Department of Energy
Washington, DC 20585

July 19, 2022

Dr. Martin Keller
Director
Alliance for Sustainable Energy, LLC
National Renewable Energy Laboratory
15013 Denver West Parkway
Golden, Colorado 80401 8220

WEL-2022-05

Dear Dr. Keller:

The Office of Enterprise Assessments' Office of Enforcement has completed an evaluation into an event involving two workers who sustained second-degree chemical burns from an anhydrous acetic acid spill, as reported into the Department of Energy's (DOE) Noncompliance Tracking System under NTS-EE-GO-ASE-BOP-2021-0010262, dated September 2, 2021. Based on this evaluation, the Office of Enforcement identified concerns that warrant management attention by Alliance for Sustainable Energy, LLC (Alliance).

The acid spill event had the potential to cause serious injury. It occurred on June 14, 2021, at the National Renewable Energy Laboratory (NREL), when two workers were removing a bubbler cap from a Proportional-Integral-Derivative (PID)/Particulate Systems Effi Microreactor. When the workers disconnected the supply side inlet, gas pressure trapped between the inlet and outlet check valves caused residual acid in the system to backflow, discharging 30-50 mL of anhydrous acetic acid onto both workers' lower arms and torsos, resulting in second-degree chemical burns.

Based on an evaluation of the facts and circumstances of this event, the Office of Enforcement identified concerns with Alliance's implementation of the requirements in 10 C.F.R. Part 851 (Part 851) *Worker Safety and Health Program* (WSHP) in the areas of hazard identification and assessment, hazard communication, fire protection, and training and information. Specifically:

- Alliance did not conduct an adequate hazard identification and assessment on the microreactor. Following the addition of bubbler components to the microreactor, Alliance did not initiate a review of the process changes to identify and assess potential hazards or determine the need to install a pressure relief device.

- Alliance did not adequately communicate the chemical hazards of anhydrous acetic acid. The worker responsible for operation of the microreactor was aware that anhydrous acetic acid, isopropyl alcohol, or water could be used within the system; however, the worker was unaware the bubbler contained residual quantities of acid when removing the cap. Signage indicating the presence of anhydrous acetic acid (in the microreactor) was affixed to an exhaust enclosure out of the worker's line-of-sight. Further, the need for personal protective equipment (PPE) for the safe handling of anhydrous acetic acid was not clearly communicated, as the workers were unaware of the presence of acid in the bubbler.

- Alliance did not adequately implement a process to decontaminate workers exposed to an acid spill. Specifically, the workers were not provided with specific training or instructions regarding spill response actions or decontamination measures for clothing contaminated with hazardous chemicals. After the spill occurred, neither worker used the chemical safety shower located in the laboratory; instead, citing modesty concerns and the potential for flooding, the workers elected to rinse their skin in a nearby restroom sink until pain from the burns subsided.

- Alliance did not implement an effective accident reporting system or ensure that workers were adequately trained to immediately report injuries to emergency response personnel. After rinsing the affected areas with water, the workers exited the laboratory and proceeded to their residence to shower and remove their contaminated clothing. The acid spill event was not reported to emergency response personnel, or to the NREL Environmental, Safety and Health staff until the injured workers later returned to the site Occupational Health Services Clinic for medical treatment.

- Alliance did not implement an appropriate procedure to respond to a Lower Explosive Limit (LEL) alarm. During the event, an LEL alarm sounded within the microreactor enclosure. When the LEL alarm stopped sounding, another laboratory worker entered the enclosure to clean up residual acid from the spill. The worker donned appropriate PPE but did not properly validate that it was safe to enter the enclosure following an LEL alarm.

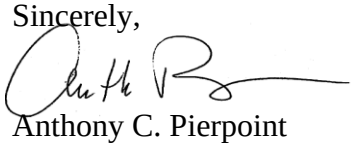
- Alliance inappropriately applied the concept of "skill-of-the-craft" to workers engaged in scientific research or laboratory operations. Craft workers within the DOE contractor complex are permitted to perform routine maintenance tasks (without detailed hazards analysis and procedural requirements) based on recognized certification or extensive training within a particular craft discipline (e.g., licensed electricians, heating, ventilation, and air conditioning technicians, etc.). The application of skill-of-the-craft concepts is inappropriate for laboratory workers. Laboratory hazards are unique to each operation and must therefore be identified, assessed, and adequately mitigated using the hierarchy of controls as specified in Subpart C of Part 851.

The Office of Enforcement acknowledges that Alliance investigated the event and prepared an investigation report that lists the design of the bubbler system as the root cause of the event. After the spill, the microreactor was placed in a safe configuration and research was paused until an appropriate mitigation strategy was identified. The Office of Enforcement evaluated Alliance's corrective action plan and it appears to adequately address the Part 851 hazard identification and abatement, hazard communication, and training and information concerns. However, there are no specific corrective actions to address Part 851 emergency shower requirements or concerns related to the timely notification of accidents at the site. The investigation and corrective action plan focused on preventing recurrence of a spill and did not include post event response actions, such as decontamination and notifications to emergency response personnel.

The Office of Enforcement has elected to issue this Enforcement Letter to convey concerns with Alliance's implementation of the requirements in 10 C.F.R. Part 851 (Part 851) *Worker Safety and Health Program*. Issuance of this Enforcement Letter reflects DOE's decision to not pursue further enforcement activity against Alliance at this time. In coordination with the Office of Energy Efficiency and Renewable Energy, the Office of Enforcement will continue to monitor Alliance's efforts to maintain a safe workplace.

This letter imposes no requirements on Alliance and no response is required. If you have any questions, please contact me at (301) 903-4033, or your staff may contact Mr. Robert Hailstone, Director, Office of Worker Safety and Health Enforcement, at (301) 903-0100.

Sincerely,



Anthony C. Pierpoint
Director
Office of Enforcement
Office of Enterprise Assessments

cc: Derek Passarelli, GFO
Heath Garrison, Alliance for Sustainable Energy, LLC