ERG

MEMORANDUM

TO: Steam Electric Rulemaking Record

FROM: Danielle Stewart, ERG
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DATE: August 14, 2020

SUBJECT: **Notes from Call with Indianapolis Power & Light – Petersburg Generating Station**

On April 1, 2020, EPA held a call with Indianapolis Power & Light (IPL) to discuss the Petersburg Generating Station (Petersburg) in Indiana. EPA was interested in learning about Petersburg's flue gas desulfurization (FGD) wastewater treatment technology and bottom ash handling system. EPA was also interested in discussing alternatives evaluated in selecting these technologies, the overall retrofit process through start-up and commissioning, and on-going operations and maintenance of both systems. See **Table 1** for a list of meeting attendees.

Table 1. List of Attendees

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Below is a summary of the topics discussed during the meeting.

Petersburg Background and Introduction

- In 2011, IPL received a draft National Pollutant Discharge Elimination System (NPDES) permit renewal that contained new water quality-based effluent limitations (WQBELs) including but not limited to selenium, mercury, and boron for Outfalls 001 and 007 (the boron WQBELs do not apply at Outfall 001). At that time, the majority of FGD wastewater on site went to an ash pond and was discharged through Outfall 001. IPL initiated internal wastewater characterization and water balance analysis in 2011 and retained CH2M Hill in 2012 to provide engineering support as it related to treatment/operational change options in order to understand risks and costs as part of the overall compliance strategy development (see the NPDES Compliance Plan developed by CH2M Hill in Appendix A). A majority of the current Plant Leadership Team was not present during this assessment and development phase.

- When the NPDES permit was finalized in August 2012, IPL determined that a three-year compliance schedule was not sufficient time to complete evaluation, carry out procurement, and install the system to become compliant by 2015. Thus, IPL entered into an Agreed Order (AO) with the Indiana Department of Environmental Management (IDEM) to allow for an additional two years to complete the necessary compliance activities (extending through September 2017). The final AO was extended until April 2018 and included interim milestones for compliance.

- Petersburg operated at approximately 60 percent capacity factor in 2019, with a budgeted capacity factor of approximately 72 percent for 2020.

- COVID-19 precautions have resulted in defining essential staffing plans.to support the business needs of the plant. The wastewater treatment plant has been fully staffed through the pandemic, performing all required duties. Some scheduled maintenance outages have been extended as a result of the implementation of the AES Corporation (IPL's parent company) environmental health and safety pandemic guidelines.

FGD Wastewater Treatment Technology Evaluation

- After a technology review, IPL eliminated some technologies based on technical infeasibility. IPL also conducted pilot testing for physical/chemical and biological treatment. The compliance evaluation included a risk and cost assessment for those technologies deemed technically feasible for the facility. Thermal FGD treatment technology, consisting of SUEZ's falling film evaporators combined with internal recycle, was the least cost option in complying with the mercury and selenium limitations at Outfall 001.

- Some of the technologies IPL considered include:

  - Zero-valent iron system, but IPL was unable to conduct a pilot test in the timeframe needed.
  - Passive biological treatment, but based on a pilot study evaluation, IPL did not have confidence in the technology to meet the new metal limitations on a consistent basis.
  - Membrane treatment technology was not considered because it had not yet been tested or implemented in the industry.

- GE and CH2M conducted a high-level water management study in conjunction with the technology review, but given the NPDES implementation deadline, the study did not have time to capture ancillary inputs/stormwater surges. In hindsight, additional time would have allowed for the completion of more advanced engineering study and been beneficial prior to installing the FGD wastewater treatment technology.

Wastewater Treatment Overview

- The FGD wastewater treatment system is comprised of two components: an evaporation system treating one-third of the flow and a recycling system for the remaining flow. A headworks tank, which serves as a primary settling basin, pumps effluent to two equalization tanks.

- Pretreatment for the falling film evaporators consists of hydrated lime addition to remove magnesium and increase the pH to 10, followed by a clarifier, polymer addition, a secondary clarifier, and adjustment of pH to 5 before entering the evaporator feed tank. The pretreated wastewater flows through a feed filter, a heat exchanger, and a deaerator before being sent to a pair of falling film evaporators. Distillate is stored for reuse within the FGD system, and brine is used to condition fly ash, which is disposed of off site. IPL cannot currently dispose of the conditioned ash on-site, but staff noted they may expand the landfill's capacity to eventually dispose on site.

- Prior to the FGD wastewater recycling, wastewater is pretreated via polymer addition and clarification (no pH change) before being sent back to the generating units. FGD recycle water is utilized in the FGD system.

- In addition to FGD wastewater treatment, IPL treats other wastewaters (referred to as OWW) with polymer addition, organosulfide, ferric chloride, and caustic or sulfuric acid to alter the pH.

FGD Wastewater Treatment Operation

- IPL has been operating the thermal FGD system for 2.5 years and has found that it is important to consider the water balance and changes in the hydraulic load, including rainfall and evaporation, so that the thermal FGD system is not overwhelmed. The thermal system can only handle a portion of the FGD wastewater at the station. IPL previously assumed that if the FGD wastewater treatment system can handle the full load, then it can also handle reduced loads; this assumption did not hold due to evaporative losses. In hindsight, plant staff recommend testing a system at all levels throughout the operating range prior to selecting a treatment technology. However, without accurate metering to understand flows, it becomes difficult to calculate an accurate water balance. Since installation, IPL has added many flow meters to try to identify when the flow balance is upset.

- When at the higher hydraulic load, it is easier to manage the water balance because the plant has a finite amount of storage space. However, FGD wastewater treatment must be able to operate through the full range of market requirements.

- While the preliminary CH2M technology evaluations were based on the water balance, IPL recognizes that additional inputs should have been identified and accounted for, and the system should not have been designed for full load. At Petersburg, the larger amount of land area at the site increases the flows that go into the system during rain events and must be treated as process water.

- The appropriate time period for water balance studies depends on the complexity of the plant. From start to end, IPL initially determined that a seven-year timeframe may have been more appropriate for allowing the effective evaluation of the complex water balance system and technologies, including more time to pilot test other technologies.

- IPL stated that, generally, the OWW treatment system, works very well, but a large storm event can quickly overload the system.

- Ideally, the pretreatment process for the evaporation system should be two or three times more robust than it was designed for. The ability to produce the appropriate water quality as influent to the evaporator is a challenge and depends on many factors. Water quality is mostly driven by dissolved solids, magnesium due to potential scaling, and calcium sulfate that forms due to lime addition. IPL monitors the number of times the wastewater is cycled through the system, intake water quality, and magnesium content of coal.

- IPL stated that if they had attempted to discharge their FGD wastewater, the plant would be in a moderate to high risk of exceeding the allowable limits, and this type of discharge is not allowed under the current NPDES permit. IDEM is in the process of updating WQBELs to current federal water quality criteria, which may further reduce limits for selenium. As IPL is already operating a FGD ZLD system, the proposed voluntary incentives program is not useful.

- IPL does not re-use distillate from the evaporator in non-FGD processes because the 2015 ELG and the proposed ELG still considers this wastewater as FGD wastewater; thus, IPL's current NPDES permit would not allow for this discharge. In addition, the proposed nitrate/nitrite limitations for FGD wastewater are extremely low, making this potential option not feasible. IPL believes this wastewater stream should be managed as non-FGD wastewater.

Bottom Ash Handling System

- At Petersburg, the bottom ash handling system uses United Conveyor Corporation (UCC) equipment with engineering completed by Burns and McDonnell. IPL installed three max-type submerged flight conveyors (SFCs) in a closed loop system. Bottom ash and pyrite from pulverizers and economizer ash is sluiced to the SFCs, and a drag chain removes the ash on the conveyor to a bunker where it dries. The water goes through a lamella clarifier and is pumped back to the low-pressure side of the bottom ash hopper to resupply water to the system.

- As part of the SFC retrofit, IPL built an enclosed bunker building and installed a sump pump system. The system does not take in rainwater, so they are able to maintain the water balance. IPL has considered sending distillate from the evaporator to the bottom ash handling system.

Operation of the Bottom Ash Handling System

- Originally, the bottom ash handling system lacked pH control equipment and therefore experienced corrosion of the mechanical parts. IPL isolated their pH issues and added caustic to the system. In addition, if particle size distribution is not optimized, this leads to increased erosion on the SFC wear plates.

- The Petersburg bottom ash system was designed based on ash loading rather than the residence time needed. Two of the SFCs have the ability to handle both high and low load. IPL increased the flight conveyor capacity by a third (i.e., number of flights on the chain) to transport additional ash. IPL maintains a balance between handling the solids and maintaining the residence time to produce water quality that can be recirculated.

- The main driver for installation of the bottom ash system was the CCR rule, rather than effluent guidelines, so IPL does not intend to discharge bottom ash transport water. If maintenance purge becomes allowable, IPL would investigate it as a potential option for the bottom ash system. IPL has considered installing a fine particle filtration system. A maintenance purge would also allow for flexibility when the plant needs to do an overhaul to change parts.