report Generated by: Russell Gerads
Applied Speciation and Consulting, LLC

Quality Control Summary - Preparation Blank Summary

Analyte (µg/L)	PBW1	PBW2	PBW3	PBW4	Mean	StdDev	eMDL*	eMDL 5x	eMDL 250x	eMDL 1000x
Hg	0.0007	0.0016	0.0016	0.0016	0.0014	0.0005	0.0003	0.0014	-	-
Se(IV)	0.000	0.000	0.144	0.000	0.036	0.072	0.005	-	1.3	5.4
Se(VI)	0.000	0.000	0.000	0.000	0.000	0.000	0.006	-	1.6	6.4
SeCN	0.000	0.000	0.000	0.000	0.000	0.000	0.005	-	1.2	5.0
MeSe(IV)	0.000	0.000	0.000	0.000	0.000	0.000	0.006	-	1.4	5.6
SeMe	0.000	0.000	0.049	0.000	0.012	0.024	0.006	-	1.4	5.6

eMDL = Estimated Method Detection Limit
*Please see narrative regarding eMDL calculations

Quality Control Summary - Certified Reference Materials

Analyte (µg/L)	CRM	True Value	Result	Recovery
Hg	NIST 1641d	1568	1580	100.8
Se(IV)	LCS	4.79	5.23	109.2
Se(VI)	LCS	4.74	4.87	102.8
SeCN	LCS	4.46	4.75	106.6
MeSe(IV)	LCS	3.24	3.37	104.1
SeMe	LCS	4.66	4.56	97.9

Total Mercury & Selenium Speciation Results for Duke Energy
Project Name: Belews - FGD WWTS (Bi-Monthly Routine 2013)
Contact: Jay Perkins
LIMS #J13050477

Date: June 11, 2013
Report Generated by: Russell Gerads
Applied Speciation and Consulting, LLC

Quality Control Summary - Matrix Duplicates

Analyte (µg/L)	Sample ID	Rep 1	Rep 2	Mean	RPD
Hg	Batch QC	0.0682	0.0671	0.0677	1.6
Se(IV)	BioReactor 2 Eff	ND (< 1.3)	ND (< 1.3)	NC	NC
Se(VI)	BioReactor 2 Eff	ND (< 1.6)	ND (< 1.6)	NC	NC
SeCN	BioReactor 2 Eff	ND (< 1.2)	ND (< 1.2)	NC	NC
MeSe(IV)	BioReactor 2 Eff	ND (< 1.4)	ND (< 1.4)	NC	NC
SeMe	BioReactor 2 Eff	ND (< 1.4)	ND (< 1.4)	NC	NC

ND = Not detected at the applied dilution
NC = Value was not calculated due to one or more concentrations below the eMDL

Quality Control Summary - Matrix Spike/ Matrix Spike Duplicate

Analyte (µg/L)	Sample ID	Spike Conc	MS Result	Recovery	Spike Conc	MSD Result	Recovery	RPD
Hg	Batch QC	2.000	2.159	104.6	2.000	2.169	105.1	0.4
Se(IV)	BioReactor 2 Eff	1390	1535	110.4	1390	1530	110.1	0.3
Se(VI)	BioReactor 2 Eff	1261	1377	109.2	1261	1358	107.7	1.4
SeCN *	BioReactor 2 Eff	1144	1232	107.7	1144	1222	106.9	0.8

* Please see narrative regarding MSD selenocyanate result.

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST FORM

Page 1 of 4

DUKE ENERGY®

Duke Energy Analytical Laboratory
Mail Code MGO3A2 (Building 7405)
13339 Hagers Ferry Rd
Huntersville, N. C. 28078
(704) 875-5245
Fax: (704) 875-4349

Analytical Laboratory Use Only

ORDER# J1305047 7 | MATRIX: OTHER | Samples Originating From NC___ SC___

Logged By cpb | Date & Time 5-29-13 1019 | SAMPLE PROGRAM Ground Water ___ NPDES ___ Drinking Water ___ UST ___ RCRA Waste ___

Vendor AS&C | Cooler Temp (C) <6

Vendor: | [15]Preserv.: 1=HCL 2=H_2SO_4 3=HNO_3 4=Ice 5=None

MR #

[19]Page 1 of 2
DISTRIBUTION
ORIGINAL to LAB, COPY to CLIENT

Customer must Complete

1)Project Name	Belews - FGD WWTS (Bi-Monthly Routine 2013)
2)Phone No:	
2) Client:	Bill Kennedy, Melonie Martin, Wayne Chapman
4)Fax No:	
5)Business Unit:	20003
6)Process:	BMCEFGD
Mail Code:	
8)Oper. Unit:	BC00
9)Res. Type:	
10)Reso. Center:	

Customer to complete all appropriate non-shaded areas.

Customer to complete appropriate columns to right

Sampling conducted: 2nd and 4th Wednesday

LAB USE ONLY [11]Lab ID	Se Speciation Bottle ID	[13]Sample Description or ID	Date	Time	Signature	[17]Comp.	[18]Grab	TDS		Br (Dionex)	Metals* + Hg 245.1**	Se (IMS), filtered	NO3-NO2	Hg 200.8 (V_AS&C)			Se, speciation - vendor to AS&C (Important to place filled bottle back into both baggies)				
											[16]Analyses Required										
											4		4	3,4	3,4	2,4				4	
20130 2163		FGD Purge Eff	5/24	7:30	Travis Thorton					1	1	1	1				1				
64		EQ Tank Eff.		7:35							1	1									
65		BioReactor 1 Inf		7:40							1**	1	1	1			1				
66		BioReactor 2 Inf		7:45							1**			1							
67		BioReactor 2 Eff		7:50				1		1	1**		1	1			1				
68		Filter Blk		0800								1									
69		Metals Trip Blk	5-21	1030	cpknox						1**										
								1		2	6	4	3	3			3				

Filtering of the Se is performed in the field please provide a filter blank too.

new bit shipped 5-29

Return Kit to Travis Thorton @ Belews

Customer to sign & date below - fill out from left to right.

1) Relinquished By: Travis Thorton	Date/Time 5/28/13 15:30	2) Accepted By: cpb	Date/Time 5-29-13
3) Relinquished By:	Date/Time	4) Accepted By: Nancy Cullinan	Date/Time 5/31/13 10:00 Temp: -0.3°C
5)Relinquished By:	Date/Time	6)Accepted By:	Date/Time
7)Relinquished By: cpb	Date/Time 5-29-13	8)Accepted By:	Date/Time
9)Seal/Locked By: cpb	Date/Time 5-29-13	10) Seal/Lock Opened By:	Date/Time
11)Seal/Locked By:	Date/Time	12)Seal/Lock Opened By:	Date/Time

Comments

* B by TRM/ICP As, Cd, Cr, Cu, Ni, Se, Ag, Zn by TRM/IMS 1**=No Hg

Customer, IMPORTANT! Please indicate desired turnaround.

[22]Requested Turnaround
21 Days ___
*7 Days ___
*48 Hr ___
*Other 6-12-13
* Add. Cost Will Apply

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST FORM

DUKE ENERGY®

Duke Energy Analytical Laboratory
Mail Code MGO3A2 (Building 7405)
13339 Hagers Ferry Rd
Huntersville, N. C. 28078
(704) 875-5245
Fax: (704) 875-4349

Analytical Laboratory Use Only

ORDER#: J13050477 | MATRIX: OTHER | Samples Originating From: NC___ SC___

Logged By: cpb | Date & Time: 5-29-13 1019

SAMPLE PROGRAM: Ground Water ___ NPDES ___ Drinking Water ___ UST ___ RCRA Waste ___

Vendor: AS&C | Cooler Temp (C): <6

Vendor: | MR #:

[19]Page 1 of 2
DISTRIBUTION
ORIGINAL to LAB, COPY to CLIENT

Customer must Complete

1)Project Name: Belews - FGD WWTS (Bi-Monthly Routine 2013)		2)Phone No:
2) Client: Bill Kennedy, Melonie Martin, Wayne Chapman		4)Fax No:
5)Business Unit: 20003	6)Process: BMCEFGD	Mail Code:
8)Oper. Unit: BC00	9)Res. Type:	10)Reso. Center:

Customer to complete all appropriate non-shaded areas.

Sampling conducted: 2nd and 4th Wednesday

Customer to complete appropriate columns to right

[15]Preserv.:1=HCL 2=H_2SO_4 3=HNO_3 4=Ice 5=None

[16]Analyses Required

LAB USE ONLY [11]Lab ID	Se Speciation Bottle ID	[13]Sample Description or ID	Date	Time	Signature	[17]Comp.	[18]Grab	TDS		Br (Dionex)	Metals* + Hg 245.1**	Se (IMS), filtered	NO3-NO2	Hg 200.8 (V_AS&C)			Se, speciation - vendor to AS&C (Important to place filled bottle back into both baggies)				
											4		4	3,4	3,4	2,4				4	
20130 2163		FGD Purge Eff	5/24	7:30	Travis Thorton					1	1	1	1				1				
64		EQ Tank Eff.		7:35							1	1									
65		BioReactor 1 Inf		7:40							1**	1	1	1			1				
66		BioReactor 2 Inf		7:45							1**			1							
67		BioReactor 2 Eff		7:50				1		1	1**		1	1			1				
68		Filter Blk		0800								1									
69		Metals Trip Blk	5-21	1030	cpknoy						1**										
								1		2	6	4	3	3			3				

Filtering of the Se is performed in the field please provide a filter blank too.

new kit shipped 5-29

Return Kit to Travis Thorton @ Belews

Customer to sign & date below - fill out from left to right.

1) Relinquished By: Travis Thorton	Date/Time: 5/28/13 15:30	2) Accepted By: cpb	Date/Time: 5-29-13
3) Relinquished By:	Date/Time:	4) Accepted By:	Date/Time:
5)Relinquished By:	Date/Time:	6)Accepted By:	Date/Time:
7)Relinquished By: cpb	Date/Time: 5-29-13	8)Accepted By:	Date/Time:
9)Seal/Locked By: cpb	Date/Time: 5-29-13	10) Seal/Lock Opened By:	Date/Time:
11)Seal/Locked By:	Date/Time:	12)Seal/Lock Opened By:	Date/Time:

Comments

* B by TRM/ICP As, Cd, Cr, Cu, Ni, Se, Ag, Zn by TRM/IMS 1**=No Hg

Customer, IMPORTANT! Please indicate desired turnaround.

[22]Requested Turnaround
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*7 Days ___
*48 Hr ___
*Other 6-12-13
* Add. Cost Will Apply