

VALIDATION REPORT FOR RECAST ENERGY LOUISVILLE FUEL SWITCH FROM COAL TO BIOMASS FOR THERMAL ENERGY



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Summary:

The Recast Energy Louisville Fuel Switch From Coal to Biomass for Thermal Energy Project (the Project) is a thermal energy generation project fuelled with locally available forestry and agricultural cellulosic residues (i.e., primary mill residues, logging residues, and crop residues), and is located at the Lubrizol Advanced Material, Inc. facility in Louisville, Kentucky (the Facility). The Project location is on land owned by one of the project customers (Lubrizol) and then subsequently leased back to the Project Proponent, Recast Energy Louisville, LLC. The Project is owned and operated by Recast Energy Louisville, LLC. Thermal energy from the biomass system displaces thermal energy generated by the gas-fired boiler system. The thermal energy generated from the biomass boiler is sold to Lubrizol and Zeon Chemicals (the project customers). The pre-project scenario consisted of the project customers receiving thermal energy that was generated by coal and supplemented with natural gas when needed.

The Project achieves GHG emission reductions by displacing thermal energy that would have been generated from a fossil fuel boiler.

The purpose of validation is to ensure the Project is implemented in accordance with the criteria stated below and meets the requirements of the Verified Carbon Standard (VCS) program. The validation scope is defined as an independent and objective review of the VCS Project Description to insure it is sound, reasonable, and meets the requirements of the stated criteria below.

The validation process consists of the independent third-party assessment of the Project design and emission reduction assertion against the criteria stated in the VCS Version 3, 8 October 2013, v3.4 and the approved Clean Development Mechanism (CDM) methodology AMS-I.C. *"Thermal energy production with or without electricity"* Version 19.

During the validation process, First Environment, Inc. (First Environment) issued one clarification and 16 corrective action requests – all of which were addressed sufficiently by Recast Energy, LLC. In summary, First Environment is reasonably assured that the Project meets all relevant VCS Version 3 requirements and correctly applies the VCS-approved CDM methodology AMS-I.C.

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1 INTRODUCTION

This report is provided to Recast Energy Louisville, LLC (Recast Energy) as a deliverable of the Verified Carbon Standard (VCS) project validation process for the Recast Energy Louisville Fuel Switch from Coal to Biomass for Thermal Energy Project (the Project). This report provides a description of the steps involved in conducting the validation and the findings of the validation performed on the basis of the VCS Standard, as well as criteria given to provide for consistent project operation, monitoring, and reporting of greenhouse gas (GHG) emission reductions. This validation report summarizes the findings of the validation.

As outlined in the VCS Project Description (VCS PD), the VCS-approved methodology applied to the project activity is the Clean Development Mechanism (CDM) methodology AMS I.C *“Thermal energy production with or without electricity”*, Version 19. The Audit Team was provided the initial version of the VCS PD dated November 7, 2012. Based on this documentation, a document review and desktop audit took place which resulted in corrective action requests (discussed later in this report) and revisions to the VCS PD. The final version, Version 2.7 dated December 4, 2014, serves as the basis of the final conclusions presented herewith.

1.1 Objective

The purpose of validation is to have an independent third party assess the Project's design. In particular, the Project's baseline, monitoring plan, and the Project's conformance with VCS requirements are validated. This is to ensure that the VCS PD, as documented, is sound and reasonable and meets the identified criteria. Validation objectives also include an assessment of the likelihood that the Project will achieve the emission reductions estimated by the Recast Energy. Validation is a requirement for all VCS projects and is seen as necessary to provide assurance to stakeholders of the quality of the Project and its intended generation of emission reductions.

1.2 Scope and Criteria

The validation scope is defined as an independent and objective review of the VCS PD. The VCS PD was reviewed against the following criteria:

- VCS Standard, 8 October 2013, v3.4 (VCS Standard);
- approved CDM methodology AMS-I.C. *“Thermal energy production with or without electricity”*, Version 19, including all methodological tools reference therein.

The Audit Team employed a risk-based approach, focusing on the identification of significant risks for project implementation and the generation of emission reductions. The validation process was also informed by the requirements stated in the VCS Standard; the VCS Program Guide, 8 October 2013, v3.5; and the ISO 14064-3 standard.

1.3 Level of Assurance

First Environment, Inc. (First Environment) and Recast Energy have agreed that a reasonable level of assurance be applied for the Project.

1.4 Summary Description of the Project

The Recast Energy Louisville Fuel Switch from Coal to Biomass for Thermal Energy Project consists of the conversion of a coal fired boiler to a biomass fired boiler at the Lubrizol facility located at 4200 Bells Lane, Louisville Kentucky. The Project is owned and operated by Recast Energy. Biomass generated locally is used to produce thermal energy which is sold to Lubrizol Advanced Material, Inc. (Lubrizol) and Zeon Chemicals, LP (Zeon), (the project customers). The pre-project scenario consisted of the Project customers' receiving thermal energy from the pre-retrofitted boiler which was fueled by coal. The Project

achieves GHG emission reductions by displacing fossil fuel produced thermal energy with thermal energy produced by renewable biomass.

The VCS PD provides additional details regarding the project activity.

2 VALIDATION PROCESS

2.1 Method and Criteria

The following validation process was used:

- conflict of interest review;
- selection of validation team;
- initial interaction with the Recast Energy;
- development of the validation plan;
- desktop review of the Project design and the baseline and monitoring methodology and other relevant Project documentation;
- site visit;
- follow-up interaction with Recast Energy for supplemental information and corrective action as necessary; and
- report development and issuance of final validation statement.

The validation process was utilized to evaluate whether the Project's approach, as outlined in the VCS PD, is consistent with the VCS Standard and the AMS-I.C methodology. A validation conformance checklist was developed for the Project which summarizes the criteria used to evaluate the Project, the Project's conformance with each criterion, and the Audit Team's validation findings.

Conflict of Interest Review

Prior to beginning any validation project, First Environment conducts an evaluation to identify any potential conflicts of interest associated with the project. No potential conflicts were found for this Project.

Audit Team

First Environment's Audit Team consisted of the following individuals who were selected based on their validation experience, as well as familiarity with renewable energy operations:

Jeff Daley – Lead Auditor
Iris Caldwell – Auditor
Howard Kanter – Auditor
Mary Pat Campbell - Auditor
James Wintergreen – Internal Reviewer

Audit Kick-off

The validation process was initiated with a kick-off conference call on October 30, 2012 between First Environment and Recast Energy. The communication focused on confirming the validation scope, objectives, criteria, schedule, and the information required for the validation. The Project was listed in the VCS Project Pipeline on November 19, 2014. The Project kick-off meeting occurred prior to the Project being listed in the VCS Project Pipeline because the VCS Project Pipeline was not established in 2012 when the validation process began.

Development of the Validation Plan

The Audit Team formally documented its validation plan as well as determined the validation sampling plan. The validation plan was informed by the kick-off meeting where key elements of the validation's scope were discussed including project team members, project level of assurance, materiality threshold, and standards of reporting and validation. The validation plan also provided an outline of the validation process and established project deliverables. A separate sampling plan was designed to review all project elements in areas of potentially high risk of inaccuracy or non-conformance.

Desktop Review

The Audit Team performed a desktop review of the VCS PD and supporting documentation, as further described in Section 2.2 below.

Site Visit

Mr. Howard Kanter performed a site visit on December 11, 2012. The focus of the site visit was to interview relevant site personnel and project stakeholders; review the Project's operations, data collection procedures, and information management systems; as well as to assess the Project's controls for sources of potential errors and omissions. The site inspection included a tour of the entire Project facility including the fuel material receiving yard, Project Boiler No. 4, Ash Handling unit, and all associated ancillary equipment (i.e., metering and data recording systems), and process areas.

Corrective Actions and Supplemental Information

The Audit Team requested clarification and supplemental information as well as corrective action during the validation process. The corrective action and clarification requests, and the responses provided, are summarized in Appendix A.

Validation Reporting

Validation reporting, represented by this report for Recast Energy, documents the validation process and identifies its findings and results. Validation reporting consists of this report and a separate Deed of Representation to be submitted to the VCS Association.

2.2 Document Review

The Audit Team conducted the validation using the VCS Standard and the AMS-I.C. methodology as the reference criteria. Additionality, eligibility requirements, baseline scenario(s), project emissions, monitoring plan, and other pertinent criteria were assessed to evaluate the Project's approach as outlined in the VCS PD against the validation criteria. Discrepancies between the VCS PD and the validation criteria were considered material and identified for corrective action. Any deviations from the validation criteria required appropriate justification.

2.3 Interviews

Through the course of validation activities and during the site visit, First Environment interviewed the following project personnel to inform the validation process:

- Donna Wirick – Recast Energy Louisville LLC; *Environmental, Health and Safety Manager*;
- Larry Dowell - Recast Energy Louisville LLC; *Plant Manager*;
- Ronnie Burnette – Recast Energy Louisville LLC; *VP Engineering & Plant Operations*.

2.4 Site Inspections

As described above, Howard Kanter performed the site visit on December 11, 2012.

2.5 Resolution of Findings

As described above, the Audit Team requested supplemental information as well as 16 corrective actions and 1 clarification request during the validation. The findings were resolved through a written response process to each issue, as well as any required VCS PD revisions including supporting evidence submittals where necessary. The corrective action and clarification requests and the responses provided are summarized in the table found in Appendix A.

2.6 Forward Action Requests

There were no forward action requests issued during the validation process.

3 VALIDATION FINDINGS

3.1 Project Details

The Project applies the AMS-I.C. methodology, which is applicable to the Project activity because it falls within the scope of the methodology. Specifically, the Project activity involves a renewable energy technology that supplies users with thermal energy that displaces fossil fuel use.

The Project Activity is located at 4200 Bells Lane in Louisville, Kentucky (latitude 38.2226280° and longitude -85.8235880°).

The Project consists of the conversion of a coal fired boiler to a biomass fired boiler. Thermal energy from the combustion of renewable biomass in the Project boiler (Boiler No. 4) is captured and sold to end users. By converting the boiler to a biomass fuelled boiler, fossil fuel based emissions that would have been produced by the coal boiler are avoided.

Prior to the initiation of the Project, the Project Boiler No. 4 was fuelled with coal.

The Project start date is December 10, 2012, corresponding to the date which the Project Boiler No. 4 was allowed per the Title V Operating Permit to combust wood biomass. The Audit Team reviewed the Title V Operating Permit to confirm the project start date.

The first crediting period is April 1, 2013 to March 31, 2023. The start of the crediting period corresponds with the date the project achieved steady operation after an initial start-up and testing period. The forecasted emission reductions expected during the first crediting period are 536,100 mt CO₂e, which classify the project scale as "Projects" in accordance with Section 3.9.1 of the VCS Standard.

The Project complies with relevant laws and regulations. The Audit Team reviewed copies of various State and local permits as well as interviewed Project personnel during the site visit in order to confirm that necessary regulatory requirements were met.

Recast Energy holds the Right-of-Use of the Project Activity, as evidenced in accordance with Item 3 of Section 3.11.1 of the VCS Standard v3.4:

Recast Energy has full ownership of the project equipment and process that generates the GHG emission reductions. This constitutes overall control and responsibility for the Project activity; therefore, Recast Energy is identified as the Project Proponent.

The Audit Team reviewed an attestation signed by Recast Energy stating that Recast Energy has not attempted to register the Project with another GHG program other than VCS, and the Project is not part of any emissions trading programs or subject to other binding emissions limits or targets. In addition, the attestation confirms that the Project has not sought and is not seeking to generate any other form of GHG related environmental credit.

Contracts with thermal energy customers and biomass suppliers were classified as commercially sensitive information. The Audit Team reviewed all business confidential information and determined that the classification as “commercially sensitive” is appropriate.

Overall, the Project Proponent(s) provided an accurate, complete description of the Project providing a comprehensive understanding of the nature of the Project.

3.2 Application of Methodology

3.2.1 Title and Reference

The VCS-approved methodology applied to the Project activity is the following CDM approved consolidated methodology:

- AMS-I.C. “Thermal energy production with or without electricity,” Version 19.

The following CDM approved methodological tools and guidance documents were applied:

- tool to calculate the emission factor for an electricity system, Version 04.0.0;
- tool to calculate baseline project and/or leakage emissions from electricity consumption, Version 1.0;
- tool to calculate project or leakage CO₂ emissions from fossil fuel combustion, Version 2.0;
- Guidelines on the Demonstration of Additionality of Small-Scale Project Activities, Version 09.0;
- General Guidelines to SCC CDM methodologies, Version 20;
- General guidance on leakage in biomass project activities, Version 03;
- Annex 18, Definition of Renewable Biomass.

3.2.2 Applicability

The Project activity complies with the applicability requirements of AMS-I.C. The table below lists the relevant applicability requirements and identifies how the Project meets them.

AMS-I.C Requirement	Project Conformance	Comments/Findings
Project consists of renewable energy technologies that supply users with thermal energy that displaces fossil fuel use.	Yes	The Project activity involves the generation of thermal energy through the use of renewable biomass which displaces the baseline fossil fuel (coal).
Total installed/rated thermal energy generation output capacity of the project equipment is equal to or less than 45 MW thermal	Yes	The total installed thermal energy generation capacity is 42.2 MW, which is below the 45MW thermal threshold.
If electricity and/or steam/heat produced by the project activity is delivered to a third party; i.e., another facility or facilities within the project boundary, a contract between the supplier and consumer(s) of the energy will have to be entered into that ensures there is no double-counting of emission reductions.	Yes	The supplier of the thermal energy has entered into a contract with each customer which transfers all rights of the environmental attributes to the supplier (Recast Energy).

AMS-I.C Requirement	Project Conformance	Comments/Findings
In the case of Project activities using biomass, emission reductions may only be accounted for the combustion of “renewable biomass” as defined in “Definition of Renewable Biomass.”	Yes	The biomass used by the Project activity is a biomass residue, as defined by definition five of Annex 18.

The Project correctly applied the AMS-I.C methodology and all associated methodological tools as referenced in Section 3.2.1 above.

3.2.3 Project Boundary

The Project boundary is defined by the geographical extent of the project activity including the Project Boiler No. 4, all associated ancillary equipment, and the biomass suppliers.

The Audit Team verified the boundary through observations and interviews during the site inspection and by reviewing the energy supply agreements between the Project activity and thermal energy end users.

The Audit Team reviewed the source, sink, and reservoir (SSR) determination included in the VCS PD and found the justification accurate and in accordance with the applied methodology.

Overall, the Project Proponent(s) provided an accurate description of the Project boundary and a comprehensive justification for the project’ SSR.

3.2.4 Baseline Scenario

Consistent with AMS-I.C., the baseline scenario of the Project is defined as the continued use of fossil fuel that would have been consumed to produce thermal energy in the absence of the project activity.

The Audit Team was provided with various forms of evidence including historical fossil fuel usage, EPA data demonstrating coal as the predominate fuel source for in-service U.S. boilers of similar age, and original boiler design specifications indicating that coal is was the baseline fuel for which the boiler was designed to operate on.

The Audit Team reviewed the Project description and supporting evidence regarding the technology applied (renewable thermal energy generation), and determined that the baseline determination for the project activity is accurate, justified, and in accordance with the applicable methodology.

3.2.5 Additionality

Because the Project utilizes AMS-I.C., the Project is considered small-scale. Therefore, demonstration of additionality was performed in accordance the *Guidelines on the Demonstration of Additionality of Small-Scale Project Activities, Version 09.0.*, which requires the demonstration of at least one barrier – investment, technological, prevailing practice, or other – that would have prevented the Project activity from occurring anyway.

Implementation Barriers: The Project faced implementation barriers associated with negotiating terms for energy supply to the Project customers. The biomass energy supply created implementation barriers for the Project because of risks associated with biomass produced energy that the Project customers were unwilling to accept without negotiating numerous concessions into the energy supply agreement. It was not until both Recast and the Project customers agreed to concessions in the energy supply agreement that provided financial incentives, including lower steam price per unit, and sharing of the revenue from VCU’s, that the Project customers were willing to accept the technology and prevailing practice risks described below. First Environment was provided with and reviewed both the Energy Supply Agreements between all parties, and the requested concessions prior to execution of the Energy Supply Agreements to confirm this implementation barrier associated with negotiating contract terms.

Barriers Due to Technology / Prevailing Practice: The Project faced prevailing practice barriers due to the lack of biomass combustion in the industrial sector. The baseline coal boiler had been in operation since 1981, was proven reliable and had a current Title V Permit. The new biomass technology required a revised Title V Operating Permit, and additional fuel handling/feeding systems, new combustion management/air handling system, and new pollution control equipment to accommodate biomass combustion. While neither the Permit revisions nor additional combustion systems represent new technologies, their application with biomass is not well tested/demonstrated and represented additional risks that were undertaken by the Project activities implementation. The VCS PD cites EPA Boiler MACT Emissions and Survey Data, as well as a biomass utilization study performed by the International Energy Agency, which were evaluated to demonstrate biomass usage among industrial boilers. The EPA study identified that biomass represented approximately six percent of total primary and secondary fuel for all reporting industrial boilers. Additionally, the biomass utilization study identified that biomass represents less than two percent of total energy generation in the United States. First Environment was provided with all referenced studies and data to confirm that biomass usage and utilization faced significant Prevailing Practice barriers.

In conclusion, First Environment reviewed the additionality demonstration and verified the supporting evidence provided, including relevant contracts and references cited and found them adequate and sufficient to justify the additionality of the Project.

3.2.6 Quantification of GHG Emission Reductions and Removals

Emission reductions are quantified in accordance with the procedures described in the AMS-I.C methodology and relevant CDM tools, except where deviations are noted below in Section 3.2.7. The equations are correctly identified and the calculation of GHG emission reductions is presented in a transparent manner, incorporating all relevant GHG sources, sinks, and reservoirs.

Baseline emissions are estimated ex-ante based on the quantity of thermal energy generated by the Project divided by the efficiency of the baseline boiler and multiplied by the CO₂ emission factor of the fossil fuel that would have been used by the baseline boiler.

Project emissions are estimated ex-ante and account for CO₂ emission due to on-site fossil fuel consumption by equipment used to move biomass within the project facility, and CO₂ emission due to electricity consumption attributed to the project activity.

Project leakage emissions from biomass processing, biomass transportation, and transportation of ash combustion residues are accounted for in accordance with AMS-I.C.

Total net emission reductions are determined by subtracting project emissions and leakage emissions from the baseline emissions.

After reviewing the quantification procedure and supporting evidence, the Audit team concluded that the methodologies and the applicable tools have been applied correctly to calculate baseline emissions, project emissions, leakage, and net GHG emission reductions and removals.

3.2.7 Methodology Deviations

The following methodology deviations were identified during the validation process. The audit team evaluated the justification and applicable supporting evidence and validated the application of the deviations listed below.

Parameter	AMS-I.C. Requirement	Deviation from Requirement	Validation Conclusion
Quantity of Steam (Q _{steam})	In case the Project is exporting heat to other facilities, the metering shall be carried out at the recipient's end.	The quantity of steam and thus thermal energy exported to the project customers is measured at the biomass boiler rather than at the customers end.	If steam and thermal energy is measured at the customer's meters, measurements will comingle mass and energy from all facility boilers rather than just the Project's biomass boiler which would grossly overestimate baseline emissions. This deviation results in more accurate quantification of emission reductions. Deviation is acceptable.
Quantity of Electricity Consumed (EC _y)	Directly meter the quantity of electricity consumed by the Project as required per the CDM "Tool to calculate baseline, project and/or leakage emissions from electricity consumption."	In lieu of monitoring Project electricity consumption, the difference between maximum electricity consumption capacity of the pre-project coal boiler and all associated ancillary equipment and the maximum electricity consumption capacity of the project biomass boiler and all associated ancillary equipment is applied as a conservative estimate of Project electricity consumption. The maximum electricity consumption capacity of the Project boiler will be reviewed with each verification period to identify any changes in project equipment and associated electricity consumption.	This deviation is conservative because it assumes all pre and post project equipment is running at its maximum potential electricity consumption. Additionally, due to the metering arrangements at the facility, this approach is more accurate than pro-rating facility electricity consumption to try and obtain project electricity consumption. This deviation provides greater accuracy and will not negatively impact the quantification of emission reductions. Deviation is acceptable.
Emission Factor for Electricity Consumption (EF _{grid, CM,y})	Apply the CDM "Tool to calculate the emission factor for an electricity system."	In lieu of the application of the "Tool to calculate the emission factor for an electricity system," the project applies the default US EPA eGrid emission factor for the SRTV sub-region.	US EPA's eGrid emission factors are reputable and widely accepted for GHG emissions quantification and represent a functionally equivalent substitution for the application of the emission factor tool. Deviation is acceptable.
Quantity of fossil fuel consumed by the Project (FC _y)	Directly meter the quantity of fuel consumed by the Project as required per the CDM "Tool to calculate project or leakage CO ₂ emissions from fossil fuel combustion."	In lieu of directly metering diesel fuel consumption by Project equipment, the Project will rely on fuel delivery invoices. The diesel fuel is metered into the on-site storage tank during fuel deliveries and recorded on delivery invoices. The Project will conservatively assume that all purchased fuel is consumed.	The use of fuel delivery invoices is a reliable data source, and the assumption that all delivered fuel is consumed by the Project will result in an overestimate of Project emissions. This deviation is conservative and will not negatively impact the quantification of emission reductions. Deviation is acceptable.

The above-mentioned deviations were appropriately justified in the VCS PD and do not impact the applicability of the methodology applied, additionality of the Project, appropriateness of the baseline scenario, or conservativeness of the emission reduction assertions.

3.2.8 Monitoring Plan

The Project applies the monitoring methodology described in the AMS-I.C. methodology. The primary variables monitored in order to determine and account for emission reductions are listed below.

Parameter	Method of Estimation	Frequency of Measurement	Unit of Measurement	Frequency of Recording
Steam generation, $Q_{\text{steam},y}$	Differential pressure flow meter	Continuous	lbs	Hourly / Monthly
Steam Pressure	Pressure meter	Hourly	Psi	Daily
Steam Temperature	RTD Temperature meter	Hourly	°F	Daily
Feed water temperature	RTD Temperature meter	Hourly	°F	Daily
Project grid electricity consumption, EC_y	Maximum equipment ratings for electricity consumption	Once per verification period	KWh	Once per verification period
Diesel Fuel Consumption, $FC_{\text{Diesel, loader},y}$	Review of fuel supplier invoices	As delivered	Gallons	As delivered / aggregated annually
Quantity of Biomass, $Q_{\text{biomass},i,y}$	Truck scale measurements	As delivered	Tons	As delivered / aggregated annually

The monitoring plan specified within the VCS PD includes all relevant data and parameters required to obtain a reliable result of generated emission reductions and meets the requirements of the AMS-I.C methodology. The VCS PD includes a complete description of the frequency, responsibility, and procedures for recording, storing, monitoring, measuring, and reporting activities. The monitoring plan ensures the adequate measurement of emissions occurring from GHG sources through the installation of appropriate metering equipment. The monitoring plan also identifies appropriate procedures for quality assurance and quality control of project data.

The Audit team concluded that the monitoring plan included in the VCS PD is adequate and in accordance with the guidelines and requirements of the AMS-I.C. methodology.

3.3 Non-Permanence Risk Analysis

The project activity does not require a non-permanence risk analysis.

3.4 Environmental Impact

The Project was not required by any local, state or federal authority to conduct an environmental impact assessment.

3.5 Comments by Stakeholders

The Project did not require stakeholder consultation.

4 VALIDATION CONCLUSION

First Environment was retained to perform a validation of the Project's approach, as outlined in the VCS PD, as part of the VCS validation process, based on the following fundamentals:

- *Level of assurance:* Reasonable assurance.
- *Objectives of validation:* To ensure that the VCS PD, as documented, is sound and reasonable and is in conformance with the VCS Standard, and the CDM methodology AMS-I.C. *"Thermal energy production with or without electricity,"* Version 19.
- *Scope, including:*
 - o Boundaries of the assertion: the Project Boiler No. 4, all associated ancillary equipment, and the biomass suppliers;
 - o The physical infrastructure, facilities, and activities within the assertion: The Project Boiler No. 4, steam distribution system, and all ancillary equipment;
 - o GHG sources, sinks, and reservoirs included within the assertion: CO₂ emissions associated with operation of baseline and project equipment.
- *Criteria:*
 - o The validation process was informed by the requirements stated in the VCS Standard; the VCS Program Guide, 8 October 2013, v3.5; and the ISO 14064-3 standard. The VCS PD was assessed against the criteria in the VCS Standard, and the approved CDM methodology AMS-I.C. *"Thermal energy production with or without electricity,"* Version 19.

The review of the VCS PD and the resolution of all corrective action and clarification requests have provided First Environment with sufficient evidence to determine the fulfillment of stated criteria.

The Project correctly applies the approved CDM methodology AMS-I.C. as well as the relevant CDM tools referenced therein. By converting the boiler to a biomass fuelled boiler, fossil fuel emissions that would have been produced by the coal fired boiler are avoided, and the project activity results in reductions of GHG emissions that are real, measurable, and give long-term benefits to the mitigation of climate change. An analysis of the additionality test demonstrates that the proposed project activity is not a likely baseline scenario. Emission reductions attributable to the Project are hence additional to any that would occur in the absence of the Project.

The total emission reductions from the Project are estimated to be 536,100 metric tonnes of CO₂e over the selected 10-year crediting period. The emission reduction forecast has been checked, and it is deemed likely that the stated amount will be realized given that the underlying assumptions do not change. The data and information used to produce the ex-ante emission reduction estimate were based on both historical and projected sources of data.

In summary, it is First Environment's opinion that the Recast Energy Louisville Fuel Switch from Coal to Biomass for Thermal Energy Project, as described in the VCS PD of December 4, 2014, version 2.7, meets all relevant VCS requirements and correctly applies the CDM methodology AMS-I.C.

The validation of the Project is based on the information made available to us and the engagement conditions detailed in this report. First Environment cannot guarantee the accuracy or correctness of this information. Hence, First Environment cannot be held liable by any party for decisions made or not made based on this report or opinion.

APPENDIX A Resolution of Findings Tables

Corrective Action Request	Summary of Participant Response	Validation Conclusion
The Project Description (PD) is inconsistent with the VCS Project Description template in the following ways: - The table on the cover page is not complete. - Section 1.1 does not include all of the required information. - Section 1.6 does not identify the start and end of the crediting period in day, month and year format. - Section 1.8 does not specify the lifetime of project activity. - Section 2.1 does not identify the methodology version number or the names and versions of all tools applied. - Section 4.3 does not identify the organization structure, responsibilities and competencies of the personnel that will be carrying out monitoring activities.	The Project Description was revised to address all of the identified issues and conform to the VCS Project Description template.	Response is acceptable
The Project start date identified in Section 1.5 of the VCS PD is inconsistent with records provided.	The Project start date in section 1.5 of the VCS PD was revised to be December 10, 2012 which is consistent with start date evidence provided.	Response is acceptable
The description of the geographic boundaries provided in Section 1.9 of the VCS PD does not include the industrial facilities consuming energy generated by the project activity.	Section 1.9 of the VCS PD has been revised to include the end users of the energy produced by the project activity.	Response is acceptable
Section 2.2 of the VCS PD does not describe how the Project meets the definition of renewable biomass as required by the <i>General Guidelines to SSC CDM Methodologies</i>, Version 17 (Paragraph 13).	Section 2.2 of the VCS PD has been revised to identify this requirement.	Response is acceptable
Section 2.5 of the VCS PD does not address whether the alternative(s) to the Project activity would have resulted in higher emissions if the barriers were not overcome.	Section 2.5 of the VCS PD has been revised to identify that without implementing the activity, the customers would have continued to use coal to fulfil their manufacturing energy requirements, resulting in higher emissions	Response is acceptable
The barriers discussion in Section 2.5 of the VCS PD does not provide adequate detail about the specific uncertainties, risk factors, and roadblocks that prevented the project activity from	The VCS PD was revised to provide a more clear discussion of the additionality barriers that would have prevented the Project activity from occurring.	Response is acceptable

Corrective Action Request	Summary of Participant Response	Validation Conclusion
occurring anyway. Please expand this discussion and provide supporting documentation as appropriate.		
Section 2.6 of the VCS PD does not demonstrate that each deviation will not negatively impact the conservativeness of the quantification of GHG emission reductions or removals per paragraph 3.5.1 of the VCS Standard.	Section 2.6 of the VCS PD has been revised to state and justify why each deviation will not negatively impact conservativeness of the quantification of GHG emission reductions.	Response is acceptable
The introduction of a new equation to calculate EF_{grid,CO_2} is not an acceptable deviation per paragraph 3.5.1 of the VCS Standard. Please justify how the alternate method of determining EF_{grid,CO_2} is a deviation from the criteria and procedures related to monitoring and measurement.	Section 2.6 of the VCS PD has been revised to remove the erroneous equations related to the emission factor and applies an appropriate US EPA eGrid emission factor for the SRTV region as a deviation.	Response is acceptable
Section 4.2 of the VCS PD does not identify the following parameters as required per AMS-I.C.: - Continuous operation of the equipment/system - CO₂ emission factor for grid electricity in year y (EF_{CO_2}) - Net quantity of thermal energy supplied by the project activity during the year y ($EG_{thermal,y}$).	Section 4.2 of the VCS PD has been revised to include parameter boxes for each identified parameter.	Response is acceptable
The equation for the calculation of project emissions from electricity consumption is not consistent with equation 1 of the <i>Tool to calculate baseline, project and/or leakage emissions from electricity consumption</i> , Version 1.0. Additionally, there is not a box in Section 4 of the VCS PD for the parameter TDL.	Section 3.2 of the VCS PD has been revised and the equation for the calculation of project emissions from electricity consumption is now consistent with the tool. Additionally, the TDL parameter has been added to Section 4.2.	Response is acceptable
The measurement methods and procedures identified in Section 4.2 of the VCS PD for quantifying diesel fuel consumption are not consistent with the measurement procedures identified in the <i>Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion</i> , Version 2.	The use of invoices in lieu of tank gauge or meter readings has been identified in Section 4.2 as the applied "measurement methods and procedures." Additionally, this approach has been identified and justified as a deviation.	Response is acceptable
The use of a U.S. Energy Information Administration (EIA) default value for the diesel fuel emission coefficient is not consistent with the requirements of the <i>Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion</i> , Version 2.	Section 3.2 of the VCS PD has been revised and the CO ₂ emission coefficient is now calculated in accordance with option B of the <i>Tool to calculate Project or leakage CO₂ emissions from fossil fuel combustion</i> , Version 2.	Response is acceptable

Corrective Action Request	Summary of Participant Response	Validation Conclusion
The efficiency value for parameter $\eta_{BL,thermal}$ is not justified in accordance with one of the three options identified in paragraph 30 of the AMS I.C v19 Methodology. Specifically, if option (b) is chosen, the highest efficiency values provided by <i>two</i> or more manufactures must be considered.	The efficiency value has been revised and now is selected based on option (a) of paragraph 30 of the Methodology. Boiler efficiency study was provided which identifies an efficiency of 83.43% based on a study of seven boilers of similar design and specifications. The baseline boiler was a spreader stoker with traveling grates and fly ash reinjection, the boilers in the efficiency study were all spreader stokers with reinjection from D.C. (dust collectors), all equipped with traveling grates.	Response is acceptable
Several parameters in Sections 4.1 and 4.2 of the VCS PD do not identify or provide all the necessary detail required in each row of the parameter boxes.	The parameter boxes in Sections 4.1 and 4.2 have been revised to clarify and provide additional information in each parameter box row consistent with the requirements of the VCS Project Description Template.	Response is acceptable
The calculation of $EG_{thermal,y}$ as identified in Section 3.1 of the PD is not in units of terajoules (TJ).	The calculation of $EG_{thermal}$ in Section 3.1 of the VCS PD has been updated and now includes the correct conversion to terajoule's.	Response is acceptable
Please justify and demonstrate the appropriateness of the value applied for the proposed deviation to determine project electricity consumption (EC_y), and further justify the appropriateness of determining this value only once per crediting period.	Electricity Consumption is determined based on the maximum potential electricity usage for Boiler No. 4 both pre- and post-conversion. The maximum potential electricity consumption was determined by a third-party engineering study performed which identified equipment ratings of each pre- and post-project piece of equipment. The difference between pre- and post-project maximum potential electricity consumption is what will be applied during verification as electricity is consumed. This is conservative because it assumes the maximum potential electricity consumption and is also more accurate than trying to determine project electricity consumption from total facility meters. The maximum potential electricity consumption of the project boiler and associated equipment will be reviewed to identify any changes in Project equipment and updated as needed.	Response is acceptable

Clarification	Summary of Participant Response	Validation Conclusion
Please clarify in Section 3.3 of the VCS PD what activities the parameter $LE_{L2,y}$ represent.	Section 3.3 of the VCS PD has been revised to clarify that leakage of type L2 is leakage from competing sources of biomass. Recast had a fuel supply study conducted ex-ante which concluded that the project would utilize less than four percent of the total biomass surplus in the project region and therefore this leakage source can be ignored (as per the general guidelines on leakage)	Response is acceptable