

2020 ECR Plan Status Update Report
Quarterly Report – Update #12
October 30, 2023

Executive Summary:

General

This report covers LG&E and KU’s (“Companies”) progress on the 2020 Environmental Cost Recovery (“ECR”) Plan through the third quarter of 2023. The Companies filed applications requesting approval on March 31, 2020¹ and received approval on September 29, 2020.

The 2020 ECR Plan safety performance through the third quarter of 2023 remains excellent with a year-to-date OSHA Recordable Incident Rate of 0.0 and an inception-to-date OSHA Recordable Incident Rate of 0.0, compared to the industry average of 3.2.

Work to date continues to focus on delivery of equipment/materials and construction activities at all three stations: Trimble County (“TC”), Ghent (“GH”), and Mill Creek (“MC”). At all three sites, work has included installation of above ground piping and electrical conduit/cable; installation of process equipment and electrical gear; installation of fiberglass tanks; erection of pre-engineered buildings and associated interior walls and roof panels is completed; loop checks for the control wiring have started and will continue into next quarter along with start-up activities for Bottom Ash at Ghent.

As previously reported, the total 2020 ECR Plan projected cost of \$405.2 million (net)², as provided in Case Nos. 2020-00060 (KU) and 2020-00061 (LG&E), was reduced to \$242.8 million (net)². The projected spend, as of the third quarter of 2023, has increased to \$272.6 million (net)² primarily due to resolution of known supply chain impacts since project inception. This projected spend continues to represent a \$132.6 million (net) reduction from the original filing. The total spend to date has increased from \$210.3 million (net)² last quarter to \$229.1 million (net)² through September 30, 2023.

Background

The Environmental Protection Agency’s (“EPA”) 2015 ELG Rule and amendments precipitated the need to construct Effluent Limitation Guidelines (“ELG”) water treatment systems at TC, MC and GH, as well as a Bottom Ash Transport Water (“BATW”) recirculation system at GH. The EPA’s proposed amendments to the 2015 ELG Rule were finalized in the Fall of 2020. The current ELG Rule includes daily maximum and monthly average limits for the concentration of mercury, nitrates/nitrites, selenium and arsenic allowed in Flue-Gas Desulfurization (“FGD”) wastewater effluent.

To meet the revised limits for these constituents, the Companies are required to install ELG water treatment systems to treat the effluent from the physical/chemical FGD process water treatment systems recently placed into service as described in the 2016 ECR Plan quarterly reports. Without the proposed 2020 ECR

¹ Case No. 2020-00060 and Case No. 2020-00061

² Co-Owners of the Trimble County plant: Illinois Municipal Electric Agency (IMEA) and Indiana Municipal Power Agency (IMPA) are responsible for 25%. IMEA owns 12.12% and IMPA owns 12.88%. Co-owner shares are not included in the costs provided in this report.

Plan projects at TC, MC, and GH stations, the Companies would not be able to continue steam generating operations at these generating stations and simultaneously comply with the ELG Rule, as enforced by Kentucky Pollutant Discharge Elimination System (“KPDES”) permits at each generating station. This would significantly impair the Companies’ ability to fulfill their mandate to provide adequate, efficient, and reasonable service to their ratepayers, as these generating stations are the three largest generating stations within the Companies’ generating fleet. The ELG Rule requires compliance for the FGD wastewater as soon as possible on or after November 1, 2020, but no later than December 31, 2025³.

The final ELG Rule also includes up to 10 percent volumetric discharge limit (on a 30-day rolling average) for BATW, which also must be complied with “as soon as possible” but in no event later than December 31, 2025. This proposed discharge limit requires KU to construct a BATW recirculation system on the existing bottom ash transport system at GH. The recirculation system will collect the transport water currently discharged from the remote bottom ash dewatering facility and reroute it through tanks and piping systems back to the four generating units for reuse. TC and MC do not require a BATW recirculation system due to their bottom ash transport systems being previously converted to a dry transport instead of a wet sluicing system like GH’s.

In March 2023, the EPA released a proposed revision to the ELG Rule requiring membrane filtration followed by solidification, or thermal evaporation for zero discharge of FGD Waste Water; zero discharge of Bottom Ash Transport Water; new discharge standards for combustion residual leachate waters, and best professional judgement for regulation of legacy combustion waters. The proposal stipulates compliance as soon as possible, but no later than December 31, 2029. A final rule is anticipated in 2024.

Schedules

FGD Process Water Treatment Facilities and Diffusers

<u>Project</u>	<u>Project #</u>	<u>Awarded Contractor</u>	<u>Status⁴</u>	<u>Planned / Actual In-Service Date⁵</u>
Trimble County Effluent Limitations Guidelines Water Treatment System ⁶	KU Project 44 LG&E Project 32	OKEP	Awarded March 15, 2021	December 2023
Mill Creek Effluent Limitations Guidelines Water Treatment System ⁶	LG&E Project 31	OKEP	Awarded March 15, 2021	June 2024
Mill Creek Outfall 025 Diffuser	LG&E Project 31	Tetra Tech	Awarded May 12, 2021	Placed in service December 2021
Ghent Effluent Limitations Guidelines Water Treatment System ⁶	KU Project 43	OKEP	Awarded March 15, 2021	November 2024

³ 84 Fed. Reg. 64664.

⁴ Project Engineering Department or Engineering, Procurement, and Construction (“EPC”) Contract work status.

⁵ The Planned In-Service Dates are per the 2020 ECR Plan filing (Straight Testimony, page 4-5) or the current, active construction schedule. Actual in-service dates are signified with red font.

⁶ ELG Equipment OEM: Frontier

Ghent Bottom Ash Transport Water Recirculation System ⁷	KU Project 43	OKEP	Awarded March 15, 2021	April 2024
Ghent Outfall 001 Diffuser	KU Project 43	MAC Construction & Excavating	Awarded March 22, 2021	Placed in service December 2021

⁷ BATW Equipment OEM: United Conveyor Corporation

Quarterly Status Update:

General

The engineering, procurement, and construction, (“EPC”) contracts for TC, MC, and GH were awarded on March 15, 2021 to Old Kentucky Energy Partners (“OKEP”), which is a joint venture between Bowen Engineering (a local company) and United E&C. At TC and GH, work has included continued installation of above ground piping and electrical conduit/cable; installation of process equipment and electrical gear; installation of fiberglass tanks; heat tracing; and initiation of commissioning activities. At MC, work included completion of the ELG building, installation of skid equipment, and majority of process piping. Electrical work completed consisted of setting of switchgears, MCC’s, installing cable tray, and nearly half of conduit. All coatings for chemical containment areas, sump, battery room, and electric rooms is complete. The piling system for the Maintenance tank was installed.

Burns & McDonnell (“B&McD”) is the ELG Owner’s Engineer and is assisting the Companies with reviewing engineering, design and construction support related to submittals and fieldwork from the EPC (OKEP) and ELG technology providers (Frontier – ELG) or United Conveyor Corporation (Ghent BATW).

KU Project 44 and LG&E Project 32 – Trimble County (TC) Station Effluent Limitations Guidelines (ELG) Water Treatment System

General

Project 44 (KU) and Project 32 (LG&E) are for construction of an ELG water treatment system at the TC generating station. The current forecasted capital cost to implement these facilities increased to \$51.6 million (net)², being allocated between KU and LG&E, with construction planned for completion in October 2023 and planned in-service within December 2023. This is allocated as KU’s 48 percent being \$24.8million (Project 44) and LG&E’s 52 percent being \$26.8 million (Project 32) – both costs are net².

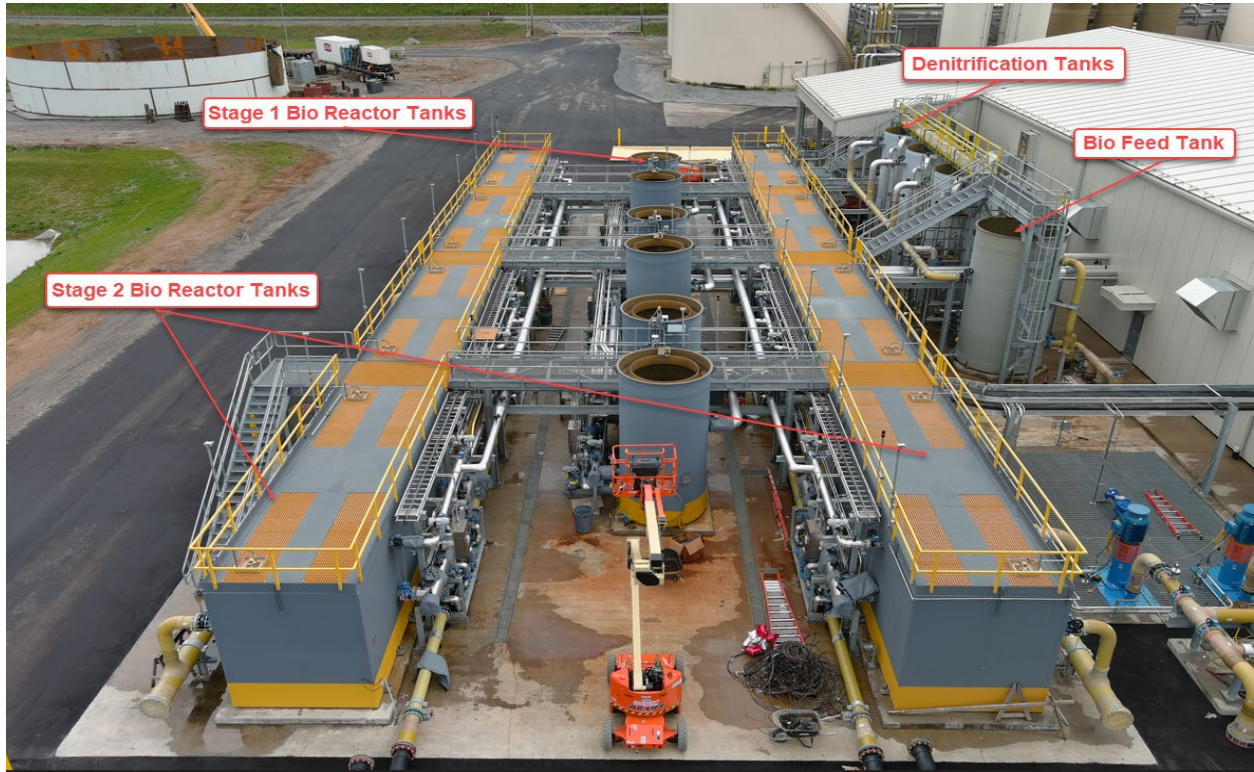
To streamline the review process and to take advantage of multiple internal resources, the TC project team continues to include the MC and GH project teams during all major reviews. This collaborative effort was implemented to minimize issues associated with the TC project, all while accelerating the review process on the subsequent projects.

ELG

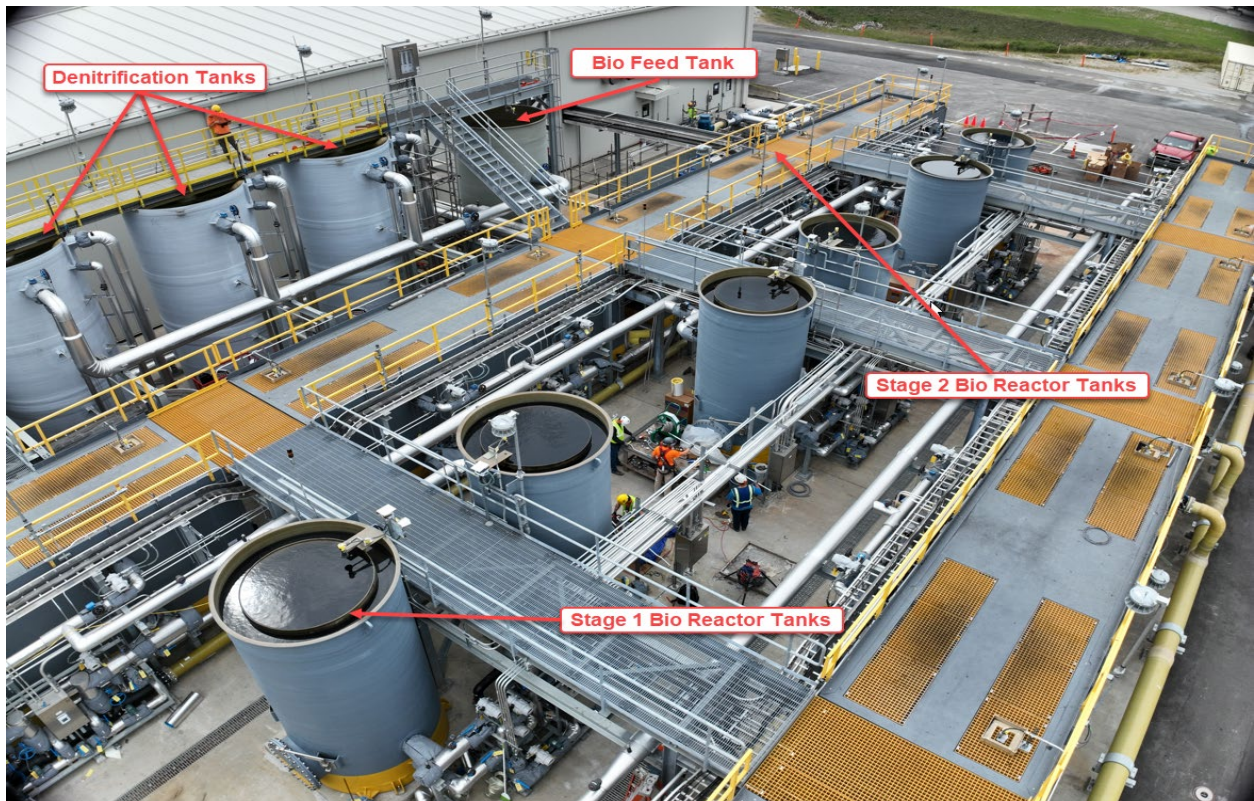
The ELG system is being constructed in close proximity to the recently completed process water treatment system (“PWS”). All facilities are being installed on land currently owned by KU and LG&E at the generating station. The system is designed to handle water flow capacity up to 750 gallons per minute.

Work completed during the third quarter of 2023 includes completion of the electrical conduit and heat trace installations; cold commissioning of the process equipment; erection of the Maintenance Tank, pump house and connecting piping to existing systems; submittal and review of various ELG project documents; along with commercial and procurement activities.

The remaining engineering focus will be on final vendor package reviews and Maintenance Tank design work. Installation continues to progress for the above ground electrical cabling and cable terminations, which are nearing completion. OKEP’s commissioning team continues mechanical and electrical system checkouts, including such effort as motor bump and pump rotations, line flushing, and wiring loop checks, electrical gear and system energizations.



Trimble County – ELG Water Treatment Location – June 2023



Trimble County – ELG Water Treatment Location – October 2023

LG&E Project 31 – Mill Creek (MC) Station Effluent Limitations Guidelines (ELG) Water Treatment System and Diffuser

General

Project 31 is for construction of an ELG water treatment system and wastewater diffuser at the MC generating station. The current forecasted capital costs to implement this project decreased to \$72.0 million. The MC project team has engaged the TC and GH project teams during all major reviews to apply lessons learned from the other projects. This collaborative effort was implemented to ensure lessons learned are applied across all the projects to promote a common fleet approach to the ELG program.

ELG

Work completed during the third quarter of 2023 includes continued participation in project technical, engineering, and construction meetings with OKEP; review of submittals and various project documents; commercial activities; and construction progress and schedule reviews. During the third quarter of 2023, OKEP completed the site paving/stripping, finished testing on process piping, and began construction turnover walkdowns. Electrical work completed consists of pulling and terminating power feeds for MCCs, installing indoor and outdoor lighting, pulling various control and power cable throughout site, and setting of the DCS control panels. The floor and first four rings of the maintenance tank have been welded and installed. The first two rings have passed all NDE weld testing; the second two rings are scheduled to be tested in early Q4.

Diffuser

The diffuser was installed and placed into service in 2021.



Mill Creek – ELG Water Treatment – June 2023



Mill Creek – ELG Water Treatment – October 2023

KU Project 43 – Ghent (GH) Station Effluent Limitations Guidelines (ELG) Water Treatment System, Bottom Ash Transport Water (BATW) Recirculation System, and Diffuser

General

Project 43 is for construction of an ELG water treatment system, a BATW recirculation system, and a wastewater outfall diffuser at the GH generating station. These facilities are designed to process and lawfully discharge wastewater from GH in accordance with the EPA’s existing and proposed amendments to the ELG Rule and the existing Kentucky Pollutant Discharge Elimination System (“KPDES”) Permit for GH. The current forecasted capital costs to implement these facilities has increased to \$149.8M, with construction completion anticipated to be completed in April 2024 for the BATW recirculation system and November 2024 for the ELG water treatment system.

The ELG Rule requires that BATW be recirculated, instead of used once, to transport bottom ash and then discharged. The BATW recirculation system at GH consists of transfer tanks, low pressure pumps, high pressure pumps, piping, foundations, controls, and related equipment. This system will collect the bottom ash sluice water, after being dewatered from the bottom ash solids in the remote bottom ash dewatering facility and pump the water to collection tanks where the water will then be pumped back to the bottom ash removal systems underneath the four generating unit boilers to be used again for sluicing bottom ash to the remote dewatering facility. The water will be recirculated as necessary, with fresh water being added to replace evaporated water. A purge system, up to 10 percent of the volumetric discharge limit (on a 30-day rolling average) for BATW per the ELG Rule, will be included to control pH and other constituent buildup in the recirculation system.

The GH project team has engaged the TC and MC project teams during all major reviews, to apply lessons learned from the other projects. This collaborative effort was implemented to ensure lessons learned are applied across all the projects to promote a common fleet approach to the ELG program.

ELG

In the third quarter of 2023, activities included attending technical, engineering, and construction meetings with OKEP, reviewing project documents, engaging in commercial activities, and monitoring construction progress and schedule. Onsite construction activities are ongoing and include the installation of above-ground piping, HVAC systems, electrical conduits, and cable trays in both the ELG Building and Biological area. Additionally, progress continues for the fire detection system, hydrostatic testing of process piping, and installation of lighting and receptacles throughout the ELG Building. Furthermore, OKEP has completed the installation of the process piping in the Biological area, chemical piping in the ELG Building and Biological area, the fire protection system, subgrade for site paving, and various coating applications (buildings, equipment, sump, etc.).

Bottom Ash Transport Water (“BATW”)

During the third quarter of 2023, work continued on control/electrical wiring and wrapping up work on the remaining mechanical activities for the high/low pressure pump locations. OKEP started producing the turnover packages for each of the subsystems and incorporate the quality documents that they have completed. Work also continued on the installation of the Submerged Flight Conveyor (“SFC”) sump and bypass pump, the flocculant chemical injection system, piping heat trace, insulation, and controls in the BATW and SFC Buildings. OKEP successfully achieved Mechanical Completion of the Unit 1 and Unit 2 Ash Subprojects and is nearing completion for the Common Ash Subproject. Additionally, OKEP completed the installation of various components, including Unit 1 Remote Input/Output marshalling cabinets, piping supports and insulation throughout the South pipe rack, cable installation in the SFC Building, and the BATW Building fire detection system.

Diffuser

The diffuser was installed and placed into service in 2021.



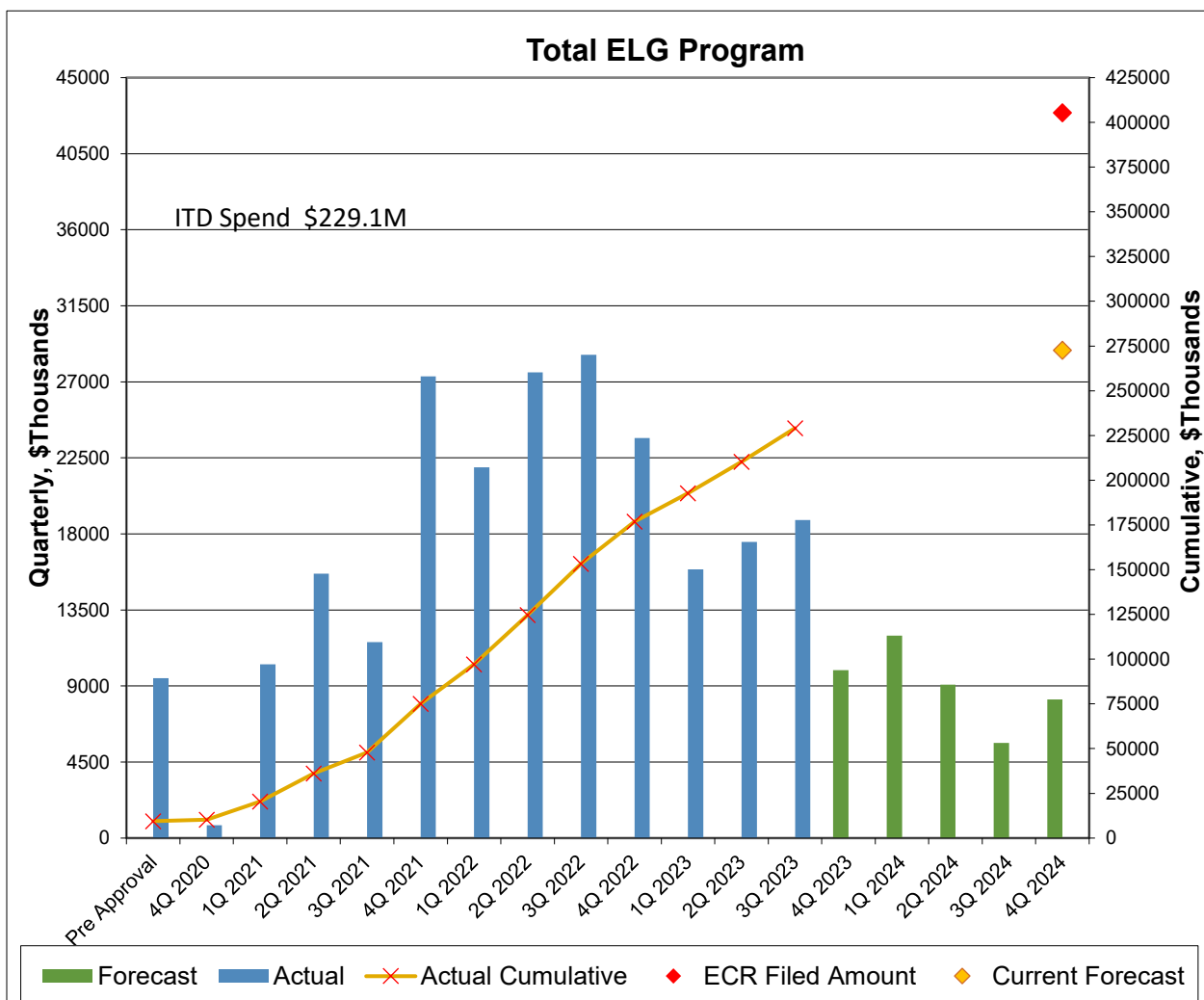
Ghent – ELG Water Treatment – June 2023



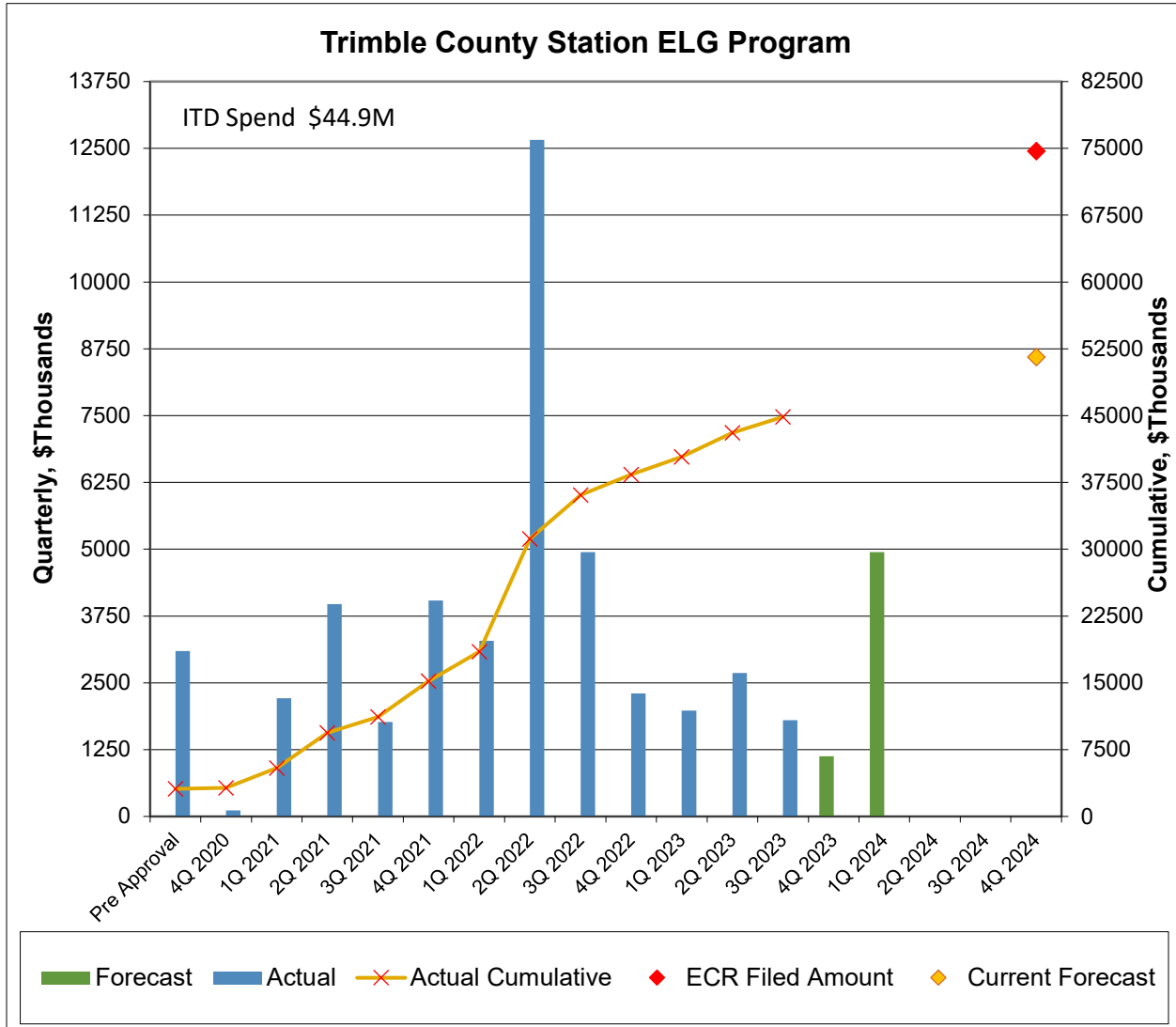
Ghent – ELG Water Treatment – October 2023

Financials:

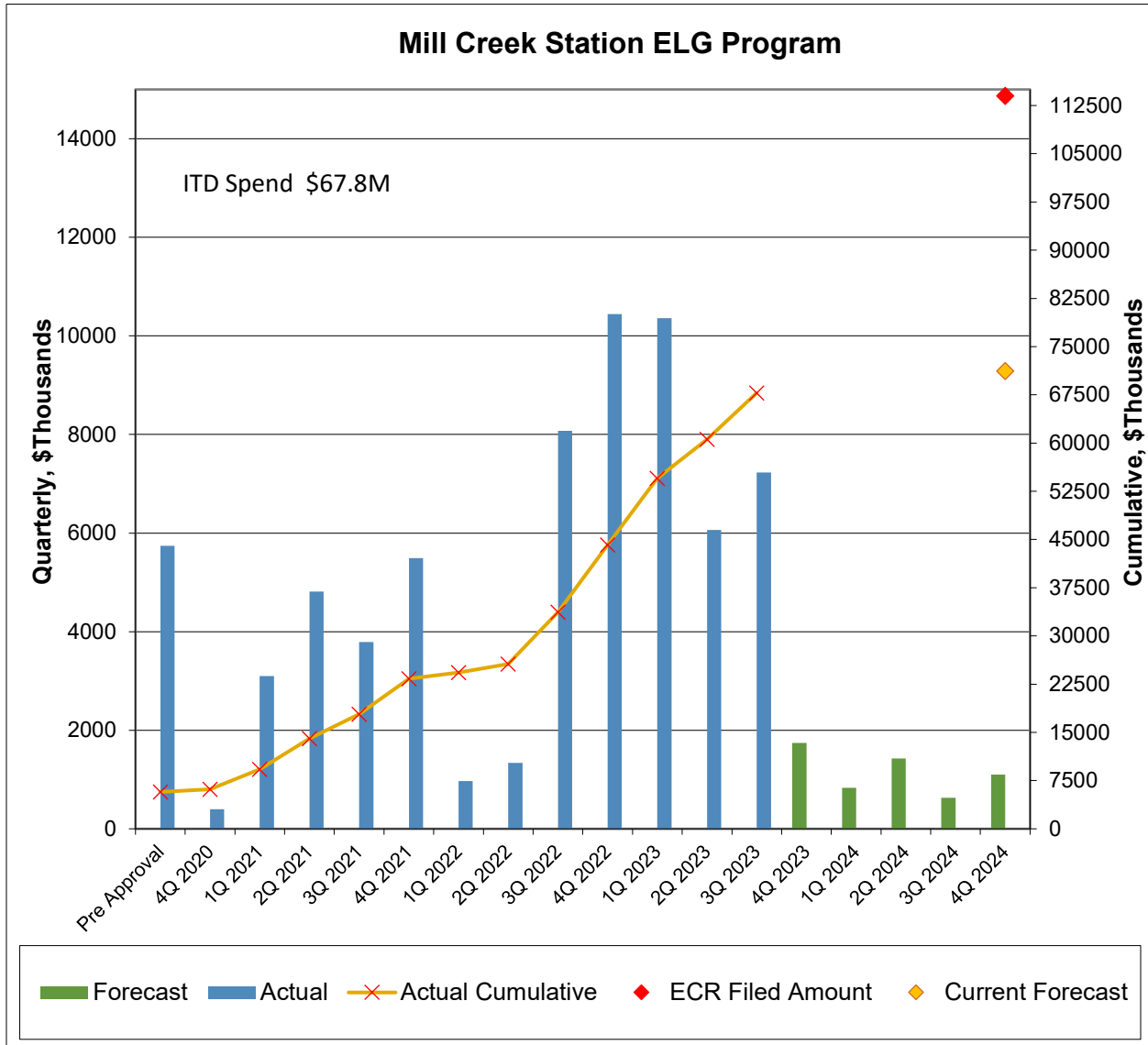
As previously reported, the total 2020 ELG Program forecasted cost was reduced from \$405.2 million, as filed, to \$242.8 million. The projected spend as of the third quarter of 2023 has increased to \$272.6 million due to scope refinement and resolution of supply chain impacts. Total spend increased from \$210.3 million (net)² to \$229.1 million (net)² through September 30, 2023. The graph below includes: 1) a symbol (◆) to show the current forecast to completion and 2) inception-to-date (“ITD”) Spend in the upper left of the chart.



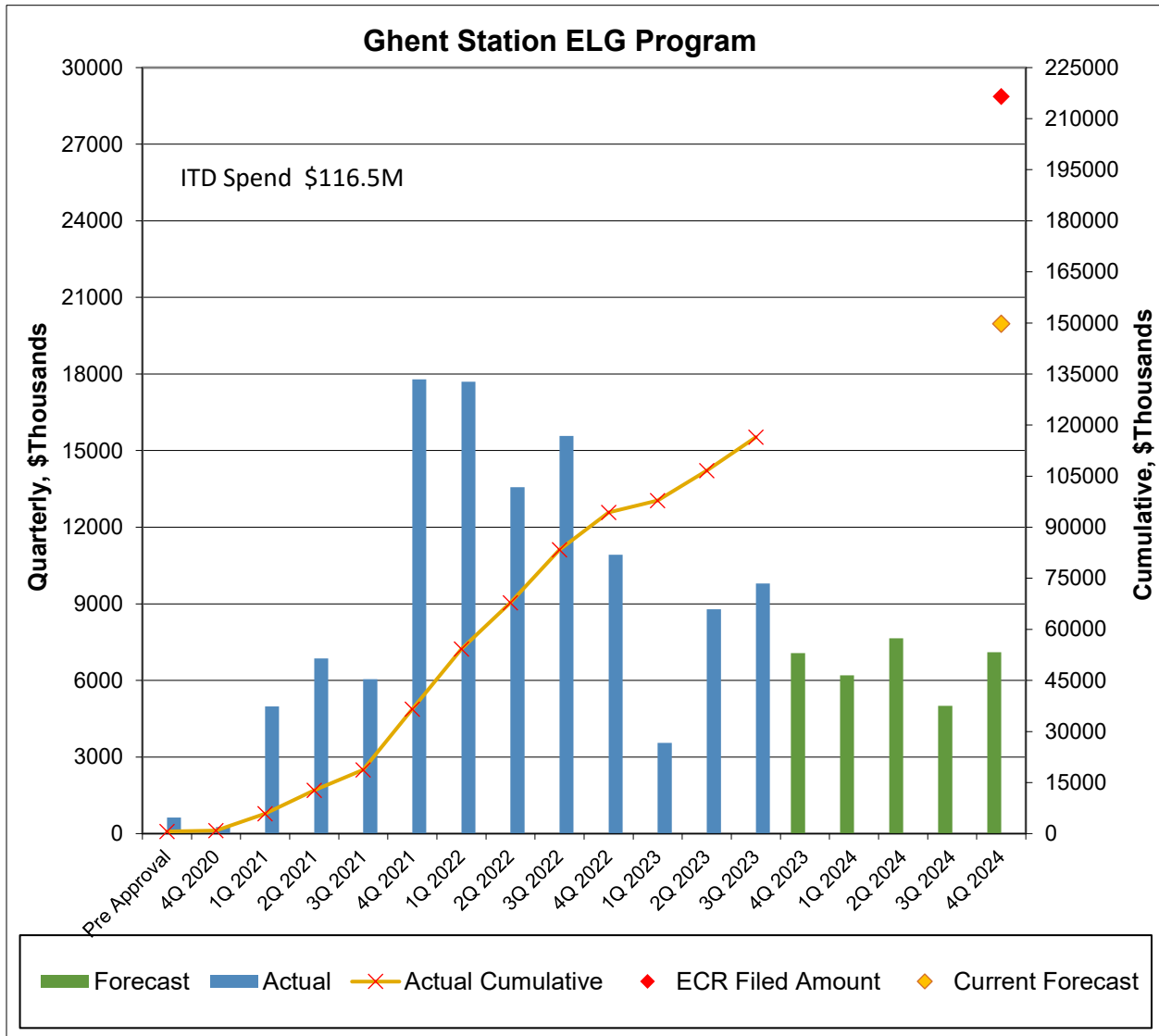
The total Trimble County Station ELG Program forecasted cost has increased to \$51.6 million (net)². Total spend increased from \$43.1 million (net)² to \$44.9 million (net)² through September 30, 2023. The graph below includes: 1) a symbol (◆) to show the current forecast to completion and 2) inception-to-date (“ITD”) Spend in the upper left of the chart.



The total Mill Creek Station ELG Program and Diffuser forecasted cost has decreased to \$72.0 million. Total spend increased from \$60.6 million to \$67.8 million through September 30, 2023. The graph below includes: 1) a symbol (◆) to show the current forecast to completion and 2) inception-to-date (“ITD”) Spend in the upper left of the chart.



The total Ghent Station ELG Program, BATW, and Diffuser forecasted cost have increased to \$149.8 million. Total spend increased from \$106.7 million to \$116.5 million through September 30, 2023. The graph below includes: 1) a symbol (♦) to show the current forecast to completion and 2) inception-to-date (“ITD”) Spend in the upper left of the chart.



Planned Activities for Next Quarter:

KU Project 44 and LG&E Project 32 – Trimble County (TC) Station Effluent Limitations Guidelines (ELG) Water Treatment System

ELG – OKEP construction will be substantially complete and subsystem packages will continue to be assembled for turnover to the startup team. OKEP startup will continue to perform subsystem commissioning. The ELG OEM will be on-site to assist OKEP in checkout and prepare to operate under water load. Turnover packages will continue to be assembled and as-built records will be drafted for review. LG&E and KU will continue to conduct meetings with OKEP to coordinate the ongoing commissioning of subsystems.

LG&E Project 31 – Mill Creek (MC) Station Effluent Limitations Guidelines (ELG) Water Treatment System and Diffuser

ELG – LG&E will continue to conduct meetings with OKEP to review construction progress of the project and to review project submittals, RFI's, and schedules. Remaining electric will be received and begin installed. DCS equipment will be delivered to the site, installation will begin, and software/hardware FAT will occur. Installation of conduit and cable tray will be nearly complete. Power, instrument, and control cables will continue to be pulled and landed in equipment, cabinets, and panels. Ongoing civil and mechanical punch lists will be walked down and recorded for areas of work completed.

Diffuser – No further work expected.

KU Project 43 – Ghent (GH) Station Effluent Limitations Guidelines (ELG) Water Treatment System, Bottom Ash Transport Water (BATW) Recirculation System, and Diffuser

ELG – KU will maintain regular meetings with OKEP to assess the progress of the construction project. This will involve reviewing project submittals, RFIs, and schedules, as well as receiving the remaining components. Onsite construction activities will continue, including the installation of process equipment, above-ground chemical, and process piping, as well as piping heat trace and insulation. Additionally, OKEP will proceed with the installation of electrical conduits and cable trays in both the ELG building and Biological Area.

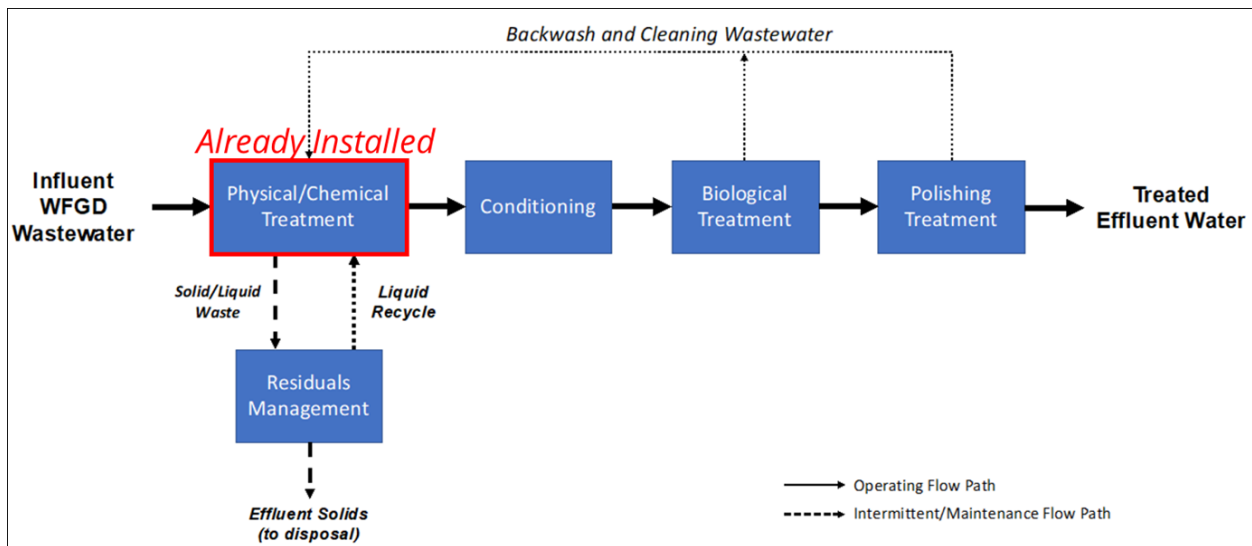
BATW – OKEP will conduct safety reviews, commercial activities, and schedule reviews while continuing electrical and instrumentation installation throughout the quarter. The BATW sump pumps, Unit 1-4 high-pressure and low pressure pumps will be completed, and system commissioning will continue for Units 1-4 high-pressure and low-pressure pumps. OKEP is expected to complete the installation of electrical conduits and cable trays in the BATW building and around the units. OKEP is expected to achieve Mechanical Completion for the remaining Subprojects during this upcoming quarter and be into performance testing and commissioning activities for the system.

APPENDIX

ELG Water Treatment System Description – TC, MC, and GH

The ELG Rule requires the Companies to use the Best Available Technology Economically Achievable (“BAT”)⁸ to control particulate, metals, arsenic, mercury, selenium, and nitrates/nitrites. Current BAT technology is physical/chemical treatment plus biological treatment. The process water systems are physical/chemical systems designed to capture particulate and most metals; however, they are not designed to capture nitrates/nitrites and selenium. The levels of nitrate/nitrite and selenium capture required by the ELG Rule requires biological treatment of the process water treatment system’s effluent.

The first step in the biological treatment process is denitrification, which is the reduction in concentration of nitrates/nitrites through a biological process utilizing denitrification equipment. Effluent from the denitrification equipment is discharged to the first stage reactor, which is comprised of fiberglass vessels and internal reactor surfaces. The reactor contains living microorganisms, which are fed nutrients and convert the nitrates/nitrites and selenium molecules in an aerobic atmosphere, to an elemental form. Effluent from the first stage reactor flows into a second stage reactor, where additional biological processes reduce remaining selenium. The elemental form of selenium is transferred, via a backwash phase of the process, to the equalization tanks at the beginning of the process water treatment system for particulate removal. The second stage reactor feeds to an ultrafiltration (“UF”) system where remaining particulate metals are filtered out. The UF tank is then discharged to a series of clean water tanks, which can be used to backwash the biological and UF systems or be discharged. A “typical” flow diagram is shown below.



The majority of the mechanical and electrical systems will be constructed in a building for weather protection, whereas most of the biological process tanks will be located outside. The building houses the denitrification equipment, UF systems, effluent tanks, various pumps and support subsystems. The system also requires cleaning and chemical feed equipment, pumps, piping, valves, and electrical equipment.

⁸ 84 Fed. Reg. 64624.

Separate rooms must be constructed inside the treatment building to house battery systems and electrical equipment. A control room is also required, along with restrooms. The reactor area, including the vessels housing the microorganisms, will be constructed outside the building under a weather canopy. All of the tanks and reactors in the system must be large enough to handle the immense volume of water flowing through the effluent treatment process. In other words, the system must be sized commensurate with the process water treatment systems recently commissioned to enable treatment of the effluent of flow from the process water treatment systems.

Diffusers Description – GH and MC

The diffusers planned to be installed at GH and MC are large multi-port pipes that connect to the stations’ wastewater outfall pipe and are placed into the bottom of the Ohio River with the discharge ports above the riverbed and facing downstream. The pictures shown below provide a general concept of the GH diffuser, which will be similar to the proposed MC diffuser. As this graphic representatively shows, the diffuser is a single large discharge pipe that is installed in the riverbed. The diffuser ports face downstream to disperse the water out of multiple discharge ports instead of a single, larger point of discharge.

Ghent Outfall 001 Diffuser Concept

