COMMONWEALTH OF KENTUCKY
BEFORE THE
KENTUCKY PUBLIC SERVICE COMMISSION

In The Matter of:

The Application of Duke Energy Kentucky, Inc., for a Certificate of Public Convenience and Necessity for Water Re-directs and Basin Closure for East Bend Generating Station	))))	Case No. 2016-00398

DIRECT TESTIMONY OF

DAVID RENNER

ON BEHALF OF

DUKE ENERGY KENTUCKY, INC.

December 2, 2016

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I. INTRODUCTION AND PURPOSE

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is David A. Renner. My business address is 400 South Tryon Street, Charlotte, North Carolina.

Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?

A. I am employed by Duke Energy Carolinas, LLC (Duke Energy Carolinas) as Vice President Coal Combustion Products Engineering. Duke Energy Carolinas is a utility subsidiary of Duke Energy Corporation (Duke Energy), and provides services to Duke Energy and its subsidiaries, including Duke Energy Kentucky, Inc. (Duke Energy Kentucky or the Company).

Q. PLEASE BRIEFLY DESCRIBE YOUR EDUCATIONAL AND PROFESSIONAL BACKGROUNDS.

A. I graduated from Purdue University with a Bachelor of Science degree in Civil Engineering in 1980. I have been a registered Professional Engineer in Indiana since 1984. I started with Public Service Indiana in 1980 as a Construction Engineer, and have held various positions in the fossil generation construction and engineering areas, including Station Manager at Gallagher Station in Indiana and at Marshall Station in North Carolina for a combined total of 10 years. I was named as Vice President of Generation Engineering in May of 2010 and to my current position in October of 2014.

Q. PLEASE SUMMARIZE YOUR DUTIES AS VICE PRESIDENT OF COAL COMBUSTION PRODUCTS ENGINEERING SERVICES.

A. My duties include overseeing and managing the centralized geotechnical engineering and technical support functions for Duke Energy's fossil-hydro fleet as it relates to coal combustion products and compliance, both in the Midwest and Carolinas.

Q. HAVE YOU PREVIOUSLY TESTIFIED BEFORE THE KENTUCKY PUBLIC SERVICE COMMISSION?

A. No.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

A. I briefly describe Duke Energy Kentucky's East Bend Generating Station (East Bend). I then describe and support the Company's Application for a certificate of public convenience and necessity to close and repurpose the ash basin located at East Bend and to construct a new process water system.

II. GENERAL DESCRIPTION OF DUKE ENERGY KENTUCKY'S EAST BEND GENERATING STATION

Q. PLEASE DESCRIBE THE EAST BEND GENERATING STATION.

A. East Bend is a 648 megawatt (MW) (nameplate rating) coal-fired base load unit located along the Ohio River in Boone County, Kentucky. East Bend was commissioned in 1981 and is owned solely by Duke Energy Kentucky. The net rating for East Bend is 600 MW representing the amount available for dispatch after supplying internal station processes. East Bend has river facilities to allow barge deliveries of coal and lime and was designed to burn eastern bituminous coal.

Q. PLEASE SUMMARIZE THE MAJOR POLLUTION CONTROL FEATURES AND ASH HANDLING PROCESSES OPERATING AT EAST BEND.

A. The major pollution control features include a high-efficiency hot side electrostatic precipitator, a lime-based flue gas desulfurization (FGD) system, and a selective catalytic reduction control (SCR) system designed to reduce nitrogen oxide (NO_x) emissions by 85 percent. The FGD system was upgraded in 2005 to increase the sulfur dioxide (SO_2) emissions removal to an average of 97 percent. The station's electrical output is directly connected to the Duke Energy Midwest (consisting of Kentucky and Ohio) 345 kilovolt (kV) transmission system.

Duke Energy Kentucky currently operates a landfill at East Bend (East Landfill) and is in the process of constructing a replacement landfill (West Landfill), which together are used for the storage and disposal of waste products resulting from the Company's FGD system and other CCR material. Duke Energy Kentucky also operates an ash pond (Pond) as East Bend. The Pond has a volume of 1,844 acre feet and is used to separate bottom ash from the water used to convey the ash from the plant before the water is discharged to the Ohio River from the pond under the National Pollution Discharge Elimination System (NPDES) permit. The Pond is also used to treat other plant water streams, such as coal pile run-off and landfill leachate, before they are discharged under the NPDES permit. Currently, boiler bottom ash is collected in a wet bottom ash hopper at the base of the boiler and then sluiced to East Bend's Pond for settling.

III. DUKE ENERGY KENTUCKY'S PROPOSAL TO CONSTRUCT NEW PROCESS WATER SYSTEMS AND ASH BASIN CLOSURE AND REPURPOSING

Q. PLEASE BRIEFLY SUMMARIZE DUKE ENERGY KENTUCKY'S PROPOSAL IN THIS APPLICATION.

A. Duke Energy Kentucky is proposing to perform necessary plant upgrades at East Bend to comply with new limitations imposed by the United States Environmental Protection Agency's (U.S. EPA's) Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals From Electric Utilities; Final Rule (CCR Final Rule) and the Steam Electric Effluent Limitation Guidelines (ELG Final Rule). The CCR Final Rule, which became effective October 19, 2015, deals extensively with coal combustion products storage and disposal. The ELG Final Rule, which was finalized on September 30, 2015, sets the first federal limits on the levels of toxic metals in wastewater that can be discharged from power plants, based on technology improvements in the steam electric power industry over the last three decades. Together, the CCR and ELG Final Rules require the Company to take action to evaluate compliance with ash handling and wastewater streams at East Bend. In order to continue operating East Bend, necessary process changes, upgrades and investments are necessary to comply with the CCR and ELG Final Rules. The plant upgrades, investments and new processes proposed to comply with the rules include:

1) Construction of a new wastewater retention basin from the existing ash pond for removing suspended solids, pH adjustment and oil and grease

removal in plant low volume wastewater, contact storm water and landfill leachate; and

2) Water redirects to add temporary and permanent collection basins, sumps, pumps and piping and re-pipe plant piping systems and contact storm water in compliance with CCR and ELG Final Rules; and

3) Construction of new 850,000 gallon FGD maintenance tank for East Bend absorber slurry and reclaim water, as well as other incidental site improvements to enable the construction and operation of the new systems.

Q. IS THE NEED TO CONSTRUCT THE NEW PROCESS WATER SYSTEM AND POND CLOSURE AND REPURPOSING A RECENT DEVELOPMENT?

A. It is a relatively new development in that the impetus for the investment and change is the recent enactment and effective date of the U.S. EPA's CCR and ELG Final Rules. With the passage of both the CCR and ELG Final Rules, Duke Energy Kentucky was compelled to begin various analysis of its Pond to determine compliance. This analysis is multi-faceted, has taken many months, and continues today.

Q. WHY DOES THE COMPANY NEED TO BEGIN CONSTRUCTION OF WATER RE-DIRECTS AND BASIN CLOSURE SYSTEM NOW?

A. To continue operation, East Bend must be in compliance with both the CCR and ELG Final Rules within specific compliance deadlines. The ELG Final Rule is necessitating new process water systems be constructed with water redirection to a

basin that is in compliance with both CCR and ELG Final Rules. These new water systems require a retention basin that is in compliance with the ELG Final Rule. The Company has explored several alternatives to reach its ultimate decision to close and repurpose the existing Pond in order to construct the appropriate systems for treatment and handling of storm and waste waters.

Duke Energy Kentucky has determined that in order to comply with the ELG and CCR Final Rules, the Company must begin construction of the new process water systems and water redirects within sufficient time to meet the new rules. Compliance with ELG requirements is required beginning November 2018. In addition, Duke Energy Kentucky has targeted completion of rerouting requirements under CCR for that same time period pending groundwater monitoring results and NPDES permit expiration of October 31, 2019. Thus, Duke Energy Kentucky's need to begin construction is immediate given the long fabrication, acquisition lead times, and extensive filed construction to complete the project work. In short, Duke Energy Kentucky must take action now to maintain compliance and to continue to operate East Bend.

The Company is diligently working to align the construction with planned station maintenance outages scheduled to occur in the spring of 2018. Because an extended outage will be required to complete the conversion, the Company is striving to accomplish the conversion as part of an already scheduled planned extended maintenance outage in the spring of 2018. By performing the work as part of the already-scheduled outage, the Company will avoid having to take an additional outage to complete the project.

Q. PLEASE EXPLAIN DUKE ENERGY KENTUCKY'S EVALUATION PROCESS TO ARRIVE ITS ULTIMATE COMPLIANCE STRATEGY.

A. Following the publication of the ELG and CCR Final Rules, Duke Energy Kentucky began evaluating the compliance obligations and possible strategies to ensure that the Company timely met both ELG and CCR Final Rule requirements. The Company's compliance strategy necessitated a thorough examination of existing processes to determine whether or not they were sufficient under these rules. Once that was examined, the Company then had to then determine the optimal compliance strategy in terms of least cost, feasibility, site suitability, and timeliness for compliance.

To assist in this evaluation, Duke Energy Kentucky retained two engineering firms, Burns & McDonnell and Amec Foster Wheeler PLC to assist the Company in developing the strategy, scope, design, schedule and cost estimates to ensure East Bend's continued operation in compliance with the CCR and ELG Final Rules. This evaluation included examining all CCR and ELG related processes at the station to confirm compliance and developing a compliance strategy where existing processes fell short to meet specific deadlines contained in these regulations. Duke Energy Kentucky has determined that in order to maintain East Bend's commercial availability under the CCR and ELG final rules, specific compliance actions must occur and include conversion to dry ash handling system, installation of new wastewater streams, and eventual Pond closure for repurposing in a way that is in compliance with the CCR Final Rule's new requirements. The timing of these various actions is dependent upon the

deadlines imposed within the ELG and CCR Final Rules. The Company has previously filed for approval of the dry bottom ash conversion at East Bend in Case No. 2016-00268. The work described in this application is additional compliance and companion work that is also necessary to ensure East Bend meets the CCR and ELG Final Rules requirements.

Q. PLEASE SUMMARIZE HOW THE NEW PROCESS WATER SYSTEMS AND BASIN CLOSURE AND REPURPOSING WILL BE ACCOMPLISHED.

A. The new retention basin will be located in the existing Pond. The existing ash Pond will undergo closure by removal. This location was selected to utilize the existing NPDES outfall and to minimize interconnecting piping and pumping revisions and costs. The new holding basin is separate and will be located in the southwest corner of the coal pile.

For the water redirect portion of the project, a new FGD Maintenance tank will be added that will accept spent slurry flows from each scrubber module as well as the absorber building sump and both North and South tunnel sump flows. A new diversion structure downstream of existing internal outfall 010 will be constructed to discharge to the eastern and western sections of the lined ash pond. The existing boiler sump will be re-routed to the new retention basin. The SCR sump, coal conveyor storm water pond, landfill leachate from the East Landfill cells 15 and 16, waste stabilization plant area clean sump, sanitary discharge, demineralizer waste and existing east landfill trench will all be routed to the re-

lined retention basin. The bottom ash stack out sump will be directed to the existing boiler room sump ash settling basin. During outage maintenance the Air heater, Electro-static Precipitator and economizer wash water will flow to the existing boiler room sump and then be pumped to a new holding basin for treatment before being released to the new retention basin. Normal flows from the Existing boiler room sump ash settling basin and existing west landfill trench will go to the new retention basin. And finally a new fixation stack out area sump will be added and routed to the new retention basin.

Q. PLEASE SUMMARIZE THE CONTRACTING AND PROCUREMENT PROCESS ENVISIONED IN THIS PROJECT.

A. The selected contracting strategy for the new process water systems and Pond repurposing is a multiple prime contract approach where engineered equipment and material will be procured from manufacturers specializing in the specific item(s). Construction will be performed by a limited number of contractors capable of performing most of the work included in the construction scope. Lump sum construction contracts are planned for the project. This approach provides several benefits, including:

- Facilitates early award of major equipment procurements to allow detailed design engineering to proceed expeditiously and equipment to be fabricated to meet the Project schedule;
- Minimizes site interface issues by limiting the number of site contractors, while allowing work to be started as soon as engineering is completed and permit approvals are received;

- Offers the greatest flexibility for Duke Energy Kentucky to be involved in key decisions regarding design; and
- Results in anticipated cost savings.

In the multiple contract approach, Duke Energy Kentucky and its consultant, Burns and McDonald will work together to procure the construction and major equipment contracts. The procurement of the long lead time equipment such as electrical equipment is necessary early in the project to support detailed design and facilitate timely delivery. The contracting approach includes eleven equipment/material contracts; two furnish and erect contracts, five construction contracts, and five construction services contracts. The equipment contracts allow engineering to be completed prior to issuing construction drawings to reduce construction costs and schedule durations.

Q. PLEASE EXPLAIN WHY THE NEW PROCESS WATER SYSTEMS AND BASIN CLOSURE AND REPURPOSING IS A REASONABLE AND ECONOMIC LONG TERM CCR AND ELG COMPLIANCE SOLUTION.

A. As I previously mentioned, in order for East Bend to continue commercial operation and supply Duke Energy Kentucky's customers, the station must comply with all applicable environmental regulations, which now include the CCR and ELG Final Rules. If the Company does not make the necessary changes to its water process systems, the Company will have to cease operations at East Bend. The ELG Final Rule makes it impossible for Duke Energy Kentucky to continue operations in the current configuration which do not comply with new

standards. The alternative is for Duke Energy Kentucky to simply shut down East Bend and pursue alternative sources of energy and capacity to serve its customers.

Q. WILL THE NEW PROCESS WATER SYSTEMS AND POND CLOSURE AND REPURPOSING IMPACT THE OPERATION OF EAST BEND OR RESULT IN WASTEFUL DUPLICATION OF SERVICES?

A. No. Duke Energy Kentucky will continue to be able to provide safe, reliable and adequate service to its customers. In fact, that is precisely why the Company is seeking to begin the project at this time. The Company intends to perform the work necessary to comply with the ELG and CCR Final Rules so to ensure there is no interruption of service or impact to the plant's operation.

As explained by Company witness, Tammy Jett, the ELG Final Rule is creating additional restrictions on the generator wastewater streams and is impacting disposal of generator waste from coal combustion facilities. The practical impact of these regulations will drive the closure of existing ash ponds and the elimination of wet bottom ash disposal across the industry. The Company must act now to ensure the continued operation of East Bend by addressing its waste disposal systems.

Q. HAS DUKE ENERGY KENTUCKY ACQUIRED THE NECESSARY ENVIRIONMENTAL PERMITS TO PERFORM THE IMPLEMENTATION OF WATER RE-DIRECTS AND BASIN CLOSURE?

A. Yes, the Company has either acquired, or is in the process of acquiring the necessary permits. Ms. Jett describes and supports the permits as part of her testimony.

Q. DO YOU BELIEVE IT IS IN THE PUBLIC INTEREST FOR DUKE ENERGY KENTUCKY TO CONSTRUCT THE NEW PROCESS WATER SYSTEMS AND POND REPURPOSING AT EAST BEND?

A. Yes. East Bend provides necessary and low cost base load capacity and energy to Duke Energy Kentucky's customers. In order to continue to operate East Bend, it must comply with all applicable environmental regulations, including the CCR and ELG Final Rules. The water redirect, basin closure, and Pond repurposing is a reasonable and cost effective compliance strategy that will allow East Bend to continue to serve our customers.

IV. FILING REQUIREMENTS SPONSORED BY WITNESS

Q. PLEASE DESCRIBE THE FILING REQUIREMENTS YOU SPONSOR.

A. I sponsor portions of Duke Energy Kentucky Exhibits 7, 8 and 9 to the Company's Application, Duke Energy Kentucky's Project Definition Report for addressing the need and scope of the water redirection, pond closure and repurposing projects.

V. CONCLUSION

Q. WERE EXHIBITS 7, 8, AND 9 TO THE COMPANY'S APPLICATION PREPARED BY YOU OR AT YOUR DIRECTION?

A. Yes.

Q. DOES THIS CONCLUDE YOUR PRE-FILED DIRECT TESTIMONY?

A. Yes.

VERIFICATION

STATE OF NORTH CAROLINA)
) SS:
COUNTY OF MECKLENBURG)

The undersigned, David Renner, Vice President Coal Combustion Products Engineering, being duly sworn, deposes and says that he has personal knowledge of the matters set forth in the foregoing testimony and they are true and correct to the best of his knowledge, information, and belief.

David Renner, Affiant

Subscribed and sworn to before me by David Renner on this 29th day of November 2016.

NOTARY PUBLIC

My Commission Expires: Oct. 20, 2018

DUKE ENERGY KENTUCKY EXHIBIT 11

COMMONWEALTH OF KENTUCKY
BEFORE THE
KENTUCKY PUBLIC SERVICE COMMISSION

In The Matter of:

The Application of Duke Energy Kentucky, Inc., for a Certificate of Public Convenience and Necessity for Water Re-directs and Basin Closure for East Bend Generating Station	))))	Case No. 2016-00398

DIRECT TESTIMONY OF

BRANDON DELIS

ON BEHALF OF

DUKE ENERGY KENTUCKY, INC.

December 2, 2016

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BD-1 Analysis of Potential Compliance Strategies

BD-2 Pond Closure Estimate

BD-3 Water Redirect Estimate

BD-4 Pond Repurposing Estimate

I. INTRODUCTION

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Brandon Delis and my business address is 526 South Church Street, Charlotte North Carolina.

Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?

A. I am employed by Duke Energy Business Services LLC., (DEBS) as Director of Program Development and Integration. DEBS provides various administrative and other services to Duke Energy Kentucky, Inc., (Duke Energy Kentucky or the Company) and other affiliated companies of Duke Energy Corporation (Duke Energy Corp.)

Q. PLEASE BRIEFLY DESCRIBE YOUR EDUCATIONAL AND PROFESSIONAL BACKGROUNDS.

A. I have a Bachelor of Science in Mechanical Engineering from the University of Kentucky and am a licensed professional engineer in the Commonwealth of Kentucky. I have been with Duke Energy Corp. for 16 years and have held various positions in engineering, project management, and operational management.

Q. PLEASE SUMMARIZE YOUR DUTIES AS DIRECTOR PROGRAM DEVELOPMENT AND INTEGRATION.

A. I manage a team of engineers and program managers that develop solutions for challenges that impact Duke Energy Corp.'s generation fleet. This includes but is not limited to developing compliance strategies for environmental regulations impacting Duke Energy Corp.'s electric generating assets.

Q. HAVE YOU PREVIOUSLY TESTIFIED BEFORE THE KENTUCKY PUBLIC SERVICE COMMISSION?

A. I recently filed testimony in Case No. 2016-00268, involving the Company's request for a certificate of public convenience and necessity (CPCN) to convert its wet bottom ash handling and storage system to a dry ash handling system (Dry Ash Conversion Case).

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

A. The purpose of my testimony is to support the Company's application for a CPCN by providing detail on the analysis, design, cost estimates, and considerations that lead to the Company's decisions to construct a new, balance-of-plant wastewater treatment system, including the following: 1) a new FGD maintenance tank and associate facilities; 2) water redirection of boiler, air heater and precipitator wash water to a new lined holding basin; and 3) repurposing of the existing East Bend Generating Station (Pond) through closure and construction of a new lined retention basin.

Q. PLEASE EXPLAIN WHAT HAS PROMPTED THE COMPANY TO MAKE SUCH INVESTMENTS AT THIS TIME.

A. The driver of the Company's decision to pursue the projects I just mentioned is to bring Duke Energy Kentucky's East Bend Generating Station (East Bend) into compliance with the United States Environmental Protection Agency's (U.S. EPA's) rules for Steam Electric Effluent Limitation Guidelines (ELG Final Rule) and Coal Combustion Residual (CCR Final Rule).

II. DISCUSSION

Q. ARE YOU FAMILIAR WITH EAST BEND'S OPERATIONS?

A. Yes. In my role as Director of Program Development and Integration, I am very familiar with the existing operations of East Bend and what actions are required to continue operating the station in compliance with recently effective environmental regulations. East Bend is one of two operating generating stations owned by Duke Energy Kentucky, and is its only base-load generating unit providing approximately 600 MegaWatts (MWs) (net capacity rating) of coal-fired generation to serve customers. This station thus serves an important role in meeting the electricity needs of Duke Energy Kentucky's customers. In order to continue operating this station, Duke Energy Kentucky must make certain investments to comply with the recently effective ELG and CCR Final Rules that have restructured ash handling and CCR processes across the utility industry.

Q. PLEASE PROVIDE A BRIEF OVERVIEW OF THE CURRENT ASH HANDLING PROCESSES AT EAST BEND.

A. Presently, approximately 80 percent of the ash produced at East Bend is dry ash, that through its handling process, is converted into a concrete-like material called Poz-o-Tec and disposed of in onsite landfills. Wet bottom ash comprises the approximately 20 percent of the remaining ash produced and is currently stored at the onsite ash pond impoundment (Pond) in compliance with the existing permits issued by the Kentucky Division of Waste Management. The Company is in the process of seeking approval to convert its wet ash handling process into a dry ash

handling process so to comply with the ELG and CCR Final Rules.[1] Once completed, all ash produced at East Bend will be disposed of on site in the Landfill.

Q. PLEASE DESCRIBE EAST BEND'S ASH POND AND ITS PRIMARY PURPOSE.

A. The onsite Pond was commissioned in 1981, along with East Bend, and has a volume of 1,844 acre feet. The Pond's primary purpose is to separate bottom ash from the water used to convey the ash from the plant before the water is discharged to the Ohio River. Currently, boiler bottom ash is collected in a wet bottom ash hopper at the base of the boiler and then sluiced to East Bend's Pond. This discharge is in accordance with a National Pollution Discharge Elimination System (NPDES) permit. The Pond is also used to collect other plant wastewater streams, such as coal pile run-off and landfill leachate, before they are discharged under the NPDES permit. The ash itself will ultimately be disposed of in the existing landfills in accordance with existing permits.

Q. WHY IS DUKE ENERGY KENTUCKY SEEKING APPROVAL TO CONSTRUCT AND IMPLEMENT NEW WATER RE-DIRECTION SYSTEMS AND TO CLOSE AND REPURPOSE THE POND AT EAST BEND?

A. As more fully explained by Duke Energy Kentucky witness, Tammy Jett, in order to continue operation, East Bend must fully comply with all applicable environmental regulations. This includes the U.S. EPA's ELG and CCR Final

[1] *In the Matter of The Application of Duke Energy Kentucky, Inc., for a Certificate of Public Convenience and Necessity for Dry Bottom Ash Conversion of the East Bend Generating Station,* Case No. 2016-000268, Application filed July 28, 2016.

Rules. Together, these two rules are driving the need for additional investment and compliance strategies around the handling of waste water streams and coal combustion residuals (CCRs) for coal-fired generating stations across the country. The ELG and CCR Final Rules require additional levels of investment and strategies for handling of the CCR and waste water streams necessary and intrinsic to coal-combustion electricity generation all within specific timeframes for compliance. As a result of passage of these two rules, Duke Energy Kentucky undertook work streams to identify both needs and opportunities to maintain or bring East Bend into timely compliance.

Q. HOW DID DUKE ENERGY KENTUCKY DEVELOP ITS COMPLIANCE STRATEGY?

A. To develop its compliance strategy, Duke Energy Kentucky examined the environmental regulations, specifically the ELG and CCR Final Rules to determine what if any actions were necessary to bring East Bend into compliance. This analysis included examining multiple scenarios to determine what alternatives provided the best long-term strategy for compliance. Duke Energy Kentucky retained two outside engineering and consulting firms to assist in developing the scope, design, schedule and cost estimates to bring East Bend Station into compliance with the CCR and ELG Final Rules.

Q. WHAT IS THE RESULT OF THIS ANALYSIS?

A. The ELG and CCR Final Rules do require Duke Energy Kentucky to take action to ensure compliance and continued operation at East Bend. Because the combination of the ELG and CCR rules will prohibit future sluicing of bottom ash

to a pond, the Company is already in the process of seeking Commission authority to convert the existing wet ash handling system to a dry ash handling system in Case No. 2016-00268. The Company will have to construct new process water systems, including a new lined retention pond for meeting the new ELG requirements. Because of the limitation on available land at and around East Bend, the existing Pond will be repurposed through clean closure in a manner that is in compliance with both the ELG and CCR final rules. To do this, the existing bottom ash will be excavated and collected in a dry state and be disposed of in a landfill. The Pond is periodically excavated with bottom ash either repurposed for beneficial use or disposal in the landfill in accordance with existing permits.

Q. PLEASE DESCRIBE DUKE ENERGY KENTUCKY'S RECOMMENDED PLANT MODIFICATIONS INCLUDING ITS POND CLOSURE AND WATER REDIRECTION STRATEGY.

A. The recommended plant modifications were developed after a review and evaluation of the CCR and ELG Final Rules. Additionally, the recommendations were developed in collaboration with Duke Energy project and plant personnel. The recommended modifications to East Bend include the following:

- Retention Basins: Construction of a new holding basin and repurposing of the existing Pond as a lined basin for retention, removal of residual suspended solids, pH adjustment, and oil and grease removal in plant low volume wastewater, contact storm water and landfill leachate.
- Water Redirects: Route low volume wastewater, landfill leachate, coal pile runoff, and contact storm water runoff to the retention basin once it is

completed. Water from the new West Landfill will also be included as part of the redirection activities. The water redirection scope will also include an 850,000 gallon FGD maintenance tank for East Bend absorber slurry and reclaim water to eliminate the need for emergency FGD wastewater discharges.

The steps necessary to close the Ash Pond are consistent with recognized and generally accepted good engineering practices. The Company's decision for clean Pond closure was intended to minimize the need for long-term maintenance and to control the post-closure release of contaminants. The Pond will be closed through the removal of all coal combustion residuals (CCR), and the closure will be performed in accordance with 40 C.F.R. § 257.102(c).

Q. WHY IS THE EXISTING POND BEING REPURPOSED?

A. As I previously mentioned, there is limited space available to construct an entirely new and separate lined pond for meeting existing requirements and the new ELG Final Rule requirements for the process water systems. Repurposing the existing Pond is the most convenient, efficient, and cost-effective strategy for meeting the time sensitive compliance deadlines. The Pond will have to be closed in a manner that complies with CCR, even though the primary driver is actually the ELG from a timing perspective.

Q. HAS DUKE ENERGY KENTUCKY PREPARED DOCUMENTS DESCRIBING THE WATER REDIRECTION AND POND CLOSURE CONSTRUCTION?

A. Yes. Exhibit 7 to the Company's Application is the Project Definition Report Duke Energy Water Redirection Program for the East Bend Station (Report) and

includes a map depicting the location of the Pond and the water redirection work to occur as well as, plans, specifications and drawings for the project. Exhibit 8 to the Company's application includes the Pond closure engineering, design and construction specifications. These document(s) describe the scope of the Pond closure activities as well as the water redirection that must occur.

Q. DID DUKE ENERGY KENTUCKY CONSIDER OR ANALYZE ANY ALTERNATIVE CCR OR ELG COMPLIANCE STRATEGIES TO THE POND REPURPOSING AND WATER REDIRECTION BEING PROPOSED IN THIS CPCN APPLICATION?

A. Yes. Duke Energy Kentucky evaluated several closure options for the ash basin at East Bend such as closure by removal, closure in place and a hybrid closure approach for consolidating ash in one half of the basin and closing it in place. These options were evaluated and ranked based on several factors such as environmental protection and impacts, relative cost, schedule, regional factors and constructability. Attachment BD-1 includes the alternative strategy evaluations. The strategy that was ultimately selected, was closure by removal and re-purposing the ash basin as a lined retention basin. Overall, the closure by removal and re-purposing option presents several advantages over other closure options that were considered such as the timeline for permitting as well as construction to meet the CCR and ELG Final Rules. These advantages include, but are not limited to, the constructability, permitting, timeline for compliance, ability to meet groundwater protection standards and the least overall project costs. Conversely, the potential permitting timeframes, constructability and high

projects costs associated with the other strategies (*e.g.*, closure of the ash basin in place and constructing a separate stand-alone retention basin and hybrid closure approach with re-purposing half the basin with construction of a new outfall), made these alternative options unfavorable.

Different water treatment technologies were considered when ultimately selecting a retention basin. An active solid removal system using tanks, clarifiers, and filter presses was considered in lieu of the retention basin. A retention basin is preferred given it is the least complex, lowest operational cost, and lowest total installed cost. An active solids removal system would only be selected if a suitable location for a retention basin of sufficient size could not be found. A hybrid active/passive treatment system was also considered utilizing a polishing filter after the retention basin. This option offers little to no advantage at East Bend given the repurposed basin offers more than sufficient area for settling solids.

Repurposing the Pond versus construction of a new separate retention basin offers additional advantages. The water redirect pipe rerouting scope is significantly reduced given the streams already flow to the existing Pond. In addition, the size of the Pond also allows the removal of a two stage settling feature which further reduces the cost. Attachment C to the Report includes a design schematic of the new retention basin that is repurposed from the existing Pond.[2]

[2] Exhibit 7.

Q. PLEASE DESCRIBE THE POND CLOSURE PROCESS THAT THE COMPANY WILL UNDERTAKE.

A. The process to remove CCR from the Ash Pond includes dewatering and utilizing appropriate equipment and methods to move the CCR to the existing on-site landfill. Dewatering will include removal of all free water and interstitial water to an appropriate level to allow for safe extraction. Existing appurtenant structures, if any, such as inlet troughs, spillways, and piping will be properly decontaminated or removed and transported to a permitted disposal facility depending on potential reuse opportunities for the structures identified at the time of closure. Decontamination procedures may consist of pressure washing, scrubbing, or other generally accepted decontamination procedures. In accordance with 40 C.F.R. § 257.102(c), CCR removal and decontamination will be complete when constituent concentrations throughout the CCR unit and areas affected by releases from the unit have been removed and groundwater monitoring concentrations do not exceed the applicable groundwater protection standards for Appendix IV constituents. If evidence of a release is identified, materials impacted by the release will be removed or remediated, as appropriate. Existing embankments may be breached to limit collection of storm water if consistent with future proposed land use as a re-purposed basin. CCR will be removed from the Ash Pond in accordance with 40 C.F.R. § 257.102(c); therefore, no final cover system will be constructed in support of closure.

Q. WHAT IS THE ESTIMATED VOLUME OF CCR MATERIAL CURRENTLY SITUATED IN THE POND?

A. The volume of CCR present in the Ash Pond was calculated and is presented in Table 1 below. The volume demonstrates the estimated maximum inventory of CCR ever on-site over the active life of the CCR surface impoundment and is based on bathymetry surveys, historical topography and soil borings as of 2014. The estimates do not include any material discharged or removed from the Ash Pond after September 2014.

Table 1. Estimated Maximum CCR Inventory On-Site

Basin	**Maximum Quantity of CCR (CY)**
Ash Pond	878,070

Q. WHAT IS THE ESTIMATED TIMING OF THE POND CLOSURE ACTIVITIES?

A. The construction work will occur over 3 years; commencing in approximately April 2017 through April 2020 and will be separated into 2 major phases to construct the west basin and east basin, respectively. The holding basin and FGD maintenance tank will be constructed prior to the currently scheduled 2018 spring outage.

Closure of the Pond will be initiated in accordance with 40 C.F.R. § 257.102(e) and anticipated to be completed within five years of the commencement of closure in accordance with 40 C.F.R. § 257.102(f)(ii).

Q. WHY DID DUKE ENERGY KENTUCKY DECIDE THE CLEAN CLOSURE STRATEGY WAS THE MOST REASONABLE APPROACH?

A. As I previously discussed, the Company did evaluate other strategies, including the possibility of closure in place. Closure in place would require additional permitting approvals as current allowed activities do not contemplate permanent disposal in the Pond. In addition, closing the Pond in place would require the Company to construct new retention basins for storm and waste water on site, where suitable locations are limited. The strategy selected results in the most reasonable and least cost solution to comply with the CCR and ELG Final Rules while enabling the Company to maximize the use of the land on the East Bend campus.

Q. PLEASE DESCRIBE THE WATER REDIRECTION WORK THAT MUST OCCUR.

A. The Report included in Exhibit 7 to the Application fully explains the scope of the water redirection process. In summary, the project will include a new FGD Maintenance Tank that will accept maintenance slurry flows from each of the three scrubber modules as well as the absorber building sump and both North and South tunnel sump flows. The maintenance tank will have provisions to pump back to any of the three absorber modules as well as the absorber building sump. A new diversion structure downstream of existing outfall 010 will discharge to the eastern and western sections of the Pond.

The Pond itself will undergo closure by removal, and will be lined and repurposed into a two-sided retention basin. The existing boiler sump (including the settling basin section) will be re-routed to the new retention basin. The SCR sump, coal conveyor storm water pond, landfill leachate from the East Landfill

cells 15-16, Waste Stabilization Plant area clean sump, sanitary discharge, demineralizer waste and existing east landfill trench will all be routed to the re-lined, two-sided retention basin when completed.

The new bottom ash stack out sump will be directed to the existing boiler room sump ash settling basin. Air heater, ESP and economizer wash water will also be routed to the existing boiler room sump and then be pumped to a new holding basin for treatment before being released to the new retention basin. Vacuum truck liquid and slurry discharge will be discharged to the holding basin for treatment. Haul road runoff, boiler room sump, and existing Landfill trench (containing cooling tower overboard, coal pile runoff, East Landfill runoff and landfill leachate from Cells 1-14) will go to the new retention basin. Existing sump pumps will be reused where possible, but it is assumed that North Tunnel normal sump pumps, South Tunnel normal sump pumps, and absorber building sump pumps will require replacement in order to have enough head to pump into the new FGD maintenance tank.

Q. PLEASE BRIEFLY EXPLAIN WHY THE COMPANY NEEDS TO BEGIN CONSTRUCTION ON THE WATER RE-DIRECTS AND BASIN CLOSURE SYSTEM NOW.

A. As I previously mentioned, the driver for the conversion is the need to bring East Bend into compliance with the CCR and ELG Final Rules. Compliance with ELG requirements is required beginning November 2018. In addition, Duke Energy Kentucky has targeted completion of rerouting requirements under CCR for that same time period pending groundwater monitoring results. In order to accomplish

that goal, the Company must commence construction to allow sufficient time to complete the required work in advance of the compliance deadlines imposed by the ELG Final Rule and targeted CCR date.

Q. WHAT IS THE ESTIMATED COST OF THE WATER RE-DIRECTS AND BASIN CLOSURE SYSTEM ?

A. The fully-loaded estimated costs, as of November 15, 2016, for construction of the new process water systems, Pond closure and repurposing is approximately $93.2 million. ($29 million Ash Pond Closure + $36.1 million Retention Basin Construction + $28.1 million Water Re-direction and Process Modifications). The detailed project budgets for the Pond Closure, Water Redirection and Pond Repurposing are contained in Attachments BD-2, 3, and 4, respectively, to my testimony.

Q. HOW WERE THESE COSTS DETERMINED?

A. The estimate basis of the water redirects and new retention basin are explained in the Burns & McDonnell PDR (Exhibit 7). The closure estimate was developed internally by CCP estimating using historic pricing from other projects.

Q. DO YOU BELIEVE THE WATER RE-DIRECTS AND BASIN CLOSURE IS A NECESSARY AND PRUDENT INVESTMENT FOR DUKE ENERGY KENTUCKY?

A. Yes. Duke Energy Kentucky must take action if it wants to continue to use East Bend to supply base load generation for its Kentucky customers. East Bend is a reliable, well maintained, and reasonably priced unit. The Pond closure and water redirection conversion will allow Duke Energy Kentucky to continue to operate

and run the plant in the near term under currently known environmental regulations. Without this investment, the Company could no longer operate East Bend without significant investment to bring the existing Pond into compliance. The Company simply is unable to continue to use its Pond as it once was under prior environmental regulations.

III. FILING REQUIREMENTS SPONSORED BY WITNESS

Q. PLEASE DESCRIBE THE FILING REQUIREMENTS YOU SPONSOR.

A. I sponsor portions of Exhibits 7 and 8, the Report and Pond closure plans and schematics, and costs respectively.

IV. CONCLUSION

Q. WERE ATTACHMENTS BD-1, BD-2, BD-3, BD-4, EXHIBITS 7 AND 8 TO THE COMPANY'S APPLICATION PREPARED BY YOU OR UNDER YOUR DIRECTION AND CONTROL?

A. Yes.

Q. DOES THIS CONCLUDE YOUR PRE-FILED DIRECT TESTIMONY?

A. Yes.

VERIFICATION

STATE OF NORTH CAROLINA)
) **SS:**
COUNTY OF MECKLENBURG)

The undersigned, Brandon Delis, Director of Program Development and Integration, being duly sworn, deposes and says that he has personal knowledge of the matters set forth in the foregoing testimony and they are true and correct to the best of his knowledge, information, and belief.

Brandon Delis, Affiant

Subscribed and sworn to before me by Brandon Delis on this 2ND day of December, 2016.

EVELYN G ROSEMAN NOTARY PUBLIC MECKLENBURG COUNTY, NC

Evelyn G. Roseman
NOTARY PUBLIC

My Commission Expires: Aug 18, 2019

CLOSURE OPTIONS TABLES

Table 1 – Closure Options Summary
Ash Basin Closure Options Evaluation
East Bend Station
Duke Energy

Option	Description
1 Removal	• dewater ash basin • remove ash and transfer to the onsite West Special Waste Landfill • remove limited quantity of residual soil (assume 1-ft of soil undercut beneath ash) • restore the excavated areas by grading to promote drainage and soil stabilization • remove embankment dike and grade soil to promote drainage • groundwater remediation and long-term monitoring (limited basis)
2 Close in Place	• leave current ash basin footprint as is and close in place • dewater ash basin • close in place with minimal grading of ash to provide drainage with an engineered final cover system and stabilize surface • eastern portion of the dike to be removed to allow drainage from the basin area • portion of the final cover within the 100 year floodplain • groundwater remediation and long-term monitoring
3 Hybrid 1	• consolidate ash into reduced footprint on the west side of ash basin • close in place consolidated footprint with engineered cover system • remove limited quantity of residual soil from the east side of the former ash area (assume 1-ft of soil undercut beneath ash) • grade and establish vegetation on east side former ash areas by grading to promote drainage and soil stabilization • portion of final cover system within the 100 year floodplain • groundwater remediation and long-term monitoring • eastern portion of the dike to be removed and soil used for final closure as needed
4 Hybrid 2	• consolidate ash into reduced footprint on the west side of ash basin and keeping the perimeter containment dike in place • close in place consolidated footprint with engineered cover system • remove limited quantity of residual soil from the east side of the former ash area (assume 1-ft of soil undercut beneath ash) • construct containment berm for ash stabilization and separation from the east side former ash area used for stormwater management area • east side stormwater management area to utilize the existing principal spillway for drainage discharge • groundwater remediation and long-term monitoring

Table 2 – Quantity Summary
Ash Basin Closure Options Evaluation
East Bend Station
Duke Energy

Item	Ash and Residual Soil Volume (CY)[1]	Weight (Tons)[2,3]	Earthwork (CY)	Final Cover Soil Volume (CY)[4]	Area (Ac)[5]
Ash Basin	958,580	1,184,110			46
Option 1 Removal	958,580	1,184,110	651,843	N/A	46
Option 2 Closure In Place- Soil	60,540	72,648	104,000	148,400	46
Option 2 Closure In Place - Geosynthetics	60,540	72,648	104,000	222,600	46
Option 3 Hybrid - Soil	219,328	280,698	104,000	74,200	23
Option 3 Hybrid - Geosynthetics	219,328	280,698	104,000	111,300	23
Option 4 Hybrid - Soil	219,328	280,698	61,000	74,200	23

1. Volume reflects the latest calculation of ash volume and residual soil undercut dated November 25, 2015 and includes the conversion of the anticipated bottom grade elevations from survey datum NAVD29 to NGVD88.
2. Convert CY Pond Ash to Tons Wet Ash at 1.2 Tons/CY (89 lbs/ft^3).
3. Convert CY Residual Soil to Tons at 1.62 Tons/CY.
4. Soil volume reflects amount of soil needed for the final cover system.
5. Area reflects surface area of the ash within the ash basin and not the area of the ash basin to the centerline of dike.

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Table 3 - Option 1 Overview: Removal
Ash Basin Closure Options Evaluation
East Bend Station
Duke Energy

Subject	Description
Description	1. Remove ash basin and transfer to on-site West Special Waste Landfill 2. Remove limited quantity of residual soil (assumed 1-ft of soil undercut beneath ash) 3. Restore the former ash basin area by grading to promote drainage and stabilization or use as a stormwater management area 4. Remove embankment dike and grade soil to promote drainage if not used for stormwater management 5. Groundwater remediation and long-term monitoring and maintenance
Details	1. Dewater ash basin of free water and pore water 2. Remove ash from basin and transfer to on-site West Special Waste Landfill ≈ 878,070 CY 3. Remove residual soils under ash basins and transfer to on-site West Special Waste Landfill ≈ 80,510 CY 4. Excavate and grade to drain soil embankment dike ≈ 455,198 CY 5. Provide additional soil borrow from on-site source to provide grading to drain ≈ 196,645 CY 6. Receptors include biological and surface water; no human receptors within 0.7 miles and the facility is located in a sparsely populated area 7. No post-closure use is anticipated 8. Groundwater remediation and long-term monitoring are not anticipated for this option
Environmental Protection and Impacts	1. Estimated time to achieve compliance with groundwater standards - the 2009 GW Risk Assessment noted iron, manganese, sulfate and/or TDS above the secondary MCLs for drinking water, but none were above the EPA's Primary Drinking Water Standard. The 2014 GW Assessment Plan noted increasing GW concentration trends in an on-site monitoring well for sulfate, chloride, sodium, manganese, calcium, boron, COD, TDS and specific conductance. GW assessment is underway at the site. It could potentially take up to 3 years, including closure, to move GW concentration trends downward and up to 5 years for compliance monitoring and reporting. 2. Related risk to residual groundwater - risk eliminated by removing source 3. Proximity to riverbank or shoreline - the West Special Waste Landfill Cell 1 is approximately 2600' from the Ohio River 4. Proximity to public drinking water intakes - The closest downstream intake was identified for the Louisville, KY intake approximately 90 miles downstream. 5. Proximity to nearest downgradient potable water well - there are no drinking water wells within a 1-mile radius except for the water supply

December 07, 2015

Table 3 - Option 1 Overview: Removal
Ash Basin Closure Options Evaluation
East Bend Station
Duke Energy

Subject	Description
	well for the plant and the closest public drinking water well is 2.25 miles downstream 6. Proximity to flora, fauna and human receptors - site vicinity is largely undeveloped with some agriculture. Big Bone Lick State Park is located approximately 4.75 miles to the southeast. No human receptors within 0.7 miles and the facility is located in a sparsely populated area. 7. Restoration of habitat, streams or wetlands - no stream or wetland impacts, ash basin will be restored to a vegetated state 8. Air emissions off-site (based on miles driven) - N/A 9. Air emissions on-site (based on gallons of fuel consumed) - the closure implementation on-site trips to West Special Waste Landfill are less than 1 mile. Assume 34,519 trips to remove 958,580 CY of ash and residual soil from basin and 651,843 CY to grade to drain 10. Avoidance of greenfield disturbance - no greenfield disturbance associated with this closure option
Cost	1. Capital costs ≈ $27,500,000 (1); $22,500,000 (1A) 2. Long-term operations maintenance and monitoring ≈ $0 3. Avoided costs- Long term groundwater monitoring and reporting
Schedule	1. Initiation time (to begin ash removal) - 6 months 2. Likelihood of meeting regulatory deadlines - likely 3. Design and permitting - 3 to 6 months 4. Construction - 34 months (6 months dewatering, 12 months removal, 16 months soil grading) 5. Post-closure - 30 years or less if demonstrated site does not present a threat to public health or environment
Regional Factors	1. Plan or potential for beneficial reuse of site - none planned 2. Imported soil needs – none needed, on-site soils 3. CCR beneficial reuse - none planned 4. Transportation impact (based on miles driven) - 1.5 miles one way to on-site landfill and estimated to be 34,519 trips = 103,557 miles. (88,808 miles for ash grading and 14,749 miles for onsite earthwork) 5. Noise impact due to on-site activity (based on proximity to neighbors) - no human receptors within 0.7 miles and the facility is located in a sparsely populated area 6. Visual impact (based on final height of storage facility, land uses within the viewshed) - no adverse visual impact
Advantages	1. Complete removal of ash in the basin and place in lined landfill 2. Shorter timeframe to reduce groundwater impacts 3. No long term environmental monitoring or maintenance 4. Less miles driven and potentially less air quality impacts

December 07, 2015

Table 3 - Option 1 Overview: Removal
Ash Basin Closure Options Evaluation
East Bend Station
Duke Energy

Subject	Description
	5. Provides more flood storage 6. Area can revert to natural habitat 7. Eliminates potential future impacts to adjacent groundwater and surface water bodies
Disadvantages	1. Cost highest for removal and haul to on-site landfill option 2. Breach of dikes, grading impacts close to the Ohio River 3. Longer timeframe for closure 4. Flood waters can inundate area 5. Additional soil needed from on-site borrow for grading to drain 6. Consumes on-site landfill airspace

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Table 4 - Option 2 Overview: Close in Place
Ash Basin Closure Options Evaluation
East Bend Station
Duke Energy

Subject	Description
Description	1. Leave current ash basin footprint as is and close in place 2. Remove dike on east end of ash basin to allow stormwater drainage and the remainder of dike to stay in place 3. Close in place with an engineered final cover system 4. Groundwater remediation and long-term monitoring
Details	1. Dewater ash basin of free water and pore water 2. Grade to promote drainage, remove dike on east end of ash basin 104,000 CY 3. Construct final cover system with compacted soil or geosynthetics ≈ 148,400 CY of clay and vegetative soils from onsite and offsite or 2,200,000 sf (~46 acres) and 222,600 CY of onsite soil for the geosynthetic final cover system 4. Receptors include biological and surface water; no human receptors within 0.7 miles and the facility is located in a sparsely populated area 5. No post-closure use is planned at this time 6. Groundwater remediation and long-term monitoring and maintenance will be required for this option
Environmental Protection and Impacts	1. Estimated time to achieve compliance with groundwater standards – the 2009 GW Risk Assessment noted iron, manganese, sulfate and/or TDS above the secondary MCLs for drinking water, but none were above the EPA's Primary Drinking Water Standard. The 2014 GW Assessment Plan noted increasing GW concentration trends in an on-site monitoring well for sulfate, chloride, sodium, manganese, calcium, boron, COD, TDS and specific conductance. GW assessment is underway at the site. It could potentially take up to 5 years, including capping, to move GW concentration trends downward and up to 10 years for compliance. 2. Related risk to residual groundwater - source potentially has intermittent contact with groundwater during river level fluctuations 3. Proximity to riverbank or shoreline - centerline of dike is approximately 250' from the Ohio River 4. Proximity to public drinking water intakes - The closest downstream intake was identified for the Louisville, KY intake approximately 90 miles downstream. 5. Proximity to nearest downgradient potable water well - there are no drinking water wells within a 1-mile radius except for the on-site water supply well used by the plant. The closest public drinking water well is 2.25 miles downstream. 6. Proximity to flora, fauna and human receptors - the local site vicinity is largely undeveloped with some agriculture land use. Big Bone Lick

December 07, 2015

Table 4 - Option 2 Overview: Close in Place
Ash Basin Closure Options Evaluation
East Bend Station
Duke Energy

Subject	Description
	State Park is located approximately 4.75 miles to the southeast, no human receptors within 0.7 miles and the facility is located in a sparsely populated area. 7. Restoration of habitat, streams or wetlands - no stream or wetland impacts, ash basin will be restored to a vegetated state 8. Air emissions off-site (based on miles driven) - assume 10,017 trips to place 111,300 CY of clay soil from off-site; 400,680 miles. For geosynthetic materials delivered to the site assume 10 trips at 500 miles one way, 10,000 miles 9. Air emissions on-site (based on gallons of fuel consumed) - the closure implementation on-site trips to West Special Waste Landfill are less than 1 mile. Assume 1,503 trips to place 37,100 CY of onsite vegetative soil. Ash grading of 60,540 CY and earthwork to grade to drain of 104,000 CY. For geosynthetic final cover, 222,600 CY of onsite final cover soil. 10. Avoidance of greenfield disturbance - no greenfield disturbance associated with this closure option
Cost	1. Capital costs ≈ $17,600,000 for compacted soil layer final cover and $18,500,000 for geosynthetic final cover system 2. Long-term operations maintenance and monitoring ≈ $ 4,100,000 3. Avoided costs ≈ $9.0M to $9.9M compared to ash removal
Schedule	1. Initiation time (to begin closure activity) - 4 months 2. Likelihood of meeting regulatory deadlines - likely 3. Design and permitting - 3 to 6 months 4. Construction - 10 to 12 months (4 months dewatering, 7 months final cover installation, 3 month soil grading) 5. Post-closure - 30 years or less if demonstrated site does not present a threat to public health or environment
Regional Factors	1. Plan or potential for beneficial reuse of site - none planned 2. Imported soil needs - for clay component of CSL 3. CCR beneficial reuse - none planned 4. Transportation impact (based on miles driven) - 20 miles one way to soil borrow for clay and 1.5 miles one way for on-site soil and estimated 11,520 trips = 405,188 miles and 37,046 miles for onsite soil for geosynthetic final cover and for geosynthetic materials delivered to the site for Option 2A. 5. Noise impact due to on-site activity (based on proximity of neighbors) - no human receptors within 0.7 miles and the facility is located in a sparsely populated area

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Table 4 - Option 2 Overview: Close in Place
Ash Basin Closure Options Evaluation
East Bend Station
Duke Energy

Subject	Description
	6. Visual impact (based on final height of storage facility, land uses within the viewshed) - no adverse visual impact
Advantages	1. Lower overall costs than removal 2. Shorter time frame than removal for closure 3. Minimal ash contact and disturbance 4. Does not consume on-site landfill airspace
Disadvantages	1. Longer to reduce groundwater impacts and potential for groundwater fluctuations into the ash 2. Proximity to riverbank or shoreline and need for armoring embankment 3. Long-term monitoring and maintenance 4. Cost of final cover system driven by offsite clay or geosynthetics 5. Portion of the final cover within the 100-year flood plain

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Table 5 - Option 3 Overview: Hybrid 1- Reduced Footprint
Ash Basin Closure Options Evaluation
East Bend Station
Duke Energy

Subject	Description
Description	1. Consolidate ash into reduced footprint on the west side of ash basin 2. Close in place consolidated footprint with an engineered cover system 3. Remove limited quantity of residual soil from east side of the former ash area (assume 1' undercut beneath ash) 4. Restore the east side former ash areas by grading to promote drainage and stabilization 5. Groundwater remediation and long-term monitoring
Details	1. Dewater ash basin of free water and pore water 2. Remove ash and residual soil from east end of basin and haul to west end ≈ 219,328 CY 3. Excavate and grade to drain the soil embankment dike on east end ≈ 104,000 CY 4. Construct a containment berm for ash from onsite soils ≈ 61,000 CY 5. Construct final cover system with compacted soil or geosynthetics ≈ 74,200 CY of clay and vegetative soils from onsite and offsite or 1,102,000 sf (23 acres) and 111,300 CY of onsite soil for geosynthetic final cover system 6. Receptors include biological and surface water; no human receptors within 0.7 miles and facility located in a sparsely populated area 7. No post-closure use is anticipated 8. Haul, place and compact ash on the west end of the basin 9. Groundwater remediation and long-term monitoring will be required for this option
Environmental Protection and Impacts	1. Estimated time to achieve compliance with groundwater standards - the 2009 GW Risk Assessment noted iron, manganese, sulfate and/or TDS above the secondary MCLs for drinking water, but none were above the EPA's Primary Drinking Water Standard. The 2014 GW Assessment Plan noted increasing GW concentration trends in an on-site monitoring well for sulfate, chloride, sodium, manganese, calcium, boron, COD, TDS and specific conductance. GW assessment is underway at the site. It could potentially take up to 5 years, including capping, to move GW trends downward and up to 10 years for compliance. 2. Related risk to residual groundwater - source potentially has intermittent contact with groundwater during river level fluctuations 3. Proximity to riverbank or shoreline - centerline of dike approximately 250' from the Ohio River 4. Proximity to public drinking water intakes - The closest downstream intake was identified for the Louisville, KY intake approximately 90 miles downstream.

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Table 5 - Option 3 Overview: Hybrid 1- Reduced Footprint
Ash Basin Closure Options Evaluation
East Bend Station
Duke Energy

Subject	Description
	5. Proximity to nearest downgradient potable water well - there are no drinking water wells within a 1-mile radius except for the water supply well for the plant and the closest public drinking water well is 2.25 miles downstream 6. Proximity to flora, fauna and human receptors - site vicinity is largely undeveloped with some agriculture. Big Bone Lick State Park is located approximately 4.75 miles to the southeast, no human receptors within 0.7 miles and the facility is located in a sparsely populated area 7. Restoration of habitat, streams or wetlands - no stream or wetland impacts, the eastern portion of the ash basin will be restored to a vegetated state 8. Air emissions off-site (based on miles driven) - assume 5,009 trips to provide 55,650 CY of offsite clay; 200,340 miles. For geosynthetic materials delivered to the site assume 10 trips at 500 miles one way, 10,000 miles 9. Air emissions on-site (based on gallons of fuel consumed) - the closure implementation. Assume 7,769 trips to move 219,328 CY of ash and residual soil for the ash basin closure and 18,550 CY of vegetative soil. Earthwork to grade to drain of 104,000 CY; For geosynthetic final cover, 111,300 CY onsite final cover soil 10. Avoidance of greenfield disturbance - no greenfield disturbance associated with this closure option
Cost	1. Capital costs ≈ $14,200,000 for compacted soil layer final cover and $14,700,000 for geosynthetic final cover system 2. Long-term operations maintenance and monitoring ≈ $ 2,900,000 3. Avoided costs ≈ $12.8M to $13.3M compared to ash removal
Schedule	1. Initiation time (to begin ash removal) - within 5 months 2. Likelihood of meeting regulatory deadlines - likely 3. Design and permitting - 3 to 6 months 4. Construction - 13 months (5 months dewatering, 1 month ash excavation, 4 months final cover installation, 3 month soil grading) 5. Post-closure - 30 years or less, if demonstrated site does not present a threat to public health or environment
Regional Factors	1. Plan or potential beneficial reuse of site - none planned 2. Imported soil needs – low permeable soils used to construct the CSL 3. CCR beneficial reuse - none planned 4. Transportation impact (based on miles driven) - 20 miles one way to soil borrow for low permeable soils and 0.5 miles one way for ash hauling, 1.5 one way for onsite soil with an estimated 12,778 trips ≈

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Table 5 - Option 3 Overview: Hybrid 1- Reduced Footprint
Ash Basin Closure Options Evaluation
East Bend Station
Duke Energy

Subject	Description
	209,611 miles and 30,540 miles for onsite soil for geosynthetic final cover and the geosynthetic materials delivered to the site for Option 3A 5. Noise impact due to on-site activity (based on proximity of neighbors) - no human receptors within 0.7 miles and the facility is located in a sparsely populated area 6. Visual impact (based on final height of storage facility, land uses within the viewshed) - no adverse visual impact
Advantages	1. Lower overall costs than removal and closure in place 2. Shorter time frame than clean closure/removal and close in place. 3. Minimizes ash contact and disturbance and long-term monitoring and maintenance 4. Minimizes ash footprint and potential exposure to groundwater
Disadvantages	1. Longer to reduce groundwater impacts and potential for groundwater fluctuations into the ash 2. Proximity to riverbank or shoreline 3. Long-term monitoring and maintenance 4. Cost of final cover system driven by offsite clay or geosynthetics 5. Portion of the final cover within the 100-year flood plain

December 07, 2015

Table 6 - Option 4 Overview: Hybrid 2- Reduced Footprint
Ash Basin Closure Options Evaluation
East Bend Station
Duke Energy

Subject	Description
Description	1. Consolidate ash into reduced footprint on the west side of ash basin 2. Close in place consolidated footprint with an engineered cover system 3. Remove limited quantity of residual soil from east side of the former ash area (assume 1' undercut beneath ash) 4. Restore the east side former ash area to be used as a stormwater management area, leave eastern dike in place, add containment berm along toe of eastern slope of the consolidated unit 5. Groundwater remediation and long-term monitoring and maintenance
Details	1. Dewater ash basin of free water and pore water 2. Remove ash and residual soil from east end of basin and haul to west end ≈ 219,328 CY 3. Construct containment berm for ash from onsite soils ≈ 61,000 CY 4. Construct final cover system with compacted soil or geosynthetics ≈ 74,200 CY of clay and vegetative soils or 1,102,000 sf (23 acres) of geosynthetic final cover system 5. Receptors include biological and surface water; no human receptors within 0.7 miles and the facility is located in a sparsely populated area 6. No post-closure use is anticipated 7. Haul, place and compact ash on the west end of the basin 8. Groundwater remediation and long-term monitoring will be required for this option
Environmental Protection and Impacts	1. Estimated time to achieve compliance with groundwater standards – the 2009 GW Risk Assessment noted iron, manganese, sulfate and/or TDS above the secondary MCLs for drinking water but none were above the EPA's Primary Drinking Water Standard. The 2014 GW Assessment Plan noted increasing GW concentration trends in an on-site monitoring well for sulfate, chloride, sodium, manganese, calcium, boron, COD, TDS and specific conductance. GW assessment is underway at the site. It could potentially take up to 5 years, including capping, to move GW trends downward and up to 10 years for compliance. 2. Related risk to residual groundwater - source potentially has intermittent contact with groundwater during river level fluctuations 3. Proximity to riverbank or shoreline - centerline of dike approximately 250' from the Ohio River 4. Proximity to public drinking water intakes - The closest downstream intake was identified for the Louisville, KY intake approximately 90 miles downstream. 5. Proximity to nearest downgradient potable water well - there are no drinking water wells within a 1-mile radius except for the water supply

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Table 6 - Option 4 Overview: Hybrid 2- Reduced Footprint
Ash Basin Closure Options Evaluation
East Bend Station
Duke Energy

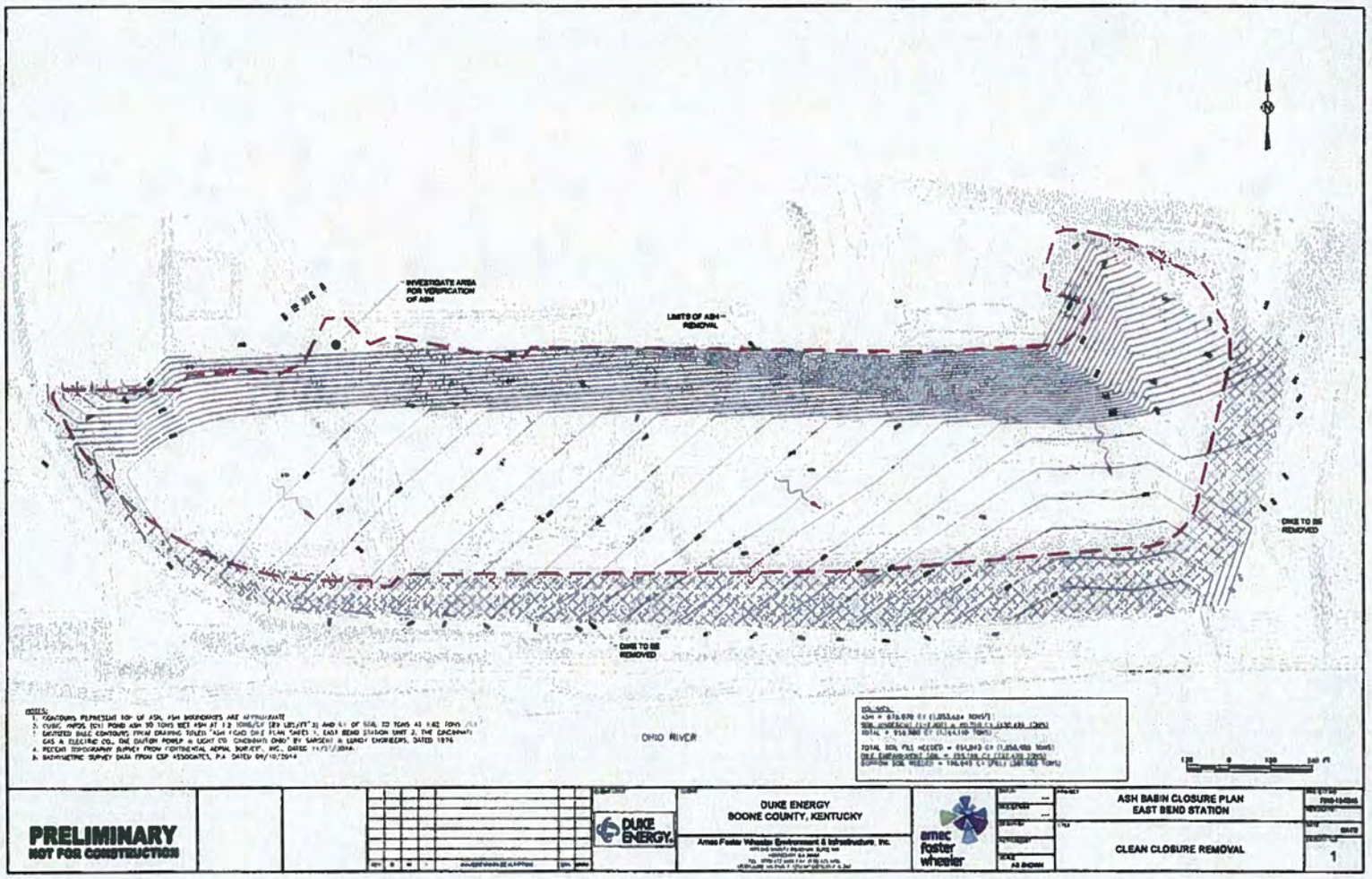
Subject	Description
	well for the plant and the closest public drinking water well is 2.25 miles downstream. 6. Proximity to flora, fauna and human receptors - site vicinity is largely undeveloped with some agriculture. Big Bone Lick State Park is located approximately 4.75 miles to the southeast, no human receptors within 0.7 miles and facility is located in a sparsely populated area 7. Restoration of habitat, streams or wetlands - no stream or wetland impacts, the eastern portion of the ash basin will be restored to a vegetative state 8. Air emissions off-site (based on miles driven) - Assume 5,009 trips to provide 55,650 CY of offsite clay; 200,340 miles. For geosynthetic materials delivered to the site assume 10 trips at 500 miles one way. 9. Air emissions on-site (based on gallons of fuel consumed) - the closure implementation onsite trips to West Special Waste Landfill are less than 1 mile. Assume 10,239 trips to move 219,328 CY of ash and residual soil for the ash basin closure and 79,550 CY of soil cover 10. Avoidance of greenfield disturbance - no greenfield disturbance associated with this closure option
Cost	1. Capital costs ≈ $14,500,000 for compacted soil layer final cover and $15,700,000 for geosynthetic final cover system 2. Long-term operations maintenance and monitoring ≈ $ 2,900,000 3. Avoided costs ≈ $11.8M to $13.0 M for removal
Schedule	1. Initiation time (to begin ash removal) - 5 months 2. Likelihood of meeting regulatory deadlines - likely 3. Design and permitting - 3 to 6 months 4. Construction - 12 months (5 months dewatering, 1 month ash excavation, 4 months final cover installation, 2 month soil grading) 5. Post-closure - 30 years or less if demonstrated site does not present a threat to public health or environment
Regional Factors	1. Plan or potential for beneficial reuse of site - none planned 2. Imported soil needs - for clay component of CSL 3. CCR beneficial reuse - none planned 4. Transportation impact (based on miles driven) - 20 miles one way to soil borrow for clay and 0.5 miles one way for onsite soil and estimated 15,248 trips = 217,023 miles 5. Noise impact due to on-site activity (based on proximity of neighbors) - no human receptors within 0.7 miles and the facility is located in a sparsely populated area 6. Visual impact (based on final height of storage facility, land uses within the viewshed) - no adverse visual impact

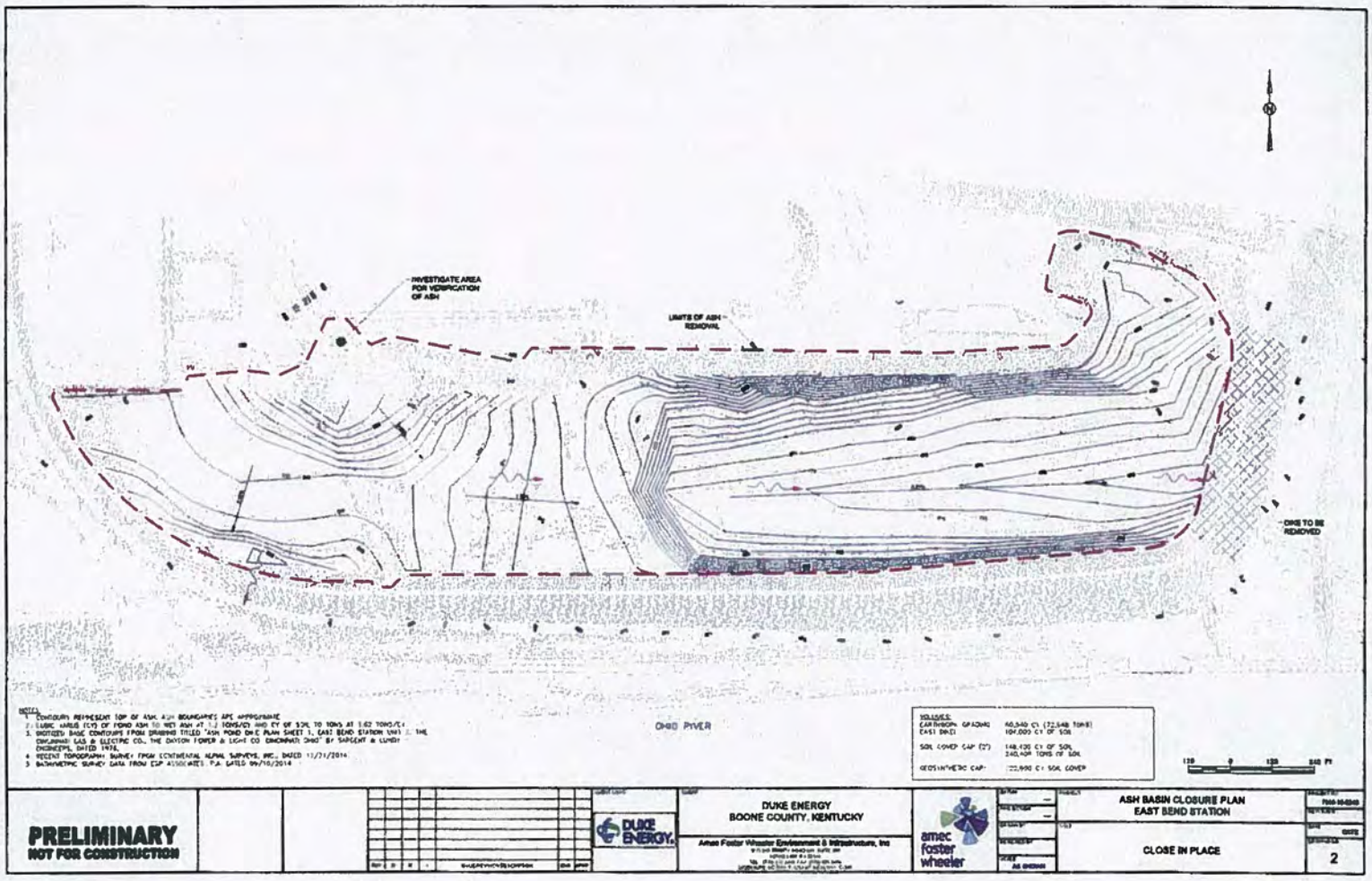
December 07, 2015

Table 6 - Option 4 Overview: Hybrid 2- Reduced Footprint
Ash Basin Closure Options Evaluation
East Bend Station
Duke Energy

Subject	Description
Advantages	1. Lower overall costs than removal and closure in place 2. Shorter time frame than clean closure/removal and close in place 3. Minimizes ash contact and disturbance and long-term monitoring and maintenance 4. Minimizes ash footprint and potential exposure to groundwater
Disadvantages	1. Longer to reduce groundwater impacts and potential for groundwater fluctuations into the ash 2. Proximity to riverbank or shoreline 3. Long-term monitoring and maintenance 4. Cost of final cover system driven by offsite clay or geosynthetics

CLOSURE OPTIONS DRAWINGS


INVESTIGATE AREA FOR VERIFICATION OF ASH
LIMITS OF ASH REMOVAL
DIKE TO BE REMOVED
DIKE TO BE REMOVED
OHIO RIVER
N
PRELIMINARY
NOT FOR CONSTRUCTION
DUKE ENERGY
DUKE ENERGY
BOONE COUNTY, KENTUCKY
amec foster wheeler
ASH BASIN CLOSURE PLAN
EAST BEND STATION
CLEAN CLOSURE REMOVAL
AS SHOWN
1



PRELIMINARY
NOT FOR CONSTRUCTION

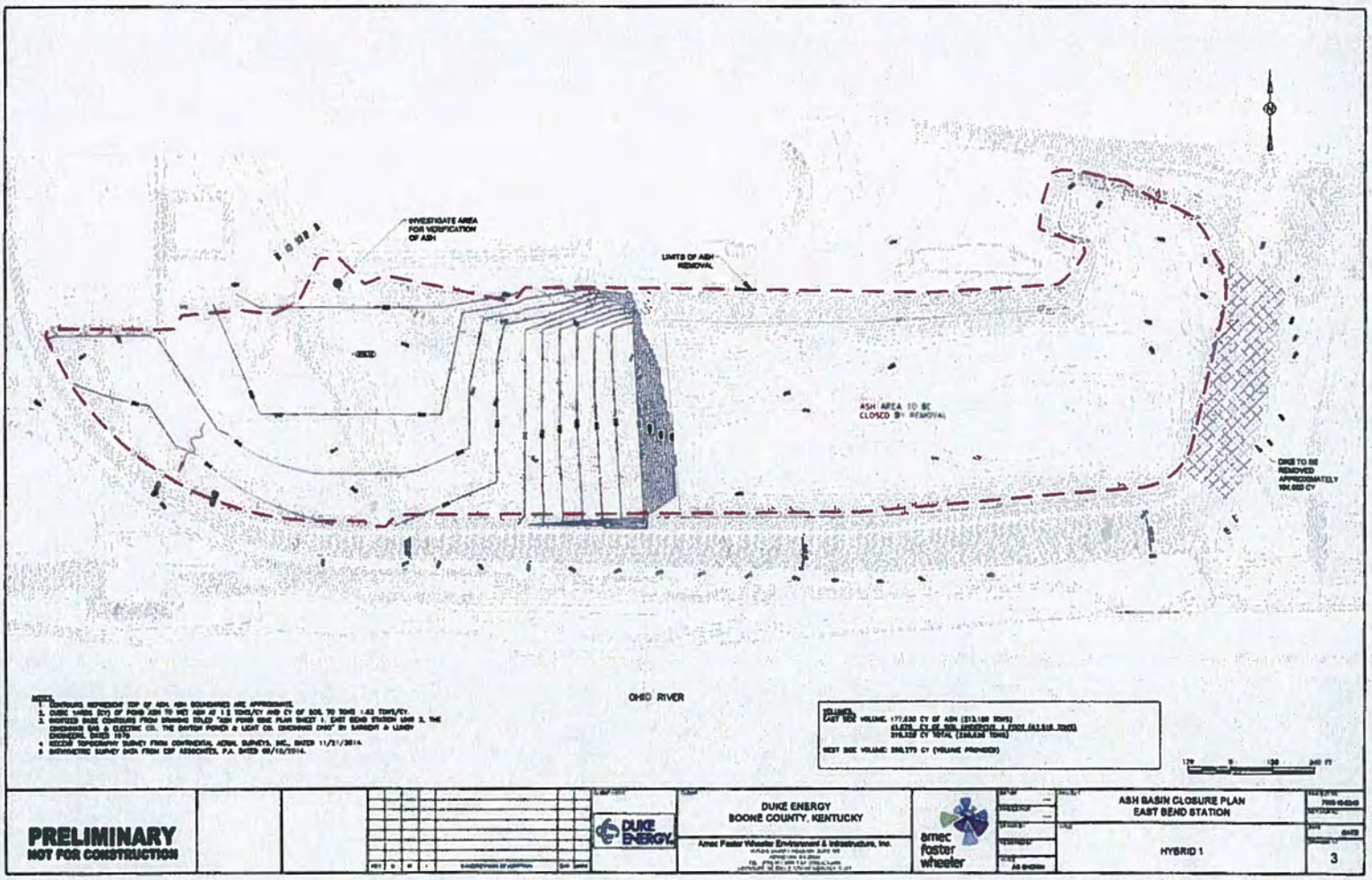
DUKE ENERGY
BOONE COUNTY, KENTUCKY

Amec Foster Wheeler Environment & Infrastructure, Inc

ASH BASIN CLOSURE PLAN
EAST BEND STATION

CLOSE IN PLACE

2



PRELIMINARY
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DUKE ENERGY
BOONE COUNTY, KENTUCKY

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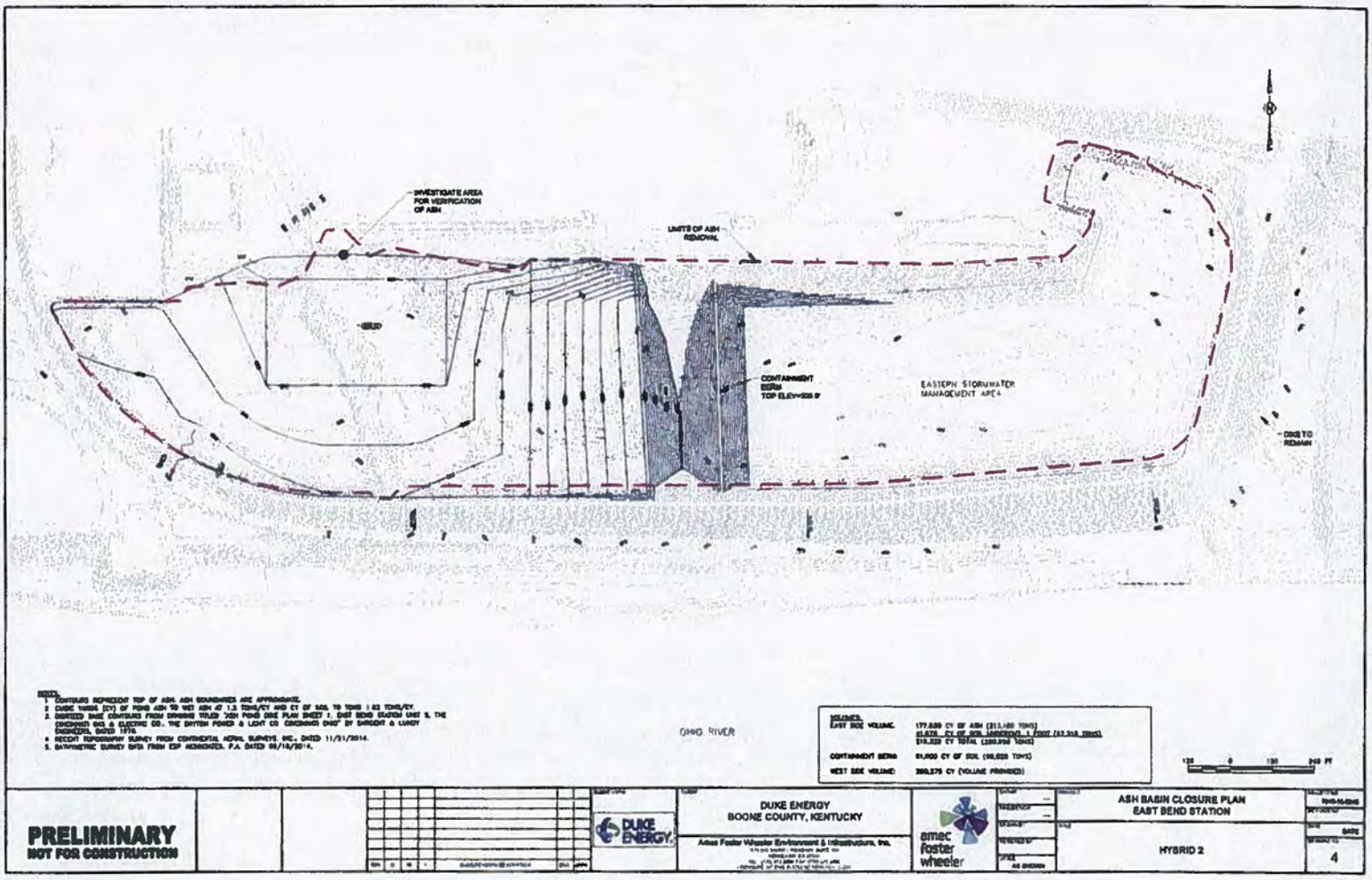
ASH BASIN CLOSURE PLAN
EAST BEND STATION

HYBRID 1

3



NOTES:
1. CONTOURS REPRESENT TOP OF ASH. ASH BOUNDARIES ARE APPROXIMATE.
2. CUBIC YARDS (CY) OF POND ASH TO WET ASH AT 1.3 TONS/CY AND CY OF SOIL TO TONS 1.62 TONS/CY.
3. DIGITIZED BASE CONTOURS FROM DRAWING TITLED "ASH POND DIKE PLAN SHEET 1, EAST BEND STATION UNIT 2, THE CINCINNATI GAS & ELECTRIC CO., THE DAYTON POWER & LIGHT CO. CINCINNATI OHIO" BY SARGENT & LUNDY ENGINEERS, DATED 1974.
4. RECENT TOPOGRAPHY SURVEY FROM CONTINENTAL AERIAL SURVEYS, INC., DATED 11/21/2014.
5. BATHYMETRIC SURVEY DATA FROM ESP ASSOCIATES, P.A. DATED 09/16/2014.

PRELIMINARY
NOT FOR CONSTRUCTION

DUKE ENERGY
BOONE COUNTY, KENTUCKY

Amec Foster Wheeler Environment & Infrastructure, Inc.

ASH BASIN CLOSURE PLAN
EAST BEND STATION

HYBRID 2

4

Scoring for Evaluation of Closure Options
Closure Options Evaluation Worksheet
Ash Basin Closure - Master Programmatic Document
Duke Energy

Site Name: East Bend Station
Date: 12/07/15

1	= Option-Specific User Input
1	= Calculated Value

Threshold Criteria: All closure options must comply with the following threshold criteria based on Duke Energy Guiding Principals for Ash Basin Closure
1. Provide continued geotechnical stability meeting appropriate safety factors under applicable loading conditions
2. Provide flow capacity and erosion resistance during design storm and flooding conditions
3. Effectively mitigate groundwater impacts (in conjunction with GW remediation where present)
4. Comply with applicable state and federal regulations (e.g. North Carolina Coal Ash Management Act)

Option	Description
1	Removal to the onsite West Special Waste Landfill and bring in fill to grade to drain
1A	Removal to the onsite West Special Waste Landfill and use the former ash basin for stormwater management
2	Close in Place using compacted clay from offsite in final cover system
2A	Close in Place with geosynthetics and onsite soil
3	Hybrid 1- Consolidate into smaller footprint to the west and close with compacted clay from offsite
3A	Hybrid 1- Consolidate into smaller footprint to the west and close with geosynthetics and onsite soil
4	Hybrid 2- Consolidate into smaller footprint to the west and close with compacted clay from offsite, use eastside as stormwater management

Environmental Protection and Impacts	Weight:	30%		User Input							Value that Scores 10	Value that Scores 0	Calculated or User Selected Score							Criterion Weight	Contribution to Total Score
Criterion	Scoring System	Required Input	Units	Option 1	Option 1A	Option 2	Option 2A	Option 3	Option 3A	Option 4			Option 1	Option 1A	Option 2	Option 2A	Option 3	Option 3A	Option 4		
Time to achieve compliance with groundwater standards at compliance boundary	Interpolation. Minimum value scores 10.	Compliance time	Years	3	3	6	6	5	5	5	3	6	10	10	0	0	3	3	3	15%	4.5%
Residual groundwater-related risk	Source removed=10 Source above GW=5 Source below GW=0 Conduits remain=1	This Area Not Used For Subjective Scoring											10	10	5	5	5	5	5	20%	6.0%
Proximity to riverbank, shoreline, or floodplain - choose reference feature appropriate for the site	Interpolation. Maximum value scores 10	Distance from CCR Unit limit	Miles or feet	3600	3600	250	250	250	250	250	3600	250	10	10	0	0	0	0	0	10%	3.0%
Proximity to public drinking water intakes	Interpolation. Maximum value scores 10	Downgradient distance to intake	Miles	92	92	90	90	89.5	89.5	89.5	92	89.5	10	10	2	2	0	0	0	5%	1.5%
Proximity to nearest downgradient potable water well	Interpolation. Maximum value scores 10	Downgradient distance to nearest well	Miles	3	3	2.25	2.25	2.5	2.5	2.5	3	2.25	10	10	0	0	3	3	3	5%	1.5%
Proximity to flora, fauna and human receptors	Subjective 0 to 10	This Area Not Used For Subjective Scoring											10	10	10	10	10	10	10	5%	1.5%
Restoration of habitat, streams or wetlands	Interpolation. Maximum value scores 10.	Habitat and wetlands acres or stream length	Acres or Linear Feet	46	0	3	3	23	23	0	46	0	10	0	1	1	5	5	0	10%	3.0%
Air emissions off-site (based on miles driven)	Interpolation. Zero miles scores 10.	Truck miles driven	Miles	0	0	400,680	10,000	200,340	10,000	200,340	0	400680	10	10	0	10	5	10	5	5%	1.5%
Air emissions on-site (based on gallons of fuel consumed) from closure implementation	Interpolation. Zero gallons scores 10.	Gallons of fuel consumed or cy of cut and fill	CY	1,610,423	958,580	201,640	887,140	341,878	434,628	298,878	201640	1610423	0	5	10	9	9	8	9	5%	1.5%
Avoidance of greenfield disturbance	Interpolation. Zero acres scores 10.	Disturbed acres of greenfield	Acres	20	20	0	0	0	0	0	0	20	0	0	10	10	10	10	10	20%	6.0%
Weighted Totals (Contribution to Total Score)													2.3	2.0	1.3	1.4	1.6	1.7	1.4		

Cost	Weight:	35%		User Input							Value that Scores 10	Value that Scores 0	Calculated or User Selected Score							Criterion Weight	Contribution to Total Score
Criterion	Scoring System	Required Input	Units	Option 1	Option 1A	Option 2	Option 2A	Option 3	Option 3A	Option 4			Option 1	Option 1A	Option 2	Option 2A	Option 3	Option 3A	Option 4		
Closure Cost	Interpolation. Min value scores 10. Max value scores 0.	Closure Cost	USD	$27,500,000	$23,500,000	$17,600,000	$18,500,000	$14,200,000	$14,700,000	$15,500,000	$14,200,000	$27,500,000	0.0	3.8	7.4	6.8	10.0	9.6	9.0	80%	28.0%
Operation, Maintenance and Monitoring Cost		OM&M Cost	USD	$0	$0	$4,100,000	$4,100,000	$2,900,000	$2,900,000	$2,900,000	$0	$4,100,000	10.0	10.0	0.0	0.0	2.9	2.9	2.9	20%	7.0%
Weighted Totals (Contribution to Total Score)													0.7	1.8	2.1	1.9	3.0	2.9	2.7		

Scoring for Evaluation of Closure Options
Closure Options Evaluation Worksheet
Ash Basin Closure - Master Programmatic Document
Duke Energy

Site Name: East Bend Station
Date: 12/07/15

1 = Option-Specific User Input
1 = Calculated Value

Schedule	Weight:	15%		User Input							Value that Scores 10	Value that Scores 0	Calculated or User Selected Score							Criterion Weight	Contribution to Total Score
Criterion	Scoring System	Required Input	Units	Option 1	Option 1A	Option 2	Option 2A	Option 3	Option 3A	Option 4			Option 1	Option 1A	Option 2	Option 2A	Option 3	Option 3A	Option 4		
Initiation Time	Interpolation Minimum value scores 10	Time to move first ash	Months	8	8	12	12	12	12	12	8	12	10	10	0	0	0	0	0	30%	4.5%
Construction Duration	Interpolation Minimum value scores 10	Estimated durations	Months	34	24	24	24	24	24	24	24	34	0	10	10	10	10	10	10	70%	10.5%
Weighted Totals (Contribution to Total Score)													0.5	1.5	1.1	1.1	1.1	1.1	1.1		

Regional Factors	Weight:	15%		User Input							Value that Scores 10	Value that Scores 0	Calculated or User Selected Score							Criterion Weight	Contribution to Total Score
Criterion	Scoring System	Required Input	Units	Option 1	Option 1A	Option 2	Option 2A	Option 3	Option 3A	Option 4			Option 1	Option 1A	Option 2	Option 2A	Option 3	Option 3A	Option 4		
Plan or potential for beneficial reuse of site	Subjective	Not Used For Subjective Scoring											10	0	5	5	2	2	0	5%	0.8%
Imported soil needs	Interpolation Min value scores 10 Max value scores 0	Soil Imported	CY	0	0	111,300	0	55,650	0	55,650	0	111300	10	10	0	10	5	10	5	5%	0.8%
Beneficial reuse of CCR	Interpolation. Maximum value scores 10.	Fraction Used	None	0.1	0.1	0	0	0.01	0.01	0.01	0.1	0	10	10	0	0	1	1	1	15%	2.3%
Transportation Impact (based on miles driven)	Interpolation Min value scores 10 Max value scores 0	Miles Driven	Miles	103,557	88,808	405,188	37,046	209,611	30,540	217,023	30,540	405,188	8	8	0	10	5	10	5	65%	9.8%
Noise impact due to on-site activity (based on proximity of neighbors to on-site work areas)	Subjective 0 to 10	Not Used For Subjective Scoring											10	10	0	10	5	10	5	5%	0.8%
View impact (based on final height of storage facility and land uses within viewshed)	Subjective 0 to 10												10	10	5	5	5	5	5	5%	0.7%
Weighted Totals (Contribution to Total Score)													1.3	1.2	0.1	1.2	0.6	1.2	0.6		

Constructability	Weight:	5%		User Input							Value that Scores 10	Value that Scores 0	Calculated or User Selected Score								
Criterion	Scoring System	Required Input	Units	Option 1	Option 1A	Option 2	Option 2A	Option 3	Option 3A	Option 4			Option 1	Option 1A	Option 2	Option 2A	Option 3	Option 3A	Option 4		
Consider stormwater management, geotechnical, and dewatering	Subjective 0 to 10: 10 is the easiest while 0 is the riskiest	Not Used For Subjective Scoring											10	10	3	3	3	3	5	100%	5.0%
Weighted Totals (Contribution to Total Score)													0.5	0.5	0.2	0.2	0.2	0.2	0.3		
Total Score For Each Option (On a Scale of 0 to 10)													5.2	7.0	4.6	5.7	6.4	6.9	6.1		

Item Description	Takeoff Qty	Unit	Labor Hours	Labor Rate	Labor Total	Mat Total	Equip Total	Subs Unit Price	Subs Total	Other Total	Grand Total
1 - East Bend			51,428.00	142.78	7,342,741.79				13,171,499	8,502,561.34	29,016,801.63
2.1 - EPC Summary									13,171,499	820,564.00	13,992,062.50
2.1.02 - Mobilization & Site Preparation									1,812,771	820,564.00	2,633,334.68
Utility and Field Surveying	236	ac						2,500.00	590,000		590,000.00
Reference Tab 6 of the BOE underpinning Includes surveys of pre-existing conditions, perform layout, document payment quantities, obtain final excavation limits, verification of liner limits, vertical control for grading and as-builts. Price based on average from previous work and RS Means Estimating section 01-71-23-1200 and s in line with some of the available pricing from unit pricng from contractors. Quantity 4ea x 59 ac = 236 ac Cost 236ac x $2,500 ac = $590,000 Total $590,000											
Abandon Outlet Piping Structure	1	ls						263,071.00	263,071		263,071.00
Reference Tab 7 of the BOE underpinning Assumption Estimated cost for removing the exsisting stormwater structure/piping in the South East corner of the Ash basin. The current structure is a 40 inchdiameter riser that was sliplined into the original 48 inich diameter riser and the outlet pipe is 36 inch diameter corrugated metal pipe. The cost will be to excavate and remove including off-site disposal of existing stormwater structures/piping that will be in the final designs. Costs Price from AMEC estimate. Total $263,071.00											
Mobilization & Demobilization	1	ls						302,089.02	302,089		302,089.02
Based on 1% of the ash excavation costs in section 2.1.05 based upon industry standard estimating assumptions. Estimate accounts for three mob/demobs due to 18 month gap expected between the east and west basin excavation activities. Cost 2.1.05 = 1% x 10,089,634 X 3ea = $302,089.02											
Readiness Review	4	ea						43,333.33	173,333		173,333.32
Reference Tab 8 of the BOE underpinning Line #1 Assumption Based on bid information from Dan River Landfill project. Assumes a total of four meetings required. Two (2ea) for work related to west side excavation activities and two (2ea) related to the east side excavation activities. Quantity Cost $43,333.33 Total 4 reviews x $43,333.33 $/review = $173,333.32											

Dust Control	18	mo		17,333.30						637,200.00	637,200.00
Reference Tab 9 (pg 4 of 10) Cost and duration based on input from site of the BOE underpinning Duration 18 mo Cost $17,700 x 2 crews = $35,400 Total 18mo x $35,400 = $637,200											
Wattles	30,000	lf								54,600.00	54,600.00
Refence Tab 10 of the BOE underpining Line # 5 (Quantity & Cost) Quantity 30,000 lf Cost $1.82/lf Total 30,000 lf x $1.82 $/lf = $54,600											
Silt Fencing	9,400	lf								9,964.00	9,964.00
Reference Tab 10 of the BOE underpinning Line # 4 (Quantity & Cost) Quantity 9,400 lf Cost $1.06/lf Total 9,400 lf x $1.06 = $9,964											
Develop Contractor Equipment Staging/Laydown Area	6,485	tn						20.19	130,932		130,932.15
Reference Tab 14 of the BOE underpinning Assumption Estimated cost to construct an equiptment staging and laydown area based on Google Earth and imput from site management. Rates are based on recent quote from Stedton Materials @ 18.89/tn and $1.30/ tn to place provided by Utter Cost 18.89/ tn +$1.30/ tn = $20.19/tn Quantity 50' W x 250' L x 2'thick / 27 = 4,630 cy 630 cy x 1.4 factor to convert to tons = 6,485 tons otal 20.19/tn x 6,485 tons = $130,932.15											
E&SC Maintenance	24	mo								118,800.00	118,800.00
Reference Tab 12 of the BOE underpinning Based on Dan River Waste Management P.O. #1107193, page 5, item 1.1.8 uration 4 mo ost 4,950/mo											

Total 24 mo x $4,950 = $118,800											
Access road into the east basin Reference Tab 14 of the BOE underpinning Assumption Estimate assumes that an access road/ramp will have to be constructed for access into the east side of the basin. Rates are based on recent quote from Sterling Materials @ 18.89/tn and $1.30/ tn to place provided by Utter. Estimate assumes the area to be appoximately 25,000 sf with a depth of 4' thick based on Google Earth Quantity 25,000sf x 4 d/27 = 3,704 cy 3,704 cy x 1.4 (factor to convert to tons) = 5,186 tns Cost $18.89/ tn + $1.30 / tn = $20.19 / tn Total $20.19 / tn x 5,186 tn =$104,705.34	5,186	tn						20.19	104,705		104,705.34
Maintenance of Access road and ramp into the east basin Reference Tab 14 of the BOE underpinning Assumption Estimate assumes that the access road/ramp will require maintenance throughout the project. Rates are based on recent quote from Sterling Materials @ 18.89/tn and $1.30/ tn to place provided by Utter. Estimate assumes an additional tonnage added to the constructed ramp will be based on approximately an additional 2' of material. Add for the haul road will be based on road 25' wide x 2,500' long x 3' deep based on Google Earth. Quantity Access Ramp 25,000sf x 2 /27 =1,852cy 1,852cy x 1.4 (factor to convert to tons) =2,593 tns Haul Road 25' wide x 2,500' lg x 3' d / 27 = 6945 cy 6945 cy x 1.4 (factor to convert to tons) = 9,722 tns 2,593 tns + 9,722 tns = 12,315 tns Cost 18.89 tn + $1.30 / tn = $20.19 / tn Total 20.19 / tn x 12,315 tns =$248,639.85	12,315	tn						20.19	248,640		248,639.85
2.1.03 - Site Infrastructure									162,794		162,793.74
Tree Removal Including Root Ball - (North Side of Basin) Reference Tab 16 of the BOE underpinning for quantities and cost - Line # A Assumption Clear and remove trees including root balls. Unit costs based on proposal from Utter Construction contractor at $12,557per acre. Acreage confirmed with Google Earth Quantity 1 ac Cost 12,557	1	ls		85.72				89,293.74	89,294		89,293.74

Total 7 ac x $12,557 = $89,293.74											
Clearing and Grubbing - (North Side of Basin) Reference Tab 3 of the BOE underpinning for quantities Reference Tab 17 of the BOE underpinning Line # 1.1.17 pg 1 of 8 Clear and Grub Unit costs of $5,250 per acre from Utter Construction contractor. Quantity 7 ac - Based on Google Earth Cost $5,250/ac Total 7 ac x $5,250/ac = $36,750	7	ac		85.72				5,250.00	36,750		36,750.00
Topsoil Stripping Reference Tab 3 of the BOE underpinning for quantities Reference Tab 17 of the BOE underpinning Line # 1.1.18 pg 2 of 8 Strip topsoil to a minimum 6" depth and place in stockpile. Quantity 7 ac - Based on Google Earth Cost $5,250/ac Total 7 ac x $5,250/ac = $36,750	7	ac		85.72				5,250.00	36,750		36,750.00
2.1.04 - Water Management & Treatment									1,126,300		1,126,300.08
Dewatering Reference Tab 18 of the BOE undperinning PO 1333655 pg 2 of 8 and duration based on site imput as noted in email Re: Estimate Items. Utter Proposal - CY2015 East Bend Pump Watch Diesel - Approximate Fuel Consumption based on 350 kw generator Assume dewatering to occur for the duration of 6 months. Project duration = 24 months ALL Water treatment cost will be accounted for under the Water Re-Direct project scope of work. Qty Unit Rate Unit HR/Days/MO Total Pumps 3 ea $3,256.50 MO 1 $9,769.50 Piping/valves/fittings etc 1 ls $34,475.90 LS 1 $34,475.90 Maintenance/Operation 1 ls $42,326.68 LS 1 $42,326.68 Forklift 1 ea $1,524.00 MO 1 $1,524.00 Generator 1 ea $9,750.00 MO 1 $9,750.00 Generator 1 ea $3,125.00 MO 1 $3,125.00 Fuel per day 1,204.80 gal $2.40 gal 30 $86,745.60 Monthly Cost $187,716.68 Quantity 6 months Cost 187,716.68 x 6 mo = $1,126,300.08	6	mo						187,716.68	1,126,300		1,126,300.08
2.1.05 - Ash Excavation & Processing									10,069,634		10,069,634.00
West Side Basin Ash - Excavate ash, load into trucks, haul and place	200,000	tn						6.04	1,208,000		1,208,000.00

Reference Tab 3 of the BOE for Quantities Reference Tab 13 of the BOE for Rates Assumption Estimated cost to excavate, load, transport and place ash in the onsite landfill. Unit rate cost based on Utter T&M contract 2347547 and Master Agreement 10906. Estimate added 25% to account for additional oversight and loss of productivity for added hours beyond 40 hours. Quantity 200,000 tn Rate $4.83 x 1.25% = $6.04/tn Total 200,000 tn x $6.04/tn = $1,208,000											
West Side Basin Ash - Excavate ash, load into trucks, haul and place	400,000	tn						9	3,600,000		3,600,000.00
Reference Tab 3 of the BOE for Quantities Reference Tab 19 of the BOE for Rates Assumption Estimated cost to excavate, load, transport and place ash in the onsite landfill. Unit rate cost based on CCR Cost Per Ton worksheet. Quantity 400,000 tn Rate $9/tn Total 400,000 tn x $9/tn = $3,600,000											
West Side Generation Ash - Excavate ash, load into trucks, haul and place	65,471	tn						9	589,239		589,239.00
Reference Tab 3 of the BOE for Quantities Reference Tab 19 of the BOE for Rates Assumption Generation ash tonnage is based on the following: The tonnage for the years 2014 and 2015 is based on plant actual production of bottom ash. For the remaining years 2016 and 2017 the estimated tonnage is based on the 2015 tonnage which equals an average rate of 2,740.67 tons per month. Estimate assumes that plant will stop placing generation ash into the basin at the end of March 2018. Unit rate cost based on CCR Cost Per Ton worksheet. . 2014 @ 24,056 tons . 2015 @ 32,888 tons . 2016 @ 32,888 tons . 2017@ 32,888 tons . 2018 @ 8,222 tons (Based on January thru March) Total Tons = 130,942 tons Total tonnage will be split between the east and west side. 130,942 tn / 2 = 65,471 tons each side. Quantity 65,471 tons Rate $9/tn Total											

65,471 tons x $9/tn = $589,239											
East Side Basin Ash - Excavate ash, load into trucks, haul and place	453,684	tn						9	4,083,156		4,083,156.00
Reference Tab 3 of the BOE for Quantities Reference Tab 19 of the BOE for Rates Assumption Estimated cost to excavate, load, transport and place ash in the onsite landfill. Unit rate cost based on CCR Cost Per Ton worksheet. Quantity 453,684 tn Rate $9/tn Total 453,684 tn x $9/tn = $4,083,156											
East Side Generation Ash - Excavate ash, load into trucks, haul and place	65,471	tn						9	589,239		589,239.00
Reference Tab 3 of the BOE for Quantities Reference Tab 19 of the BOE for Rates Assumption Generation ash tonnage is based on the following: The tonnage for the years 2014 and 2015 is based on plant actual production of bottom ash. For the remaining years 2016 and 2017 the estimated tonnage is based on the 2015 tonnage which equals an average rate of 2,740.67 tons per month. Estimate assumes that plant will stop placing generation ash into the basin at the end of March 2018. Unit rate cost based on CCR Cost Per Ton worksheet. - 2014 @ 24,056 tons - 2015 @ 32,888 tons - 2016 @ 32,888 tons - 2017@ 32,888 tons - 2018 @ 8,222 tons (Based on January thru March) Total Tons = 130,942 tons Total tonnage will be split between the east and west side. 130,942 tn / 2 = 65,471 tons each side Quantity 65,471 tons Rate $9/tn Total 65,471 tons x $9/tn = $589,239											
3.1 - Duke Energy Summary			51,428.00	142.78	7,342,741.79					1,914,784.34	9,257,526.13
3.1.02 - Engineering			26,274.00	162.71	4,275,076.01						4,275,076.01
Total Engineering	26,274	hr	26,274.00	162.71	4,275,076.01						4,275,076.01
Reference Tab 4 of the BOE underpinning Project Management - 12,508 hrs = $2,133,554 Strategic Engineering - 296 hrs = $321,143 Basin Closure - 13,470 hrs = $1,820,379 Total = $4,275,076 Based on AMEC FW vendor quote"											

3.1.04 - Owner Indirects										494,634.47	494,634.47
Construction Trailer / underpinning / maintainance / furniture lease	24	mo								120,000.00	120,000.00
Rent on two double wides ent on furniture service for holding tanks naintenance and cleaning for trailers Quantity 24 mo Cost $5,000/mo Total 24 mo x $5,000 = $120,000											
Construction Utilities	24	mo								60,000.00	60,000.00
Costs based on estimator's construciton experience Duration 24 mo Cost $2,500 /mo Total 24 mo x $2,500 = $60,000											
Office Supplies	24	mo								24,000.00	24,000.00
Costs based on estimator's construction experience Duration 24 mo Cost $1,000 / mo Total 24 mo x $1,000 = $24,000											
Office Equipment Rental	24	mo								63,600.00	63,600.00
Costs based on estimator's construction experience Duration 24 mo Cost $2,650 / mo otal 4 mo x $2,650 = $63,600											
Rentals	24	mo								92,400.00	92,400.00
Assumed to be three trucks and one ATV. Pricing includes FO&G for vehicles. ruck rental estimates at $800 ea./month for a total of $2,400/month ATV Rental estimated at $600 ea./month nsurance estimated at $75/month for trucks and ATV for a total of $300/month uel estimated at $100/month for each truck and $50/month for each ATV for a total of $350/month laintenance estimated at $50/month for each truck and ATV for a total of $200/month otal monthly cost for all items above is $3,850/ month.											
Consumables -	1	ls								134,634.47	134,634.47
Consumables estimated as 3% of Duke labor costs											

$4,487,815.65 x 3% = $134,634.47											
3.1.06 - Duke Labor			25,154.00	121.96	3,067,665.78					1,420,149.87	4,487,815.65
Project Mangement and Development	4,550	hr	4,550.00	125.41	570,615.50						570,615.50
Reference Tab 5 of the BOE underpinning Doc #1											
Hours developed from the CCP Basin Closure Staffing Plan worksheet											
Engineering Services	2,984	hr	2,984.00	119.12	355,454.08						355,454.08
Reference Tab 5 of the BOE underpinning Doc #1											
Hours developed from the CCP Basin Closure Staffing Plan worksheet											
Project Controls	660	hr	660	103.23	68,131.80						68,131.80
Reference Tab 5 of the BOE underpinning Doc #1											
Hours developed from the CCP Basin Closure Staffing Plan worksheet											
Construction Management	2,970	hr	2,970.00	87.5	259,875.00						259,875.00
Reference Tab 5 of the BOE underpinning Doc #1											
Hours developed from the CCP Basin Closure Staffing Plan worksheet											
Supply Chain	600	hr	600	87.83	52,698.00						52,698.00
Reference Tab 5 of the BOE underpinning Doc #1											
Hours developed from the CCP Basin Closure Staffing Plan worksheet											
Support Services	660	hr	660	88.42	58,357.20						58,357.20
Reference Tab 5 of the BOE underpinning Doc #1											
Hours developed from the CCP Basin Closure Staffing Plan worksheet											
Regulated Generation (Craft)	660	hr	660	55.87	36,874.20						36,874.20
Reference Tab 5 of the BOE underpinning Doc #1											
Hours developed from the CCP Basin Closure Staffing Plan worksheet											
Staff Augmentation Technical	12,070	hr	12,070.00	138	1,665,660.00						1,665,660.00
Reference Tab 5 of the BOE underpinning Doc #1											
Hours developed from the CCP Basin Closure Staffing Plan worksheet											
Expenses and Duke PD only	1	ls								460,149.87	460,149.87
Reference Tab 5 of the BOE underpinning Doc #3-5											
Hours developed from the CCP Basin Closure Staffing Plan worksheet											
CCP Allocation Estimate	1	ls								960,000.00	960,000.00
Reference Tab 5 of the BOE underpinning Doc #3-5											
Hours developed from the CCP Basin Closure Staffing Plan worksheet											
4.1 - Net Contingency											
Estimate Uncertainty		ls									
4.2 - Risk EMV										3,763,833.00	3,763,833.00
Risk EMV	1	ls								3,763,833.00	3,763,833.00
5.0 - Escalation										2,003,380.00	2,003,380.00
Escalation	1	ls								2,003,380.00	2,003,380.00
Grand Total			51,428.00	142.78	7,342,741.79				13,171,499	8,502,561.34	29,016,801.63

EAST BEND (EB020298)- SW/PW REROUTE COST ESTIMATE

Construction	
Labor	8,532,896
Material	6,307,275
Equipment	841,318
Mgmt & Indirects	1,510,000
	17,191,489
Engineering	1,650,378
Engineered Equipment / Subcontract	2,570,368
Start-Up	385,600
Warranty	21,183
Escalation @2.5%	456,296
Duke Internal Cost (PowerPlan)	1,846,039
	24,121,353
Contingency @ 15%	3,618,203
	27,739,556
AFUDC (PowerPlan)	358,119
TOTAL	**28,097,675**

EAST BEND (EB020290) - LINED RETENTION BASIN ESTIMATE

Construction	
Labor	4,757,748
Material	6,609,057
Const. Equipment	4,356,187
Mgmt & Indirects	1,510,000
	17,232,992
Engineering	1,650,378
Engineered Equipment / Subcontract	8,245,560
Start-Up	96,400
Warranty	27,817
Escalation @2.5%	599,214
Duke Internal Cost (PowerPlan)	2,534,524
	30,386,885
Contingency @ 15%	4,558,033
	34,944,918
AFUDC (PowerPlan)	**1,126,725**
TOTAL	**36,071,643**

COMMONWEALTH OF KENTUCKY
BEFORE THE
KENTUCKY PUBLIC SERVICE COMMISSION

In The Matter of:

The Application of Duke Energy Kentucky, Inc., for a Certificate of Public Convenience and Necessity for Water Re-directs and Basin Closure for East Bend Generating Station	))))	Case No. 2016-00398

DIRECT TESTIMONY OF

JOSEPH G. POTTS

ON BEHALF OF

DUKE ENERGY KENTUCKY, INC.

December 2, 2016

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I. INTRODUCTION

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Joseph G. Potts and my business address is 139 East Fourth Street, Cincinnati, Ohio.

Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?

A. I am employed by Duke Energy Business Services, LLC, (DEBS) as Principal Engineer, Central Services. DEBS provides various administrative and other services to Duke Energy Kentucky, Inc., (Duke Energy Kentucky or the Company) and other affiliated companies of Duke Energy Corporation (Duke Energy Corp.).

Q. PLEASE BRIEFLY DESCRIBE YOUR EDUCATIONAL AND PROFESSIONAL BACKGROUNDS.

A. I have a Bachelors of Science in Mechanical Engineering from Michigan Technological University. I also have a Masters in Mechanical Engineering from Rensselaer Polytechnic Institute. I am a Licensed Professional Engineer in the Commonwealth of Kentucky as well as a Licensed Waste Water Treatment Operator.

I began my professional career with Dow Corning Corporation in 1980 as an Engineer and rising to the levels of Supervisor and Manager. I joined Cinergy Corporation (n/k/a Duke Energy) as a Process Engineer in 2001. Since joining the company, I have been with Duke Energy Corp. and its affiliated companies in various engineering roles to present.

Q. PLEASE SUMMARIZE YOUR DUTIES AS PRINCIPAL ENGINEER.

A. I am the Process Engineer for the East Bend Water Re-Direction and Basin Closure project and also serve as the program process engineer for the Water Re-Direction and Basin Closure programs across the Duke Energy Corp. generation fleet in the Midwest (Indiana & Kentucky coal-fired generating stations).

Q. HAVE YOU PREVIOUSLY TESTIFIED BEFORE THE KENTUCKY PUBLIC SERVICE COMMISSION?

A. No.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

A. The purpose of my testimony is to provide details on the construction, and impact to current operations of the new process water systems and water re-direction as well as the basin closure work that is to be constructed at Duke Energy's East Bend Unit 2 Generating Station (East Bend).

II. DISCUSSION

Q. PLEASE SUMMARIZE THE COMPANY'S APPLICATION IN THIS PROCEEDING.

A. Duke Energy Kentucky is seeking approval of a certificate of convenience and public necessity (CPCN) to construct a new process water system and water re-direction and basin closure and repurposing to comply with new federal environmental compliance requirements enacted by the United States Environmental Protection Agency (U.S. EPA), namely the Steam Electric Effluent Limitation Guidelines (ELG Final Rule) and Coal Combustion Residual (CCR Final Rule).

Q. PLEASE BRIEFLY EXPLAIN WHY A NEW PROCESS WATER SYSTEM WITH WATER RE-DIRECTION AND BASIN CLOSURE IS NEEDED.

A. There are two primary forms of ash derived from the coal combustion process at East Bend. Approximately 80 percent of the ash produced at East Bend is fly ash which is collected from the boiler exhaust using Electrostatic Precipitators (ESP). The dry fly ash material is conveyed to holding silos and then mixed with the spent scrubber slurry and quick lime at the waste stabilization plant to make a stable material called Poz-O-Tec. The mixture sets up much like concrete and is placed in the onsite station Landfills. The remaining 20 percent of the coal ash is bottom ash and is currently wet sluiced and stored in the onsite ash pond (Pond).

It is my understanding that based upon the recently enacted ELG Final Rule and CCR Final Rule; Duke Energy Kentucky must take action to change its handling, storage, treatment and disposal of bottom ash in order to continue operation at East Bend. These changes require, among other things, taking action to ensure existing impoundments meet new stability and construction thresholds or are closed in accordance with such new requirements.

Q. PLEASE DESCRIBE HOW THE NEW PROCESS WATER SYSTEM, WATER RE-DIRECTION AND BASIN CLOSURE WILL BE CONSTRUCTED.

A. There are three interrelated projects that will occur at East Bend to comply with the ELG and CCR Final Rules. They are as follows:

1) Ash Pond Closure – consisting of dewatering, excavation and disposal of the existing bottom ash in the existing Pond. This work will occur in two

phases with the first between approximately April 2017 through December 2018; and the latter commencing in December 2018 through April 2020.

2) Retention Basin Construction and Water Re-Direction – consisting of re-purposing of the existing Ash Pond following ash removal, and converting it into an East 26 acre and West 14 acre lined industrial impoundment (Retention Basin). This work will also occur in two phases, timed in sequence with the Ash Pond Closure.

3) Dry Bottom Ash Conversion– requiring installation of an under boiler bottom ash conveyor to replace the existing bottom ash sluicing system. This work is scheduled to commence in March 2017 and be completed by May 2018.

The subject of this CPCN is the Retention Basin and Water Re-Direction Projects, whose scope includes:

- basin site preparation;
- cut, fill, and re-grading of the existing dike around the Pond;
- install an impervious basin liner;
- protective gravel cover over the liner;
- excavation and installation of a 2 acre lined holding basin for collection and treatment of station wash waters (Boiler Wash, Air Heater Wash, Precipitator Wash);
- installation of polymer and caustic treatment equipment; and

- installation of a Flue Gas Desulfurization (FGD) maintenance tank and pumps to collect and hold FGD Scrubber slurry and FGD water during FGD outage maintenance.

The project construction will also involve installation of one permanent and four temporary sumps with pumps to facilitate the construction and re-routing of process and storm water for the station as well as fabrication and installation of interconnecting piping, re-routing of storm water, electrical switch gear, instrumentation, and process control systems.

Q. WILL ANY ADDITIONAL RELATED WORK OCCUR AS PART OF THE CONSTRUCTION YOU DESCRIBED?

A. In addition to what I described above, I would note that the Company has another CPCN pending before the Commission regarding the Dry Bottom Ash conversion in Case No. 2016-00268. In addition, the Company is currently constructing the first cell of its West Landfill as was approved by the Commission in Case No. 2015-00089.

Q. WHEN WILL THE WATER RE-DIRECTS AND BASIN CLOSURE CONSTRUCTION ACTUALLY TAKE PLACE?

A. The construction work will occur over 3 years; commencing in approximately April 2017 through April 2020 and will be separated into 2 major phases involving the west basin section and east basin section, respectively.

Q. PLEASE EXPLAIN WHY THE WORK WILL BE PERFORMED IN TWO PHASES.

A. The multiple phase approach is necessary to continue East Bend's commercial operation during the construction timeline. While ash removal and construction is commencing on the west basin section the station will be able to remain in operation because East Bend process and storm water will be directed to use the east twenty-six acres of the existing Ash Pond. After the west retention basin construction is completed, process and storm water flows will be re-directed to the fourteen acre west retention basin so that construction work can commence on the east retention basin. This process will allow the construction work to be accomplished with the unit on line with the necessary tie-ins for piping and electrical feeds to occur during planned maintenance outages.

Q. PLEASE FURTHER DESCRIBE THE CLOSURE PROCESS FOR THE ASH POND SECTIONS.

A. The closure process of the east section of the retention process is scheduled to begin in December 2018 and be completed by April 2020. At this time all influent water flows will be temporarily re-directed from the east section to the new west section. The east section will be dewatered; ash removed, and then relined the same as the west section. When construction is complete the east section will be put back in operation as the east retention basin to receive storm water runoff water and treated station water from the west retention basin.

The holding basin will be available for operation when the Dry Bottom ash process is completed in May 2018. Outage wash waters from boiler wash, air heater wash and ESP wash will be directed to the holding basin for chemical treatment with caustic and polymer to raise the pH and settle sediments. After

neutralization, the treated surface water will be decanted in a controlled manner and slowly released to the West Retention basin.

The FGD maintenance tank will be available for operation after May 2018. At that time it will be used to collect FGD maintenance waters and scrubber slurry from the absorbers and associated scrubbing equipment in preparation for maintenance and outage work.

Q. WHAT IS THE ESTIMATED INCREMENTAL ONGOING COST OF OPERATION FOR THESE NEW PROCESSES ONCE COMPLETED?

A. The estimated incremental ongoing cost of operation once the project is completed is approximately $187,000 per year. These costs are summarized in the table below.

Retention Basin	Chemical Cost	$127,000/yr	Polymer, Caustic, CO2
Holding Basin	Chemical Cost	$22,500/yr	Polymer, Caustic
Holding Basin	Cleaning	$37,500/yr	Labor, Equipment
Total		$187,000/yr	

Q. PLEASE BRIEFLY EXPLAIN WHY THE COMPANY HAS REQUESTED AN EXPEDITED REVIEW AND NEEDS TO BEGIN CONSTRUCTION AS SOON AS POSSIBLE.

A. The need to start construction soon is driven by lead times for procurement and fabrication of process equipment and procurement of electrical switchgear. Construction of the new (repurposed) thirty-five acre basin will encompass the entire area surrounding the existing Pond and will include; dewatering, ash

removal, grading and lining. This work is seasonal and needs to be done during dry weather with temperatures above freezing. The work is planned to complete in advance of any deadlines and allow for submittal of water test data 180 days ahead of Kentucky Pollutant Discharge Elimination System (KPDES) permit expiration.

The driver for the construction itself is the need to bring East Bend into timely compliance with the ELG and CCR Final Rules. The US EPA implementation timeframe is as soon as possible within the following time window November 1, 2018 through December 31, 2023. The purpose of the window is to allow permitees and state regulators time to comply with the new federal rule during permit renewals. The current East Bend KPDES permit expires October 31, 2019. Duke Energy Kentucky will be in compliance with the ELG Final Rule prior to Kentucky permit renewal. The ELG Final Rule requires East Bend to stop sluicing bottom ash to the existing Ash Pond and convert to the Dry Bottom Ash conveying system. East Bend will be in compliance with this section of the ELG Final Rule when the Dry Bottom Ash system is placed in operation, which is planned for May 2018. Additionally, Dry Fly Ash collection and FGD blowdown treatment are also required under the ELG Final Rule. East Bend station is already in compliance with these two streams using the Poz-O-Tec fixation process. The fixation and stabilization represent a zero discharge FGD process.

Duke Energy Kentucky has also determined that compliance with the CCR and ELG Final Rules at East Bend station will require removal of the ash stored in

the existing ash basin for final disposal in the permitted onsite Landfills. Those rules require Duke Energy Kentucky to stop the sluicing of CCR's (bottom ash) and stop all water flows to the existing Ash Pond no later than April 17, 2019. Completing the Dry Bottom Ash project by May 2018 and placing the West Section of the re-purposed lined retention basin into service by December 2018 will allow East Bend to meet this compliance deadline.

For these reasons, Duke Energy Kentucky needs to commence construction as soon as practical. The Company has worked diligently to prepare this filing. The engineering drawings, analysis and permitting applications and confirmation regarding whether or not certain permits were necessary took time to prepare and receive.

III. FILING REQUIREMENTS SPONSORED BY WITNESS

Q. PLEASE DESCRIBE THE FILING REQUIREMENTS YOU SPONSOR.

A. I sponsor Exhibits 7 and 8, which include the Project Definition Report, Duke Energy Water Redirection Program (Report) and the Closure Plan respectively. The Report includes, among other things a map of the East Bend station that depicts the location, plans, drawing and schematics of the new process water systems, and construction of (repurposing) for the new retention basin. I also sponsor the sections of the Report that include the design plans including the system flow diagrams and general arrangements drawings detailing the scope of the construction. Similarly, Exhibit 8, contains the pond closure maps, plans, schematics, etc., that are necessary and enable the pond repurposing detained in the Report.

IV. CONCLUSION

Q. WERE EXHIBITS 7 AND 8 TO THE COMPANY'S APPLICATION AND ATTACHMENT PREPARED BY YOU OR AT YOUR DIRECTION?

A. Yes.

Q. DOES THIS CONCLUDE YOUR PRE-FILED DIRECT TESTIMONY?

A. Yes.

VERIFICATION

STATE OF OHIO)
) **SS:**
COUNTY OF HAMILTON)

The undersigned, Joseph G. Potts, Principal Engineer, being duly sworn, deposes and says that he has personal knowledge of the matters set forth in the foregoing testimony and they are true and correct to the best of his knowledge, information, and belief.

Joseph G. Potts, Affiant

Subscribed and sworn to before me by Joseph G. Potts on this 2ND day of December, 2016.

NOTARY PUBLIC

My Commission Expires: 1/5/2019

ADELE M. FRISCH
Notary Public, State of Ohio
My Commission Expires 01-05-2019

COMMONWEALTH OF KENTUCKY
BEFORE THE
KENTUCKY PUBLIC SERVICE COMMISSION

In The Matter of:

The Application of Duke Energy Kentucky, Inc., for a Certificate of Public Convenience and Necessity for Water Re-directs and Basin Closure for East Bend Generating Station	))))	Case No. 2016-00398

DIRECT TESTIMONY OF

TAMMY JETT

ON BEHALF OF

DUKE ENERGY KENTUCKY, INC.

December 2, 2016

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I. INTRODUCTION AND PURPOSE

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Tammy Jett. My business address is 139 East Fourth Street, Cincinnati, Ohio 45202.

Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?

A. I am employed by Duke Energy Business Services LLC. (Duke Energy Business Services) as a Principal Environmental Specialist in the CCP (Coal Combustion Products) Environmental Programs Department. Duke Energy Business Services is a service company subsidiary of Duke Energy Corporation (Duke Energy), which provides services to Duke Energy and its subsidiaries, including Duke Energy Kentucky, Inc. (Duke Energy Kentucky or the Company).

Q. PLEASE BRIEFLY DESCRIBE YOUR EDUCATIONAL AND PROFESSIONAL BACKGROUNDS.

A. I received a Master's Degree in Environmental Science from Miami University in 1989. I have also earned a Bachelor's Degree in Urban Ecology and an Associate's Degree in Psychology from Thomas More College in 1987. I began my career with The Cincinnati Gas & Electric Company in 1989 as an Intern as part of my graduate degree curriculum. I was hired as a Junior Licensing Specialist in 1989 after my internship was completed. I have held a number of environmental compliance related positions over the last twenty-six years in the environmental organizations, within Duke Energy and predecessor companies. These positions involved increasing responsibility and include Regulatory Compliance Coordinator, Environmental Scientist III and Senior and Lead Environmental Specialist. In 2015, I was promoted to Principal Environmental

Specialist, which is the highest technical (non-managerial) position currently available in the Duke Energy Environmental organization.

Q. PLEASE SUMMARIZE YOUR DUTIES AS PRINCIPAL ENVIRONMENTAL SPECIALIST.

A. As Principal Environmental Specialist, I am the subject matter expert for environmental coal ash compliance for the Duke Energy Kentucky and Ohio generating stations. I have responsibility for permitting and specializing in all facets of the coal ash program. I obtain permits for the Company's coal ash facilities, such as coal ash landfills, and then assist with monitoring, record keeping, reporting and other facets of our compliance program. I am also responsible for reviewing new Federal and State regulations which include the regulation of coal ash, such as the United States Environmental Protection Agency's (U.S. EPA) Coal Combustion Residual rule (CCR Final Rule) and the Kentucky Special Waste rules, among others, and determining their impact on our generating coal ash facilities. I am involved in strategic planning across all the Duke Energy service areas, including Ohio, Kentucky, Indiana, North Carolina, South Carolina and Florida, for federal coal ash compliance issues to provide a consistent strategy for implementing the CCR Final rule.

Q. HAVE YOU PREVIOUSLY TESTIFIED BEFORE THE KENTUCKY PUBLIC SERVICE COMMISSION?

A. Yes. I provided testimony in Case No. 2015-00089 supporting Duke Energy Kentucky's request for a Certificate of Public Convenience and Necessity for construction (CPCN) of its West Landfill at the East Bend Generating Station (East Bend). Most recently, I provided testimony in Case No. 2016-00268, Duke

Energy Kentucky's application for a CPCN for constructing a dry bottom ash handling system at East Bend.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

A. The purpose of my testimony is to discuss the environmental requirements applicable to the Company's operation of East Bend that specifically relate to the construction of a new process water system and closure for repurposing of the East Bend ash pond (Pond) necessary under environmental regulations. In doing so, I provide an overview of the environmental controls that exist today at East Bend and the regulations that require such controls. I also discuss how East Bend complies with the current environmental regulations and how the construction is necessary for East Bend's continued compliance with these regulations.

II. ENVIRONMENTAL REGULATIONS IMPACTING DUKE ENERGY KENTUCKY'S EAST BEND GENERATING STATION

Q. WHAT ARE THE MOST SIGNIFICANT ENVIRONMENTAL REGULATIONS CURRENTLY IMPACTING DUKE ENERGY KENTUCKY'S EAST BEND STATION?

A. There are several programs promulgated by the U.S. EPA under the Clean Air Act (CAA) that impact all of the Company's generating stations, and particularly East Bend. These regulations are the primary drivers of Duke Energy Kentucky's compliance strategies for its plants. They are as follows: the Mercury Air Toxics Standard (MATS Rule) and the Cross State Air Pollution Rule (CSAPR) including the U.S. EPA's December 2015 proposed update.

The CCR Final Rule and Steam Electric Effluent Limitation Guidelines (ELG Final Rule), in addition to other emerging regulations under the Clean Water Act (CWA), and Green House Gas (GHG) emissions are likely to impact the Company's generating stations. The regulations that most directly impact the Company's ash handling strategies as it pertains to the landfill need and operation are the CAA and the CCR and ELG Final Rules.

Q. PLEASE BRIEFLY DESCRIBE THE CAA.

A. The CAA is the comprehensive federal law that regulates air emissions from stationary and mobile sources. Among other things, this law authorizes EPA to establish a number of programs to regulate air emissions so as to protect public health and public welfare. Many of these programs overlap and at times regulate the same pollutants.

Q. CAN YOU PROVIDE A BRIEF SUMMARY OF THE MATS RULE?

A. The MATS Rule regulates hazardous air pollutant emissions from new and existing coal- and oil-fired steam electric generating units (EGUs) that are greater than 25 MWs in capacity. It is a command and control program that imposes unit-by-unit restrictions on emissions of mercury, acid gases such as hydrogen chloride, and certain non-mercury metals, including arsenic, chromium, nickel and selenium. The MATS Rule allows EGUs, as one option, to demonstrate compliance by measuring mercury, hydrogen chloride, and non-mercury metal emissions directly. It also allows the EGUs the option of demonstrating compliance by measuring surrogates for acid gases and for non-mercury metals.

Q. DOES EAST BEND CURRENTLY COMPLY WITH THE MATS RULE?

A. Yes. East Bend began complying with MATS Rule in April 2015.

Q. PLEASE PROVIDE A SHORT DESCRIPTION OF THE HISTORY AND STATUS OF CAIR AND CSAPR.

A. On August 8, 2011, the EPA published the final CSAPR rule to replace the existing CAIR. CSAPR established new state-level annual SO_2 and NO_x budgets and ozone-season NO_x budgets. The rule was initially scheduled to take effect January 1, 2012; however, on December 30, 2011, the D.C. Circuit stayed the rule. On August 21, 2012, the D.C. Circuit then vacated CSAPR and directed that EPA continue administering CAIR pending completion of a new rulemaking to replace CSAPR. However, on April 26, 2014, the United States Supreme Court reversed the D.C. Circuit's decision and remanded the case back to the D.C. Circuit for further proceedings. Because of the litigation, the CSAPR deadlines were tolled by three years and CSPAR ultimately went into effect on January 1, 2015. On December 3, 2015, the U.S. EPA proposed to further update and reduce ozone season NO_x allowance budget beginning in 2017. The U.S. EPA finalized this change with the Cross-State Air Pollution Rule Update for the 2008 Ozone NAAQs published in the Federal Register on October 26, 2016. This change reduced the number of NO_x allowances for East Bend.

Q. HOW HAS CSAPR'S IMPLEMENTATION IMPACTED EAST BEND?

A. Because it has well performing wet FGD and SCR, East Bend has, to date, been able to comply with CSAPR without the installation of additional controls. That will likely be the case with the U.S. EPA's update to the ozone season budgets beginning in May 2017. Because of the restrictions on trading and the more limited allowance budgets (particularly ozone season NO_x), the allowance prices under CSAPR could be expected to increase. While the East Bend SCR design is

expected to be robust enough to comply with the CSAPR rule update, if it is economically prudent, East Bend could also opt to buy allowances on the market.

Q. PLEASE DESCRIBE THE MAJOR EFFORTS TO REGULATE GREENHOUSE GASES THAT RELATE TO ELECTRIC GENERATING UNITS.

A. In 2007, the Supreme Court ruled in *Massachusetts v. EPA*[1] that greenhouse gases are a pollutant subject to regulation under the CAA. Subsequently, the U.S. EPA undertook a number of rulemakings targeting greenhouse gas emissions from EGUs. The first was the 2010 Tailoring Rule, which required major stationary sources of greenhouse gases to obtain preconstruction and operating permits. The U.S. Supreme Court eventually rule that the U.S. EPA could only require a source to obtain a preconstruction permit for greenhouse gases if it also had to obtain a preconstruction permit for conventional pollutants such as sulfur dioxide. On April 13, 2012, the U.S. EPA proposed a rule to establish New Source Performance Standards for CO_2 emissions from new natural gas and coal-fired EGUs. Then on January 8, 2014, the U.S. EPA withdrew that proposal and proposed emission guidelines for states to follow in developing plans to address CO_2 emissions from existing fossil fuel-fired EGUs. On the same day, the U.S. EPA proposed standards of performance to limit CO_2 emissions from modified and reconstructed EGUs. The WPA finalized both rules on October 23, 2015, the former becoming known as the Clean Power Plan (CPP).

Q. PLEASE DISCUSS THE EPA'S CPP PLAN CO_2 IMPLICATIONS FOR EXISTING EGUS WITH RESPECT TO EAST BEND.

[1] *Massachusetts v. Environmental Protection Agency*, 549 U.S. 497 (2007).

A. The CPP established an emission performance rate of 1,305 pounds of CO_2 per net megawatt-hour of electricity produced for all existing coal-fired EGUs, including East Bend. The final rule also established state-level pounds of CO_2 per net megawatt-hour of electricity produced emission performance rates and state-level mass-based annual CO_2 tonnage limits for all states. The CPP requires each state to develop and submit an implementation plan to EPA detailing how it will achieve the CO_2 emission limitations specified in the CPP. The CPP gives states the option of developing a rate-based or a mass-based implementation plan. EPA in the CPP outlined three rate-based and three mass-based approaches states can select from when developing their implementation plans.

Numerous petitions were filed with the D.C. Circuit Court challenging the legal status of the CPP. Oral arguments before the full D.C. Circuit were held on September 27, 2016. Regardless of that court's decision in the case, it is expected that the losing parties will seek review by the U.S. Supreme Court. If this occurs, and if the Supreme Court grants review, the final legal status of the CPP might not be settled until sometime in 2018. Meanwhile, on February 9, 2016, the U.S Supreme Court granted a stay of the CPP effective until its legal status is resolved.

The Supreme Court's stay of the CPP means that Kentucky is under no obligation at this time to develop and submit an implementation plan to EPA and will not be unless the CPP is ultimately upheld by the courts. If the CPP is ultimately overturned, there will be no obligation to reduce CO_2 emissions at East Bend. If the CPP is ultimately upheld by the courts, the September 6, 2018, date in the final CPP for states to submit final implementation plans to EPA for

approval will need to be revised. The new date will depend on when the final legal status of the CPP is resolved.

If the CPP survives legal challenge and is implemented, the regulatory requirements that would apply to East Bend will be established by the Commonwealth of Kentucky through its implementation plan. Therefore, Duke Energy Kentucky would not know the exact regulatory requirements that will apply to East Bend until the Commonwealth of Kentucky completes its implementation plan and it is approved by the U.S. EPA, which could occur as late as 2021. Duke Energy Kentucky cannot predict what regulatory requirements might ultimately apply to East Bend.

III. GENERAL DESCRIPTION OF ENVIRONMENTAL CONTROLS AT DUKE ENERGY KENTUCKY'S EAST BEND GENERATION STATION

Q. PLEASE DESCRIBE THE ENVIRONMENTAL CONTROLS AT EAST BEND.

A. The major environmental and pollution control features at East Bend are: a mechanical draft cooling tower, a high-efficiency hot side electrostatic precipitator, a lime-based flue gas desulfurization (FGD) system, low nitrogen oxide (NO_x) burners and a selective catalytic reduction control (SCR) system. The SCR is designed to reduce NO_x emissions by approximately 85 percent. The FGD system was upgraded in 2005 to increase the sulfur dioxide (SO_2) emissions removal capability to about 97 percent. The station electrical output is directly connected to the Duke Energy Midwest (consisting of Kentucky and Ohio) 345 kilovolt (kV) transmission system.

Q. PLEASE DESCRIBE HOW ASH IS CURRENTLY HANDLED AT EAST BEND.

A. Duke Energy Kentucky currently operates one landfill at East Bend and is in the process of constructing another onsite landfill (collectively, the Landfills), which are being and will be used for the disposal of materials and ash resulting from the Company's FGD process and other CCR-producing processes.

The original or "East" Landfill is comprised of approximately 162 acres and has been in place since East Bend was constructed in 1981. The newer or "West" Landfill, once completed, will consist of approximately 200 acres of lined landfill that is designed to accept approximately 30 years of CCR waste from the East Bend Station and other permitted sources, as needed, to make fixated scrubber sludge. Although the West Landfill has been and will continue to be designed to comply with CCR, the East Landfill's original construction pre-dated CCR's effective date. The East Landfill will eventually have to be closed in a manner that complies with the CCR rule.

The Landfills are permitted to receive various forms of CCR waste, including, but not limited to, FGD waste, fly ash and bottom ash (Generator Waste), from a number of generating sources, including those generating stations currently owned and/or operated by Duke Energy Kentucky and from generating stations owned by other Kentucky utilities and Ohio-based electric generators. The dry fly ash created at East Bend is combined into a mixture of FGD solids, fly ash, and lime, and forms a substance called Poz-O-Tec, that sets up much like concrete, and is placed in the East Landfill. Depending upon generation output, East Bend produces approximately 1.3 million tons of Poz-O-Tec, including

approximately 156,000 tons of fly ash annually. The remaining 20 percent of CCR material is bottom ash. This bottom ash is currently treated in an ash pond (Pond) located on site at East Bend.

The other generating sources are permitted for disposal in the East Bend landfills primarily as fly ash sources to be used in the Poz-O-Tec process since East Bend does not produce enough fly ash needed for Poz-O-Tec production. The presence of the Landfills and Pond has permitted Duke Energy Kentucky to manage its costs of environmental compliance and provide safe and reliable electric service by eliminating the need to transport and pay for sending generator waste to commercial landfills.

Q. PLEASE BRIEFLY DESCRIBE THE ASH POND LOCATED AT EAST BEND.

A. The Pond was commissioned in 1981 and it has a volume of 1,844 acre feet. The Pond receives bottom ash from the bottom of the boiler that is sluiced to the Pond with water. While residing in the Pond, the bottom ash separates from the water used to convey the ash from the plant before the water is discharged to the Ohio River from the Pond in accordance with a National Pollutant Discharge Elimination System (NPDES) permit. The Pond is also used to treat other plant water streams, such as coal pile run-off and landfill leachate, before they are discharged under the NPDES permit.

Q. PLEASE DESCRIBE THE CURRENT STATUS OF, AND THE COMPANY'S MODELING ASSUMPTIONS FOR, THE CCR AND ELG FINAL RULES.

A. In April 2009, the EPA began assessing the integrity of ash dikes nationwide, and began developing regulations to manage CCRs. CCRs primarily include fly ash, bottom ash, and FGD byproducts (typically calcium sulfate (gypsum) or calcium sulfite) that are destined for disposal. In June 2010, the EPA proposed a rule containing two options for handling CCRs: 1) as a special waste listed under the Resource Conservation and Recovery Act (RCRA) Subtitle C Hazardous Waste Regulations; and 2) as a solid waste under RCRA Subtitle D Non-Hazardous Waste Regulations. Both options included dam safety requirements and had strict new requirements regarding the handling, disposal, and beneficial use of CCRs except when reused in encapsulated applications (such as ready mix concrete and the production of wallboard).

When the EPA published its proposed ELG revisions, it indicated that it was working to integrate the ELG rule with the CCR rule. In the CCR proposal, the EPA said that there could be strong support for a conclusion that regulation of CCR disposal under RCRA Subtitle D would be adequate because of 1) potentially lower CCR risk assessment results, 2) the ELG requirements that the EPA may promulgate, and 3) increased federal oversight such requirements could achieve. The CCR Final Rule and/or ELG Final Rule result in conversions to dry handling of fly ash and bottom ash; increased use of landfills; the closure of existing wet ash storage ponds; and the addition of alternative wastewater treatment systems. In its ELG proposal, the EPA indicated that the requirements of the two rules needed to be harmonized before either rule was released. The CCR rule was published as final as a Subtitle D, non-hazardous waste rule on April 17, 2015.

Q. PLEASE DESCRIBE THE IMPACT OF THE CCR AND ELG FINAL RULES ON EAST BEND'S OPERATIONS.

A. The ELG Final Rule was published on November 3, 2015. This rule sets new or additional requirements for wastewater streams from several processes and byproducts at steam electric generating plants. Some of these wastewater streams are generated at East Bend Station, including but not limited to fly ash and bottom ash wastewaters. This rule will require the Company to take action to achieve compliance that includes conversion of the existing wet ash system to a dry ash handling system. As part of converting to dry ash handling, new wastewater treatment systems must be installed. The existing Pond can no longer be used in its current form as an ash transport water treatment system. Additionally, due to East Bend site limitations (*e.g.,* proximity to the river, availability of other land, etc.) the existing Pond must be repurposed through clean closure to comply with ELG. Compliance with some aspects of the CCR rule began within 6-12 months after publication, while other actions will require 5 years or more. Compliance with the ELG Final Rule will begin as early as November 1, 2018, but no later than December 31, 2023.

As expected, the combination of ELG and CCR rule implementation require East Bend's conversion to dry ash handling (bottom ash). Additionally, these rules require the initiation of closure of the active wet ash storage Pond; installation of balance-of-plant wastewater treatment systems, including Pond repurposing; and otherwise higher operations and maintenance costs for managing CCR under more stringent disposal requirements.

Q. PLEASE EXPLAIN HOW THE CCR AND ELG REGULATIONSIMPACT DUKE ENERGY KENTUCKY'S ENVIRONMENTAL COMPLIANCE STRATEGY.

A. The CCR Final Rule and ELG Rule have implications to ash handling and impoundment basins across the industry, not just Duke Energy Kentucky. In Duke Energy Kentucky's situation, compliance strategies now must include provisions that necessitate the conversion to dry handling of ash and closure of its existing Pond and repurposing it in accordance with more stringent CCR and ELG standards. Specifically, as it relates to East Bend, the CCR Final Rule requires implementation of an altered groundwater monitoring program for the Landfills and the Pond. The Company must take additional action, including but not limited to, lining and closing the Pond for repurposing. As such, there are three separate, but interrelated projects that must occur at East Bend to bring the station into ELG and CCR Final Rule compliance. They are as follows:

1) Ash Pond Closure – consisting of dewatering, excavation and disposal of the existing bottom ash in the existing Pond. This work will occur in two phases with the first between approximately April 2017 through December 2018; and the latter commencing in December 2018 through April 2020;

2) Retention Basin Construction and Water Re-Direction – consisting of re-purposing of the existing Ash Pond following ash removal, and converting it into an East 26 acre and West 14 acre lined industrial impoundment (Retention Basin). This work will also occur in two phases, timed in sequence with the Ash Pond Closure; and

3) Dry Bottom Ash Conversion– requiring installation of an under boiler bottom ash conveyor to replace the existing bottom ash sluicing system. This work is scheduled to commence in March 2017 and be completed by May 2018.

Q. PLEASE DESCRIBE DUKE ENERGY KENTUCKY'S CPCN PROPOSAL IN THIS PROCEEDING.

A. The subject of this CPCN is the Ash Pond Closure and Retention Basin Construction and Water Re-Direction Projects. Duke Energy Kentucky previously filed its CPCN application in Case No. 2016-00268, to address the Dry Bottom Ash Conversion. The scope of the work contemplated in this CPCN is described in the Direct Testimony of Company witness Joseph Potts. In general, the work contemplated in this CPCN includes necessary processes to drain the Pond for clean closure and repurposing, redirection of existing water runoff and construction of new process water systems.

Q. HAS DUKE ENERGY KENTUCKY APPLIED FOR OR RECEIVED THE NECESSARY PERMITS FOR THE CONSTRUCTION?

A. Yes, Duke Energy has applied for or received the necessary permits or concurrences to perform pond closure, repurposing of the pond and installing new process water systems. The permits or concurrences and their respective status are as follows:

1) Application for Permit to Construct Across or Along a Stream and/or Water Quality Certification and Dam Construction Permit Modification Report (Application for Stream Construction. This Application for Stream Construction is to obtain a final Stream Construction Permit for Construction in or Along a Stream.

The Company has filed the Dam Construction Permit Modification Report and anticipates filing the Application for Permit to Construct Across or Along a Stream and/or Water Quality Certification with the Kentucky Department of Environmental Protection (KDEP) as soon as it receives the necessary proof of publication affidavits from the newspapers. The Company does not anticipate any difficulty in obtaining this permit. A copy of these permit applications, excluding affidavits, are included as Exhibit 2 to the Company's Application. The Company will supplement this exhibit with the affidavits upon receipt.

2) Exhibit 3 is the Company's Indiana Bat Conservation Memorandum of Agreement Modification No.2 and Federally Listed Species Coordination Request and Threatened and Endangered Species Habitat Survey (Tree Clearing Permit Application). This Tree Clearing Application was filed with the United States Department of Fish and Wildlife Resources in order to cut and remove trees to enable the construction around the Pond. The Company does not anticipate any difficulty in obtaining this permit Timber removal for this project is subject to mitigation payments. Duke Energy is in the process of submitting the check for the mitigation payment to finalize the permitting process. Timber removal must occur outside of the bat roosting season (October 15th - March 31st). Even if trees are removed during the approved removal period, in Kentucky, Duke Energy Kentucky still needs a permit.

3) Dewatering Concurrence Letter. A request was submitted to KDEP, Division of Surface Water, under KPDES Permit #0040444, for regulatory concurrence involving redirection of flow during construction activities associated with ash pond ash removal, lining and repurposing to secondary settling basins.

This letter was written seeking concurrence from KDEP that the temporary and permanent redirection of water that presently flows into the existing Pond can occur and remains consistent with applicable regulatory requirements, including the Station's KPDES permit. The issue pertains to the management and discharge of water from Outfall 001 under the current KPDES Permit during the planned ash removal, lining and repurposing of the existing Pond. Rerouting of the water is necessary so that the pond can be partitioned into two sections (East and West), allowing for the work to be completed in phases. A copy of the concurrence letter is included as Exhibit 4 to the Company's Application.

4) The Station Permit. The authority to dispose of ash is contained in the existing station permit from the Kentucky Division of Waste Management, Permit number SW00800006. This permit, along with KDEP application form number 7094A, details the various forms of waste that can be disposed of in the onsite Landfills, including, but not limited to, FGD waste, fly ash and bottom ash (Generator Waste). A copy of this permit is included as Exhibit 5 to the Application.

5) A concurrence letter from the Kentucky Department of Environmental Protection (KDEP), Division of Waste Management, Solid Waste Branch, Activity I.D. No. APE20160010, was received and states conditions under which closure of the Pond can be undertaken without a permit modification to the Company's existing Kentucky Division of Waste Management, Permit number SW00800006. A copy of this letter is included as Exhibit 6 to the Company's Application.

Q. WILL THE POND CLOSURE AND REPURPOSING AND PROCESS WATER SYSTEMS CONSTRUCTION ALLOW THE COMPANY TO COMPLY THE WITH CCR AND ELG FINAL RULES?

A. Yes. Duke Energy Kentucky must have a way to handle wastewater sources in compliance with the ELG Final Rule. The Pond repurposing will provide a necessary wastewater treatment facility in response to ELG. While the driver of the Company's decision to close the Pond for repurposing is to meet ELG Final Rule requirements, the new groundwater monitoring requirements contained in the CCR Final Rule may force the closure of the Pond anyway. As such, the Pond closure and repurposing project is a proactive step in anticipation of the potential forced Pond closure likely under the CCR rule.

Q. WHY DOESN'T THE COMPANY WAIT UNTIL THE RESULTS OF THE CCR ANALYSIS TO DETERMINE IF THE POND MUST BE CLOSED UNDER CCR?

A. There are two reasons. First, there is not sufficient available area to construct an entirely new pond at East Bend so to provide the necessary repository for the new wastewater streams necessary under the ELG Final Rule. Second, it is not possible to wait for confirmation from the results of the CCR Final Rule statistical testing and required groundwater monitoring to determine if the Pond must be closed under CCR. Doing so would leave East Bend without a pond for handling wastewater because the CCR rule does not allow sufficient time from when groundwater monitoring results are analyzed for statistical exceedances to when the pond can no longer accept any wastewaters if a statistical exceedance occurs. Closing the Pond and repurposing it in a timely manner is imperative if East

Bend is to continue uninterrupted operation, and it remains the most reasonable and cost effective manner in which to meet both ELG and CCR requirements.

IV. FILING REQUIREMENTS SPONSORED BY WITNESS

Q. PLEASE DESCRIBE THE FILING REQUIREMENTS YOU SPONSOR.

A. I sponsor Exhibits 2 through 6, the various permits I previously described.

V. CONCLUSION

Q. WERE EXHIBITS 2 THROUGH 6 TO THE COMPANY'S APPLICATION TRUE AND ACCURATE COPIES OF THE ACTUAL PERMITS AND PERMIT APPLICATIONS SUBMITTED?

A. Yes. These exhibits are true and accurate copies of the actual permits, permit applications, and concurrence letters I described.

Q. DOES THIS CONCLUDE YOUR PRE-FILED DIRECT TESTIMONY?

A. Yes.

VERIFICATION

STATE OF OHIO)
) **SS:**
COUNTY OF HAMILTON)

The undersigned, Tammy Jett, being duly sworn, deposes and says that she has personal knowledge of the matters set forth in the foregoing testimony and they are true and correct to the best of her knowledge, information, and belief.

Tammy Jett

Tammy Jett, Affiant

Subscribed and sworn to before me by Tammy Jett on this 2ND day of December, 2016.

Adele M. Frisch

NOTARY PUBLIC

ADELE M. FRISCH
Notary Public, State of Ohio
My Commission Expires 01-05-2019

My Commission Expires: 1/5/2019

COMMONWEALTH OF KENTUCKY
BEFORE THE
KENTUCKY PUBLIC SERVICE COMMISSION

In The Matter of:

The Application of Duke Energy Kentucky, Inc., for a Certificate of Public Convenience and Necessity for Water Re-directs and Basin Closure for East Bend Generating Station	))))	Case No. 2016-00398

DIRECT TESTIMONY OF

WILLIAM DON WATHEN JR.

ON BEHALF OF

DUKE ENERGY KENTUCKY, INC.

December 2, 2016

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I. INTRODUCTION

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is William Don Wathen Jr., and my business address is 139 East Fourth Street, Cincinnati, Ohio 45202.

Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?

A. I am employed by Duke Energy Business Services LLC (DEBS) as Director of Rates & Regulatory Strategy - Ohio and Kentucky. DEBS provides various administrative and other services to Duke Energy Kentucky, Inc., (Duke Energy Kentucky or the Company) and other affiliated companies of Duke Energy Corporation (Duke Energy Corp.).

Q. PLEASE BRIEFLY DESCRIBE YOUR EDUCATIONAL AND PROFESSIONAL BACKGROUNDS.

A. I received Bachelor Degrees in Business Administration and Chemical Engineering, and a Master of Business Administration Degree, all from the University of Kentucky. After completing graduate studies, I was employed by Kentucky Utilities Company as a planning analyst. In 1989, I began employment with the Indiana Utility Regulatory Commission as a senior engineer. From 1992 until mid-1998, I was employed by SVBK Consulting Group, where I held several positions as a consultant focusing principally on utility rate matters. I was hired by Cinergy Services, Inc., in 1998, as an Economic and Financial Specialist in the Budgets and Forecasts Department. In 1999, I was promoted to the position of Manager, Financial Forecasts. In August 2003, I was named to the position of

Director - Rates. On December 1, 2009, I took the position of Director of Rates & Regulatory Strategy - Ohio and Kentucky.

Q. PLEASE SUMMARIZE YOUR DUTIES AS DIRECTOR OF RATES & REGULATORY STRATEGY - OHIO AND KENTUCKY.

A. As Director of Rates & Regulatory Strategy - Ohio and Kentucky, I am responsible for all state and federal rate matters involving Duke Energy Kentucky and its parent, Duke Energy Ohio, Inc. (Duke Energy Ohio).

Q. HAVE YOU PREVIOUSLY TESTIFIED BEFORE THE KENTUCKY PUBLIC SERVICE COMMISSION?

A. Yes. I have presented testimony on numerous occasions before the Kentucky Public Service Commission (Commission) and various other state, local, and federal regulators.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

A. The purpose of my testimony is to provide an overview of the Company's proposed financial and accounting treatment and corresponding rate impact of the Company's proposal to construct a process water system and basin closure and repurposing at Duke Energy's East Bend Unit 2 Generating Station (East Bend).

II. DISCUSSION

Q. PLEASE BRIEFLY DESCRIBE THE COMPANY'S APPLICATION IN THIS PROCEEDING.

A. Duke Energy Kentucky is seeking approval of a certificate of public convenience and necessity (CPCN) to construct new process water systems at East Bend and to close and repurpose the existing East Bend ash pond (Pond).

Q. WILL THE CONSTRUCTION OF THE PROCESS WATER SYSTEM AND POND CLOSURE AND REPURPOSING MATERIALLY IMPACT DUKE ENERGY KENTUCKY'S FINANCIAL CONDITION?

A. No. the proposed construction will not require an investment sufficient to materially affect Duke Energy Kentucky's financial condition.

Q. WHAT ARE THE ESTIMATED COSTS OF CONSTRUCTION FOR THE NEW PROCESS WATER SYSTEM AND POND CLOSURE AND REPURPOSING??

A. Based upon information provided by Mr. Delis, the fully loaded total estimated cost of Pond closure (bottom ash removal and dewatering) is approximately $29,016,801.63. The estimated fully loaded cost of construction (internal and external labor included) for Pond repurposing to a lined retention pond is approximately $36,071,634. The total estimated fully loaded costs of construction for water redirection (internal and external labor included) is approximately $28,097,675.

Q. HOW IS THE COMPANY PROPOSING TO FINANCE THE PROJECT CONSTRUCTION?

A. The Company is proposing to finance the construction through continuing operations and, if necessary, through debt issuances.

Q. WILL THERE BE AN IMMEDIATE IMPACT TO CUSTOMER RATES WITH THE PROJECT CONSTRUCTION?

A. No. While the Company will seek to include the cost of construction and operation and maintenance of the new systems and Pond closure and repurposing in its electric base rates at some point, the Company is not seeking cost recovery in this application. The Company may seek to include this project as part of an overall environmental compliance plan and recovery mechanism pursuant to KRS 278.183 or, alternatively, it may seek recovery through a traditional base rate case. A final decision in that regard has not yet been reached; however, in either case the Company acknowledges that Commission approval will be required in order to recover these costs.

III. FILING REQUIREMENTS SPONSORED BY WITNESS

Q. PLEASE DESCRIBE THE FILING REQUIREMENTS YOU SPONSOR.

A. I sponsor the financial exhibit contained in Exhibit 1 to the Company's Application.

Q. WAS EXHIBIT 1 TO THE COMPANY'S APPLICATION PREPARED BY YOU OR AT YOUR DIRECTION?

A. Yes.

IV. CONCLUSION

Q. DOES THIS CONCLUDE YOUR PRE-FILED DIRECT TESTIMONY?

A. Yes.

VERIFICATION

STATE OF OHIO)
) **SS:**
COUNTY OF HAMILTON)

The undersigned, William Don Wathen Jr., Director of Rates & Regulatory Strategy – Ohio and Kentucky, being duly sworn, deposes and says that he has personal knowledge of the matters set forth in the foregoing testimony and they are true and correct to the best of his knowledge, information, and belief.

William Don Wathen Jr., Affiant

Subscribed and sworn to before me by William Don Wathen Jr. on this 2ND day of December, 2016.

NOTARY PUBLIC

ADELE M. FRISCH
Notary Public, State of Ohio
My Commission Expires 01-05-2019

My Commission Expires: 1/5/2019