# Visible Emission Test Report

Completed for:

Gainesville Renewable Energy Center Woody Biomass Power Plant Biomass Fuel Handling System (EU-001) Alkaline Sorbent Storage Silo (EU-002) Ash Handling System (EU-003)

Test Report Number: 20-6132-010203-001

Testing Completed: November 22 – 25, 2013 & December 20, 2013



#### **Visible Emission Test Report**

#### Gainesville Renewable Energy Center Woody Biomass Power Plant Biomass Fuel Handling System (EU-001) Alkaline Sorbent Storage Silo (EU-002) Ash Handling System (EU-003) Gainesville, Florida

C.E.M. Solutions Project No. 6132

Testing Conducted: November 22 – 25, 2013 and December 20, 2013

C.E.M. Solutions, Inc Report Number: 20-6132-010203-001

C.E.M. Solutions, Inc. 1183 E. Overdrive Circle Hernando, Florida 34442 Phone: 352-489-4337

#### Declaration of Conformance to ASTM D 7036-04: Standard Practice for Competence of Air Emission Testing Bodies

C.E.M. Solutions operates in conformance with the requirements of ASTM D 7036-04: Standard Practice for Competence of Air Emission Testing Bodies through the use of a quality system which incorporates a quality manual, internal audit system, systematic training of personnel and rigorous review of test methods and operating procedures.

Joe Conti

Quality Assurance Manager, G.E.M. Solutions, Inc.

#### **Statement of Validity**

I hereby certify the information and data provided in this emissions test report for tests performed at the Gainesville Renewable Energy Center's Woody Biomass Power Plant (Emission Units 001, 002, and 003), conducted on November 22, 23 and 25, 2013 and December 20, 2013 are complete and accurate to the best of my knowledge.

Joe Conti Quality Assurance Manager, C.E.M. Solutions, Inc.

Jeremy Johnson

President, C.E.M. Solutions, Inc.

# Project Background

Name of Source Owner:	Gainesville Renewable Energy Center
Address of Owner:	11201 NW Hwy 441 Gainesville, FL 32653
Source Identification:	Facility ID: 0010131 Biomass Fuel Delivery Preparation, Storage and Handling (EU-001) Alkaline Sorbent Storage Silo (EU-002) Ash Handling, Storage and Shipment (EU-003)
Location of Source:	Alachua County, Florida
Type of Operation:	SIC Code: 4911
Tests Performed:	Method 9 – Determination of Visible Emission
Test Technicians (VE Certified):	Joe Conti Josh Cooper, Alex Houseal
Date(s) Tests Conducted:	November 22, 2013: VE on Ash Silo Vacuum Blower #2 VE on Ash Silo Vacuum Blower #1 VE on Fly Ash Silo Bin Vent Filter November 23, 2013: VE on Fuel Day Bin Vent Filter #1 VE on Fuel Day Bin Vent Filter #2 November 25, 2013: Screen/Hog Building Baghouse December 20, 2013: Alkaline Sorbent Storage Silo Bin Vent
Site Test Coordinator:	Eric Johnson, Fagen, Inc.
State Regulatory Observers:	No Observers Present

## **Table of Contents**

Introduction	1
Facility Description	2
Biomass Fuel Delivery, Preparation Storage and Handling (EU 001)	2
Boiling fluidized bed (BFB) boiler (EU 002)	2
Ash Handling, Storage and Shipment (EU 003)	3
Test Program/Operating Conditions	4
Test Methods	5
Visible Emission Determination	5
Emission Monitoring Results	6
Biomass Fuel Delivery System (001)	6
Alkaline Sorbent Storage Silo (002)	6
Ash Handling System (003)	6
	Introduction Facility Description Biomass Fuel Delivery, Preparation Storage and Handling (EU 001) Boiling fluidized bed (BFB) boiler (EU 002) Ash Handling, Storage and Shipment (EU 003) Test Program/Operating Conditions Test Methods Visible Emission Determination Emission Monitoring Results Biomass Fuel Delivery System (001) Alkaline Sorbent Storage Silo (002) Ash Handling System (003)

## List of Tables

Table 1: Summary of Test Results	.1
Table 2: Summary of EPA Reference Methods	.5
Table 3: Visible Emissions Summary	.7

## Appendices

Appendix A:	Facility	Operating	Data
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- Appendix B: Method 9 Support Data Appendix C: Accreditations and Certifications

### 1.0 Introduction

Fagen, Inc. retained C.E.M. Solutions, Inc. to perform visible emissions monitoring on the Gainesville Renewable Energy Center's Woody Biomass Power Plant . Visible emissions were conducted on the Biomass Fuel Delivery System (EU-001), the Alkaline Sorbent Storage Silo (EU-002) and the Ash Handling System (EU-003) to show compliance with FDEP permit number 0010131-001-AC.

Eric Johnson of Fagen, Inc. coordinated plant operations throughout the monitoring program. All testing was conducted in accordance with test methods promulgated by the USEPA.

Table 1, summarizes the results of the test program.

#### Table 1: Summary of Test Results Woody Biomass Power Plant Emission Units -001, -002 and -003

Sample Location	Emission Unit ID	VE % <sup>a</sup>	Emission Limit	Status (Pass/Fail)
Screen/Hog Building Baghouse	001	0.0 %	5% VE	PASS
BFB Boiler Fuel Day Bin Vent Filter No. 1	001	0.0 %	5% VE	PASS
BFB Boiler Fuel Day Bin Vent Filter No. 2	001	0.0 %	5% VE	PASS
Alkaline Sorbent Storage Bon Vent Filter	002	0.0 %	5% VE	PASS
Ash Silo Vacuum Blower No. 1	003	0.0 %	5% VE	PASS
Ash Silo Vacuum Blower No. 2	003	0.0 %	5% VE	PASS
Fly Ash Silo Bin Vent Filter	003	0.0 %	5% VE	PASS

a = highest 6 minute block average

## 2.0 Facility Description

The Gainesville Renewable Energy Center's Woody Biomass Power Plant consists of a Biomass Fuel Delivery, Preparation, Storage and Handling system, a Woody Biomass-fueled BFB Boiler, and an Ash Handling, Storage and Shipment system.

# 2.1 Biomass Fuel Delivery, Preparation Storage and Handling (EU 001)

The biomass fuel delivery, preparation, storage and handling system consists of: three truck dumpers; two sets of screens and hogs (i.e., machines used to size wood chips); and automatic and manual stacker/reclaimers to maintain on average a 15 to 20 day supply of biomass fuel for the BFB boiler based on full load operation and average biomass fuel moisture content. The GREC biomass fuels are initially chipped/ground and processed at offsite locations and then transported to the site by truck. Between 130 and 150 fuel truck deliveries per day are expected based on the maximum BFB boiler biomass fuel consumption rate/average moisture content and a 6-day-per-week delivery schedule. During peak delivery periods, the delivery facilities are capable of unloading 24 truckloads of biomass fuel per hour. The GREC biomass fuel handling system includes scales to weigh each truck entering and departing the facility to determine the delivered fuel weight. The maximum designed hourly biomass processing rate is 600 tons per hour (TPH) with a maximum designed yearly rate of 1,395,030 tons per year (TPY).

## 2.2 Boiling fluidized bed (BFB) boiler (EU 002)

The boiler is a woody biomass fueled bubbling fluidized bed (BFB) boiler wherein wood is combusted within a bed of hot sand. Heat from the exhaust is recovered to generate superheated steam to generate 100 MW (net) of electricity in a steam turbine generator. Primary fuel will be clean woody biomass. Natural gas is used as a startup fuel. The maximum heat input capacity is 1,358 MMBtu per hour (4 hour average basis) while firing woody biomass. Flue gas exhausts will exit a 230 feet tall, 12 ft. outer diameter stack at approximately 310°F and a volumetric flow rate of 520,600 actual cubic feet per minute (acfm).

An alkaline sorbent storage silo is used to story sodium bicarbonate for the IDSIS emission control system. The storage silo has a bin vent installed to control PM emissions while the silo is loaded with sorbent from a truck.

#### 2.3 Ash Handling, Storage and Shipment (EU 003)

Approximately two thirds of ash created by the combustion of biomass fuel exits the BFB boiler as fly ash with the remaining third leaving as bottom ash. The design maximum process throughput rates are 27,594 TPY of fly ash and 13,140 TPY of bottom ash.

Fly ash from the boiler convective pass and fabric filter baghouse hoppers is collected dry and transported pneumatically to a single fly ash storage silo by means of two vacuum blowers. The transferred fly ash first passes through a receiver/collector that separates the fly ash from the conveying air stream. The separated fly ash then flowd through an air lock valve into the storage silo, which will be vented through a baghouse for control of PM emissions. From the silo, the fly ash is either stabilized using water in a pug mill or loaded dry into a receiving truck. For the fly ash stabilization case, fly ash and water are mixed in a pug mill and then transferred via a chute into covered trucks and then hauled offsite for reuse or disposal. During the dry transfer of fly ash, an enclosed process is utilized to transfer ash from the silo through a chute into sealed trucks.

## 3.0 Test Program/Operating Conditions

Visible emission monitoring was conducted on the Ash Silos Vacuum Blowers and the Fly Ash Silo on November 22, 2013. The Fuel Day Bin Vents were observed for visible emissions on November 23, 2013. Visible emission observations on the Screen/Hog Building Baghouse were conducted on November 25, 2013. The Alkaline Sorbent Storage Silo was observed for visble emissions on December 20, 2013. Monitoring was conducted while the systems were operating at maximum capacity to the extent practicable. During the visible emission observations, the truck hoppers operated at approximately 389.23 tons/hr. The Metering Bins were operating at approximately xxx. The Alkaline storage tank was filled at a pressure of 10 psi. The depth of the sorbent in the silo was documented during the filling operation.

Plant operating data were provided by Gainesville Renewable Energy Center, Inc. and are located in Appendix A.

## 4.0 Test Methods

All testing was performed in accordance with methods approved by the USEPA and FDEP. The following discusses the methods, as well as quality assurance and sample handling procedures.

Table 2 summarizes the EPA test methods utilized to complete the test program.

Tal	ble 2: Summary of EPA Reference Methods
	Woody Biomass Power Plant
	Emission Units -001, -002 and -003
EPA Method	Description
9	Opacity (Visible Emissions)

#### 4.1 Visible Emission Determination

USEPA Method 9 was utilized to determine visible emissions.

Visible emissions observations were performed by a FDEP certified visible emissions reader. Readings were taken at 15 second intervals and reduced into six minute averages as required by the applicable EPA standard. One, sixty (60) minute visible emissions test run was performed on each of the point sources while the system was operating at or near maximum capacity, to the extent practical.

Method 9 data summary, field data and VE reader's certification are located in Appendix B and C.

## 5.0 Emission Monitoring Results

The following section presents the results of the monitoring program. Table 3 summarizes the test program results. Supporting RM field data are presented in Appendix B.

### 5.1 Biomass Fuel Delivery System (001)

The highest six-minute average visible emission observation from the three point sources (the Screen/Hog Building Baghouse, BFB Boiler Fuel Day Bin Vent Filter No. 1 and BFB Boiler Fuel Day Bin Vent Filter No. 2) that make up the Biomass Fuel Delivery, Preparation, Storage and Handling emission unit was 0.0%, each passing the emissions limitation of 5 %.

### 5.2 Alkaline Sorbent Storage Silo (002)

The highest six-minute average visible emission observed from the Alkaline Sorbent Storage Silo was 0.0% passing the emissions limitation of 5%.

### 5.3 Ash Handling System (003)

The highest six-minute average visible emission observation from the three point sources (the Ash Silo Vacuum Blower No. 1, Ash Silo Vacuum Blower No. 2 and the Fly Ash Silo Bin Vent Filter) that make up the Ash Handling, Storage and Shipment emission unit was 0.0%, each passing the emissions limitation of 5 %.

Table 3: Visible Emissions Summary
Woody Biomass Power Plant
Emission Units -001, -002 and -003

Sample Location	Date	Start Time (EST)	End Time (EST)	VE % <sup>a</sup>	Emission Limit
Screen/Hog Building Baghouse	11/25/2013	08:40	10:05	0.0%	5% VE
BFB Boiler Fuel Day Bin Vent Filter No. 1	11/23/2013	09:45	10:45	0.0%	5% VE
BFB Boiler Fuel Day Bin Vent Filter No. 2	11/23/2013	09:45	10:45	0.0%	5% VE
Alkaline Sorbent Storage Bon Vent Filter	12/20/2013	14:33	15:03	0.0%	5% VE
Ash Silo Vacuum Blower No. 1	11/22/2013	14:00	15:00	0.0%	5% VE
Ash Silo Vacuum Blower No. 2	11/22/2013	12:20	13:20	0.0%	5% VE
Fly Ash Silo Bin Vent Filter	11/22/2013	14:00	15:00	0.0%	5% VE

a = highest 6 minute block average

Appendix A: Facility Operating Data



#### Florida Department of

#### **ENVIRONMENTAL PROTECTION**

BOB MARTINEZ CENTER 2600 BLAIR STONE ROAD TALLAHASSEE, FLORIDA 32399-2400 RICK SCOTT GOVERNOR

HERSCHEL T. VINYARD JR. SECRETARY

Sent by Electronic mail – Received Receipt Requested

Thomas W. Davis, P.E. Environmental Consulting & Technology, Inc. 3701 Northwest 98<sup>th</sup> Street Gainesville, FL 32606 <u>tdavis@ectinc.com</u>

Re: Required Visible Emissions Tests Gainesville Renewable Energy Center Permit No. 0010131-001-AC (PSD-FL-411)

Dear Mr. Davis:

The Department received your request for clarification of the required visible emissions tests at the above referenced facility. After reviewing the requirements of Permit No. 0010131-001-AC (PSD-FL-411), we agree with your interpretation that the following visible emissions tests are required:

EU-001 point sources required to have an initial EPA Method 9 VE test:

- Screen/Hog Building Baghouse
- BFB Boiler Fuel Day Bin Vent Filter No. 1
- BFB Boiler Fuel Day Bin Vent Filter No. 2

EU-002 point sources required to have an initial EPA Method 9 VE test:

- BFB Boiler
- Alkaline Sorbent Storage Silo Bin Vent Filter

EU-003 point sources required to have an initial EPA Method 9 VE test:

- Ash Silo Vacuum Blower No. 1
- Ash Silo Vacuum Blower No. 2
- Fly Ash Silo Bin Vent Filter

Please call Edward Svec at 850/717-9031 if you have any questions regarding this determination.

Sincerely,

Syed Arif, Environmental Administrator Office of Permitting and Compliance Division of Air Resource Management

Mr. James Gordon, CEO, GREC: jgordon@amrenewables.com Mr. Richard Rachal, FDEP Northeast District: <u>richard.rachal@dep.state.fl.us</u> Ms. Lynn Scearce, DEP OPC: <u>lynn.scearce@dep.state.fl.us</u>



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![](_page_16_Figure_0.jpeg)

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<sup>2013.12.23 15:09:30</sup> 

Gainesville Renewable Energy Center 11201 NW US 441 Gainesville, FL 32653 Ticket # 8,490 11/25/13 9:51 am Order MJOHNSON Trk ID GREC000139 Cust ID WRR Order Number WRRMJOHNSON Gross : 86840 lb Tare : 28320 lb Net : 58520 lb 29.26 tn

Adjusted Net :

Mat ID UWW 29.26 Tons

Gainesville Renewable Energy Center 11201 NW US 441 Gainesville, FL 32653 Ticket # 8,491 11/25/13 8:45 am Order MJOHNSON Trk ID GREC000016 Cust ID WRR Order Number WRRMJOHNSON Gross : 83480 lb Tare : 28500 lb Net : 54980 lb 27.49 tn

Adjusted Net :

Mat ID UWW 27.49 Tons

Gainesville Renewable Energy Center 11201 NW US 441 Gainesville, FL 32653 Ticket # 8,492 11/25/13 8:46 am Order MJOHNSON Trk ID GREC000189 Cust ID WRR Order Number WRRMJOHNSON Gross : 83320 Ib Tare : 34180 Ib Net : 49140 Ib 24.57 tn

Adjusted Net

Mat ID UWW 24.57 Tons

Gainesville Renewable Energy Center 11201 NW US 441 Gainesville, FL 32653 Ticket # 8,493 11/25/13 8:59 am Order Parnell Trk ID GREC000097 Cust ID RIGONI Order Number COL012 Gross : 83140 lb Tare : 30680 lb Net : 52460 lb 26.23 tn

Adjusted Net :

Mat ID HWRES 26.23 Tons

Gainesville Renewable Energy Center 11201 NW US 441 Gainesville, FL 32653 Ticket # 8,494 11/25/13 8:57 am Order KANAPAHA Trk ID GREC000162 Cust ID CTC Order Number ALA013 Gross : 83720 lb Tare : 30800 lb Net : 52920 lb 26.46 tn

Adjusted Net : Mat ID HWWTC 26.46 Tons

Gainesville Renewable Energy Center 11201 NW US 441 Gainesville, FL 32653 Ticket # 8,496 11/25/13 9:01 am Order MJOHNSON Trk ID GREC000169 Cust ID WRR Order Number WRRMJOHNSON Gross : 87580 lb Tare : 34120 lb Net : 53460 lb 26.73 tn

Adjusted Net :

Mat ID UWW 26.73 Tons

Gainesville Renewable Energy Center 11201 NW US 441 Gainesville, FL 32653 Ticket # 8,497 11/25/13 9:08 am Order MJOHNSON Trk ID GREC000170 Cust ID WRR Order Number WRRMJOHNSON Gross : 82200 lb Tare : 34060 lb Net : 48140 lb 24.07 tn

Adjusted Net :

Mat ID UWW 24.07 Tons

Gainesville Renewable Energy Center 11201 NW US 441 Gainesville, FL 32653 Ticket # 8,526 11/25/13 11:20 am Order MJOHNSON Trk ID GREC000171 Cust ID WRR Order Number WRRMJOHNSON Gross : 86840 lb Tare : 34060 lb Net : 52780 lb 26.39 tn

Adjusted Net

Mat ID UWW 26.39 Tons

Gainesville Renewable Energy Center 11201 NW US 441 Gainesville, FL 32653 8,498 11/25/13 9:38 am Ticket # Order HOGFUEL Trk ID GREC000192 Cust ID SLC Order Number HOGFUEL Gross: 74920 lb 27180 lb Tare : 23.87 tn Net: 47740 lb Moisture Content : Adjusted Net : Mat ID KDHOGFUEL 23.87 Tons

VE2

Gainesville Renewable Energy Center 11201 NW US 441 Gainesville, FL 32653 Ticket # 8,499 11/25/13 9:42 am Order Thomas & Thomas Trk ID GREC000085 Cust ID HARLEY Order Number SUW010 Gross : 82940 lb Tare : 34160 lb Net : 48780 lb 24.39 tn

Adjusted Net :

Mat ID HWRES 24.39 Tons

Gainesville Renewable Energy Center 11201 NW US 441 Gainesville, FL 32653 Ticket # 8,500 11/25/13 9:39 am Order MJOHNSON Trk ID GREC000073 Cust ID WRR Order Number WRRMJOHNSON Gross : 83520 lb Tare : 28240 lb Net : 55280 lb 27.64 tn

Adjusted Net :

Mat ID UWW 27.64 Tons

Gainesville Renewable Energy Center 11201 NW US 441 Gainesville, FL 32653 Ticket # 8,501 11/25/13 9:49 am Order PCS PHOSPHATE Trk ID GREC000078 Cust ID BANDE Order Number HAM007 Gross: 84380 lb Tare: 26360 lb Net: 58020 lb 29.01 tn

Adjusted Net :

Mat ID MIXEDRES 29.01 Tons

Gainesville Renewable Energy Center 11201 NW US 441 Gainesville, FL 32653 Ticket # 8,502 11/25/13 9:51 am Order WRR Ocala yard Trk ID GREC000012 Cust ID WRR Order Number WRROCA Gross : 68220 lb Tare : 29240 lb Net : 38980 lb 19.49 tn

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Adjusted Net 🗄

Mat ID UWW 19.49 Tons

Gainesville Renewable Energy Center 11201 NW US 441 Gainesville, FL 32653 Ticket # 8,503 11/25/13 9:57 am Order WRR Ocala yard Trk ID GREC000115 Cust ID WRR Order Number WRROCA Gross : 80560 lb Tare : 27760 lb Net : 52800 lb 26.40 tn

Adjusted Net :

Mat ID UWW 26.40 Tons

Gainesville Renewable Energy Center 11201 NW US 441 Gainesville, FL 32653 Ticket # 8,504 11/25/13 9:52 am Order MJOHNSON Trk ID GREC000075 Cust ID WRR Order Number WRRMJOHNSON Gross : 83900 lb Tare : 27580 lb Net : 56320 lb 28.16 tn

Adjusted Net :

Mat ID UWW 28.16 Tons

Gainesville Renewable Energy Center 11201 NW US 441 Gainesville, FL 32653 Ticket # 8,505 11/25/13 10:04 am Order GREER Trk ID GREC000024 Cust ID RJN Order Number ORA001 Gross : 83920 Ib Tare : 33000 Ib Net : 50920 Ib 25.46 tn

Adjusted Net : Mat ID HWRES

25.46 Tons

Gainesville Renewable Energy Center 11201 NW US 441 Gainesville, FL 32653 Ticket # 8,506 11/25/13 10:07 am Order Parnell Trk ID GREC000093 Cust ID RIGONI Order Number COL012 Gross : 86920 lb Tare : 31000 lb Net : 55920 lb 27.96 tn

Adjusted Net :

Mat ID HWRES 27.96 Tons

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## Appendix B: Method 9 Support Data

VE Field Documentation

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Day Bin vent filler # 2

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Appendix C: Accreditations and Certifications

# **VISIBLE EMISSIONS EVALUATOR**

## Joseph Conti

This is to certify that the above named observer has met the specifications of Federal Reference Method 9 and is qualified as a visible emissions evaluator. Maximum deviation on white and black smoke did not exceed 7.5% opacity and no single error exceeding 15% opacity was incurred during the certification test conducted by Eastern Technical Associates, Inc. of Raleigh, N.C. This certificate is valid for six months from date of issue.

414132 Certificate #

8/14/2013 Date of Certification

2/13/2014

Certification Expiration Date

CON689124 Student ID Number

Tampa, FL

TMPS12 Last Lecture

Marty Hughes
Director of Training

# **VISIBLE EMISSIONS EVALUATOR**

## Joshua Cooper

This is to certify that the above named observer has met the specifications of Federal Reference Method 9 and is qualified as a visible emissions evaluator. Maximum deviation on white and black smoke did not exceed 7.5% opacity and no single error exceeding 15% opacity was incurred during the certification test conducted by Eastern Technical Associates, Inc. of Raleigh, N.C. This certificate is valid for six months from date of issue.

414133 Certificate #

8/14/2013 Date of Certification

2/13/2014

Certification Expiration Date

COO752114 Student ID Number

Tampa, FL

TMPF12 Last Lecture

*Marty Hughes* **Director of Training** 

# **VISIBLE EMISSIONS EVALUATOR**

## **Alex Houseal**

This is to certify that the above named observer has met the specifications of Federal Reference Method 9 and is qualified as a visible emissions evaluator. Maximum deviation on white and black smoke did not exceed 7.5% opacity and no single error exceeding 15% opacity was incurred during the certification test conducted by Eastern Technical Associates, Inc. of Raleigh, N.C. This certificate is valid for six months from date of issue.

413941	HOU704558		
Certificate #	Student ID Number		
8/7/2013	Orlando, FL		
Date of Certification	Location		
2/6/2014	TMPS12		
Certification Expiration Date	Last Lecture		
Marty Hug	ihes		
Director of Tr	aining		