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 data requests 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 16th day of September, 2016.

Ruth M. Loccisano

NOTARY PUBLIC

My Commission Expires:

RUTH M. LOCCISANO
Notary Public, State of Ohio
My Commission Expires 06-18-2017

VERIFICATION

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

The undersigned, Daniel Hartmann, being duly sworn, deposes and says that he has personal knowledge of the matters set forth in the foregoing data requests and they are true and correct to the best of his knowledge, information, and belief.

Daniel Hartmann

Daniel Hartmann, Affiant

Subscribed and sworn to before me by Daniel Hartmann on this 21st day of September, 2016.

Adele M. Frisch

NOTARY PUBLIC

My Commission Expires: 1/5/2019

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

KYPSC CASE NO. 2016-00268
TABLE OF CONTENTS

STAFF-DR-01-001

REQUEST:

Refer to the Application, page 11. It is stated that:

a. The estimated annual cost of trucking fly ash to the landfill and its placement is $480,000. Confirm that this expense is already being incurred by Duke Kentucky and that it is not a new or incremental expense.

b. The estimated annual cost of trucking fly ash to the landfill and its placement is $480,000, and the incremental cost of trucking dry bottom ash to the landfill is $240,000. Refer also to the Application, page 4, which states that approximately 20 percent of the ash produced at East Bend is bottom ash. Explain why an approximate 25 percent increase in the volume of materials moved would result in a 50 percent increase in cost.

c. The incremental Operations and Maintenance expense is estimated at $310,000 annually. Provide a breakdown showing the components making up the $310,000 expense.

RESPONSE:

a. The costs outlined are for bottom ash, not fly ash, as mentioned in the question. Bottom ash is currently sluiced to the ash pond. Some of the ash is removed from the pond annually and placed in the landfill. The cost to remove this bottom ash from the pond and truck it to the landfill averages $240,000/yr. The remainder of the bottom ash that is currently sluiced to the pond is left in the pond. Since the Company will be converting to a dry bottom ash collection, in the future all bottom ash will need to be trucked to the landfill at an estimated cost of $480,000/yr. Therefore the incremental cost increase for trucking ash to the pond is $240,000/yr.

b. As mentioned in the previous response, the costs in the application are for bottom ash only, not fly ash.

c. The average annual maintenance costs for the under boiler SFC were taken from an estimate for a similar project for another station in the Duke fleet of similar size and cost. The methodology used is based on an escalating percentage of the capital cost and an estimate of the number of chain replacements which will be the single largest maintenance expense. This is likely a conservative estimate. Please see below for the calculation:

Under Boiler Dewatering Conveyor Maintenance Cost Estimate

Capital Cost =	$2,200,000	per conveyor,
	$134,580	other equip
	$2,334,580	total equipment
Chain Cost =	$300,000	per replacement

Years	% Capital / year	$/year	# chains	Chain costs	Cost / period	Cost / year
1 - 5	5	$116,729	1	$300,000	$883,645	$176,729
6 - 10	7.5	$175,094	2	$600,000	$1,475,468	$295,094
11 - 15	10	$233,458	2	$600,000	$1,767,290	$353,458
16 - 20	12.5	$291,823	2	$600,000	$2,059,113	$411,823
Total Maintenance Cost					$6,185,515	
Annual Average Cost						$309,276

PERSON RESPONSIBLE: Daniel Hartmann

PUBLIC STAFF-DR-01-002
(As to Attachment only)

REQUEST:

Refer to the Application, Exhibit 4.

a. Describe Burns & McDonnell Engineering Company, Inc.'s ("Burns & McDonnell") on-going role in the dry bottom ash conversion project.

b. Have Duke Kentucky and Burns & McDonnell entered into any contractual arrangements related to the dry bottom ash conversion project? If so, provide copies of all such documents.

RESPONSE:

CONFIDENTIAL PROPRIETARY TRADE SECRET (As to Attachment only)

a. Burns & McDonnell Engineering Company, Inc. is functioning as the Company's Engineer for this project. As such, they are providing the structural, mechanical, and electrical engineering design services for conversion of the existing bottom ash handling system to the submerged flight conveyor. After approval of the project, Burns & McDonnell will prepare drawings and specifications and procure the equipment and erection services of the complete system with the exception of the submerged flight conveyor itself which will be purchased directly by Duke Kentucky.

b. Duke Kentucky has a contract with Burns & McDonnell to provide the engineering services necessary to develop the scope, cost estimate, and schedule for the dry bottom ash conversion project. Please refer to the copy of the master contract and release specifically for East Bend Station attached as CONFIDENTIAL ATTACHMENT STAFF-DR-01-002. This document was submitted under seal with a Petition for Confidential Treatment.

PERSON RESPONSIBLE: Daniel Hartmann

STAFF-DR-01-002 CONF ATTACHMENT IS BEING FILED UNDER SEAL

STAFF-DR-01-003

REQUEST:

Refer to the Application, Exhibit 4, page 8 of 78. Explain what is meant by a Level 3 project schedule.

RESPONSE:

A Level 3 detailed Project Control Schedule (PCS) is developed using computerized critical path methods (CPM) and Primavera scheduling software. The Level 3 PCS contains considerably more detail than a Milestone Control Schedule and will become the overall controlling schedule document for the project. The PCS is initially developed by Project Controls based on durations derived from estimated quantities and information from the project team. As construction contracts are awarded and contractor scheduling input is provided, durations and timing will be revised and incorporated to reflect both vendor and contractor input.

PERSON RESPONSIBLE: Daniel Hartmann

REQUEST:

Refer to the Application, Exhibit 4, page 10 of 78.

a. Describe United Conveyor Corporation's "(UCC") qualifications to design and furnish an under-boiler Submerged Flight Conveyor system.

b. Provide the economic and locations of like systems that UCC has furnished.

RESPONSE:

a. United Conveyor Corporation (UCC) is a global leader in ash handling solutions for the power generation industry and has been in business since 1920. UCC has pioneered material handling technology and has devoted its efforts exclusively to the design, supply, installation, and maintenance of ash handling and other abrasive material handling systems.

Headquartered in Illinois, UCC offers global support from over 50 sales and service locations around the world. Global operations in the United States, Germany, India, and China allow the company to seamlessly serve its international customer base.

United Conveyor Corporation has one of the world's most advanced research laboratories and conveyor test loops to simulate ash and reagent handling applications and validate design parameters. UCC works closely with customers to test and verify conveying performance before deployment at the plant to effectively manage risk.

The Submerged Flight Conveyor (SFC) is a proven bottom ash handling system and the most cost-effective compared with other alternatives. Designed for use with most boiler types, this type of bottom ash handling system has become the most common bottom ash handling system since the mid-1990s. This system is often used to replace legacy sluice systems and is well suited to new installations where water and headroom are limited. UCC has over 100 installations worldwide, and the UCC SFC system has proven to be the industry leader for performance and reliability.

b. Please see STAFF-DR-01-004 Attachment for a list from UCC of their domestic installations. The Cliffside station referenced in the attachment as owned by Duke Power was not a conversion like what is proposed by Duke Energy Kentucky in this case. That project was part of the original construction of the unit. The costs are not comparable. Duke Energy Kentucky has no knowledge of the economics of other facilities because they are not Duke-owned facilities.

PERSON RESPONSIBLE: Daniel Hartmann

UNITED CONVEYOR CORPORATION

North American Installation List
Under-Boiler Submerged Flight Conveyor (SFC)
Updated 29 July 2015

Utility	Plant/Unit	Location	Unit	SFC Model No.	Size (MW)	Year Installed	Boiler Type	Closed Loop	Retrofit/ New Unit	Fuel Type
Public Service of New Mexico	San Juan Station	Waterflow, NM	4	1838	473	2016	PC	Yes	Retrofit	Subituminous
PacifiCorp	Hunter Station	Castle Dale, UT	3	1530	496	2016	PC	Yes	Retrofit	Bituminous
MidAmerican Energy	George Neal Station	Sergeant Bluff, IA	4	1530	644	2015	PC	Yes	Retrofit	PRB
Ameren/UE	Labadie	Labadie, MO	4	1530	621	2011	PC	No	Retrofit	PRB
Sandy Creek Power Partners, L.P.	Sandy Creek Energy Station	Riesel, TX	1	1534	1000	2011	PC	No	New Unit	PRB
Luminant	Oak Grove Station	Franklin, TX	1		800	2011	PC	No	Retrofit	Lignite
			2		800	2011	PC	No	Retrofit	Lignite
Salt River Project	Coronado	St. Johns, AZ	2	1530	600	2011	PC	No	Retrofit	Bituminous
			1	1530	600	2009	PC	No	Retrofit	Bituminous
AEP	J.W. Turk Station	Fulton, AR	1	1530	600	2010	PC	No	New Unit	PRB
Peabody Energy	Prairie State Energy Campus	Lively Grove, IL	1	1838	800	2009	PC	Yes	New Unit	Bituminous
			2	1838	800	2009	PC	Yes	New Unit	Bituminous
Duke Power	Cliffside	Cliffside, NC	6	1534	900	2009	PC	No	New Unit	Bituminous
City Utilities of Springfield	Southwest Power Station	Springfield, MO	2	1526	300	2009	PC	Yes	New Unit	PRB
Kansas City Power & Light	Iatan Station	Weston, MO	2	1530	850	2009	PC	Yes	New Unit	PRB
			1	1530	726	2008	PC	Yes	Retrofit	PRB
Tucson Electric Power Co.	Springerville Station	Springerville, AZ	2	1530	380	2009	PC	Yes	Retrofit	Western Bituminous
			4	1530	450	2007	PC	Yes	Retrofit	PRB
			3	1530	450	2005	PC	Yes	Retrofit	PRB
WE Energies	Elm Road Station	Oak Creek, WI	2	1534	615	2008	PC	Yes	New Unit	Bituminous
			1	1534	615	2007	PC	Yes	New Unit	Bituminous
LSP Services Plum Point, LLC	Plum Point Energy Station	Osceola, AR	1	1526	660	2007	PC	No	New Unit	PRB
OPPD Nebraska City	Nebraska City Station	Nebraska City, NE	2	1530	660	2006	PC	No	New Unit	PRB

Installation List: Under-Boiler SFCs

Utility	Plant/Unit	Location	Unit	SFC Model No.	Size (MW)	Year Installed	Boiler Type	Closed Loop	Retrofit/ New Unit	Fuel Type
Ameren/UE	Meramec Plant	St. Louis, MO	4	1530	360	2005	PC	No	Retrofit	PRB
FMC Wyoming Inc.	Soda Ash Plant	Green River, WY	6	1019	93	2005	PC	No	Retrofit	Bituminous
Wisconsin Public Service Corp.	Weston	Rothschild, WI	4	1530	500	2005	PC	Yes	New Unit	PRB
Tri-State Gen. & Trans. Association	Craig Generating Station	Craig, CO	3	1526	482	2005	PC	Yes	Retrofit	Subituminous
Deseret Power	Bonanza Station	Bonanza, UT	1	1526	500	2003	PC	No	Retrofit	Bituminous
Xcel Energy Public Service Co. of Colorado	Pawnee Station	Brush, CO	1	1526	500	2002	PC	No	Retrofit	PRB
Kansas City Power & Light	La Cygne Station	La Cygne, MO	1	1530	760	2002	Cyclone	No	Retrofit	PRB (Blend)
			1	1530	760	2002	Cyclone	No	Retrofit	PRB (Blend)
			1	1530	760	2002	Cyclone	No	Retrofit	PRB (Blend)
	Hawthorn	Kansas City, MO	5	1526	550	2001	PC	No	New Unit	PRB
Mirant Mid-Atlantic	Morgantown	Newburg, MD	2	1526	610	1999	PC	No	Retrofit	Bituminous
			2	1526	610	1999	PC	No	Retrofit	Bituminous
			1	1526	610	1998	PC	No	Retrofit	Bituminous
			1	1526	610	1998	PC	No	Retrofit	Bituminous
Sask Power	Shand Power Station	Estevan, Canada	1		300	1992	PC		New Unit	Lignite
Clean Harbors	Deer Park	Deer Park, TX	1, 2	1522		1988	Incinerator	No	Retrofit	Waste
Xcel Energy Public Service Co. of Colorado	Harrington Power Plant	Amarillo, TX	2	2022	350	1985	PC	No	Retrofit	PRB
			3	2022	350	1985	PC	No	Retrofit	PRB
			1	2022	350	1984	PC	No	Retrofit	PRB

REQUEST:

Refer to the Application, Exhibit 4, page 11 of 78.

a. Provide a complete description of all options and technologies that Duke Kentucky considered to convert to a dry bottom ash system.

b. Provide the financial analysis that was performed for each alternative.

c. If not already included in each analysis, provide a present value revenue requirement for each alternative.

RESPONSE:

a. Duke Energy Kentucky considered three options for conversion to dry bottom ash handling –1) Pneumatic; 2) Under Boiler SFC; and 3) Remote SFC. For the Pneumatic system, the existing wet bottom ash hopper would be removed and replaced with a dry hopper. Bottom ash falls from the combustion process in the boiler into the dry hopper onto a grate. Air is blown into the hopper underneath the grate to cool and fracture the ash. The ash is collected at the bottom of the hopper and then is pulled by vacuum into a silo located outside the boiler building. Economizer ash would also be collected dry from the economizer hoppers and drawn by vacuum to the silo. The silo would be elevated such that a truck can pull underneath and be filled with ash for transport to the landfill.

Pyrites would need to be collected separately as their weight does not lend itself to a vacuum system (this initial and O&M cost is not included in the analysis).

The Under Boiler Submerged Flight Conveyor (SFC) is located directly under the boiler where the current ash hopper is located. Bottom ash falls from the combustion process in the boiler into the water-filled, upper trough of the SFC that quenches, fractures, and cools the ash. The ash particles fall to the bottom of the SFC where chains and flights move the ash along the horizontal trough at the bottom of the SFC and up a dewatering ramp. At the top of the ramp, the ash falls through a discharge chute into a concrete bunker where it continues to dewater. Ash from the pile will be loaded into trucks for final disposal in the landfill. Economizer ash will continue to be collected in the economizer hoppers. The economizer ash will be transported by dry flight conveyor and discharged into the SFC where it will be collected with the dry bottom ash as explained above. The pyrites will be collected wet as they currently are and transported to the SFC and discharged.

The Remote SFC option utilizes the existing wet bottom ash hopper, ash sluice pumps, and discharge piping to the ash pond. At an area along the path of the bottom ash piping, a site with enough available space would be selected to erect a submerged flight conveyor. The economizer ash and pyrites would also continue to be sluiced through the piping and would also be directed to the remote SFC. The SFC would function as the under boiler SFC described above, dewatering the bottom ash, economizer ash, and pyrites. The SFC would discharge the ash and pyrites onto a pad where it can be loaded onto trucks and transported to the landfill. The Remote SFC option is a good choice when an extended outage is not planned for the generating unit as it can be built remotely and tied in during a short duration outage of one week.

b. Please see STAFF-DR-01-005 Attachment for the Technology Comparison Table which was completed at the outset of this project. Screening level estimates were used to develop the cost comparisons and O&M cost estimates. The table includes an NPV analysis of the options. East Bend Station Unit 2 has a 10 week outage scheduled during the spring of 2018 which coincides with the time requirements to install a dry bottom ash system. This enabled consideration of under boiler options such as the Pneumatic and Under Boiler SFC to be considered as lengthy outages are required for these technologies. Based on this, the more expensive Remote SFC's were eliminated from consideration early on due to cost. The initial cost of the Pneumatic and Under Boiler SFC are very close and the 20 year NPV is virtually identical making both acceptable options from an economic point of view. However, evaluating the Pros and Cons of each option led Duke Energy Kentucky to select the Under Boiler SFC for the following reasons:

- the SFC option is a more proven technology that has been in service for decades versus the Pneumatic option which is relatively new;
- the station Forced Draft air system is already taxed for air and diverting some of this air to the Pneumatic system as required for operation would limit generating load on the unit (not reflected in the economic analysis); and

- efforts to increase Forced Draft air would introduce significant additional cost to the project by upgrading or replacing existing fans and may introduce NSR considerations to the project which would jeopardize the schedule for completing the project ahead of the required dates.

c. See above response.

PERSON RESPONSIBLE: Daniel Hartmann

Technology Comparison Table
East Bend Station
Unit 2
Bottom Ash Wet to Dry Conversion
Project # 88669

by: J. Leach, Revision 0

	Option 1 Pneumatic (PAX)	Option 2 Underboiler Drag Chain Conveyor	Option 3A Near Remote Drag Chain Conveyor	Option 3B Far Remote Drag Chain Conveyor
System Description	Pneumatic bottom ash system utilizing vacuum exhausters to pull ash to a new bottom ash silo. Utilizes 1 silo with fully redundant exhausters and dual ash pipes.	Underboiler drag chain conveyor system located directly beneath the Unit 2 boiler. Bunker located just outside boiler building.	Remotely located drag chain conveyor system utilizing a single conveyor, located close to the boiler building to reduce piping. Equipment is located inside of a new enclosure and the bunker is fully enclosed.	Remotely located drag chain conveyor system utilizing a signle conveyor, located far from the boiler building to reduce haul truck drive distance. Equipment is located inside of a new enclosure and the bunker is fully enclosed.
Outage Duration	6 weeks	6 weeks	1 week	1 week
"Dry" Material Storage	4 days	2 days	2 days	2 days
Days of Redundancy with 1 train out of service	Fully redundant	4 hours	4 hours	4 hours
Additional Required Operations FTE's	0	0	0	0
Haul/Load FTE's	0.7	1.8	1.3	1.3
Avg Yearly O&M Cost	$87,360	$224,640	$162,240	$162,240
Avg Yearly Electrical Use (kWh)	1,300,000	1,500,000	4,600,000	5,100,000
Avg Yearly Electrical Costs	$41,600	$48,000	$147,200	$163,200
Estimated Capital Cost	$18,000,000	$16,000,000	$25,000,000	$44,000,000
Project NPV 10 years	$19,178,560	$20,579,351	$30,197,455	$49,466,197
Project NPV 20 years	$19,828,970	$19,866,707	$29,888,621	$48,615,541
	$37,736	$0	($9,521,915)	($28,748,834)
Project NPV 40 years	$20,481,769	$21,246,818	$30,955,015	$50,262,927
NPV Rank (Based on 20 year NPV)	1	2	3	4
Pros	Completely dry - reduces uncertainty regarding future regulations and eliminates all potential streams of waste water for bottom ash.	Low cost	Shorter outage duration	Shorter outage duration
	Eliminates existing sluice system which is maintenance intensive.	Eliminates existing sluice system which is maintenance intensive.	Economizer ash and pyrites can continue to be conveyed with the bottom ash with minimal modifications required	Economizer ash and pyrites can continue to be conveyed with the bottom ash with minimal modifications required
	Straighforward low complexity system.	Economizer and Pyrites can be conveyed directly into the conveyor	Minimal impact on boiler area access. Only equipment in boiler area is related to seal water overflow system.	Minimal impact on boiler area access. Only new equipment in boiler area is related to seal water overflow system and sluice pump replacement
	Boiler seal trough will be replaced with a dry boiler seal system	Proven technology with high reliability	Technology is proven, but does not have a long history in the remote application. 3 current installations.	Technology is proven, but does not have a long history in the remote application. 3 current installations.
	Economizer ash will be pulled into the new vacuum system	Few moving parts	All new system components are redundant	All new system components are redundant
	Footprint of new equipment matches footprint of existing hoppers. Does not create new interfereces with the existing coal mills.	Zero water discharge		
	System loads directly to truck eliminating need for front end loader and loader operator to fill the truck.	Operations is familiar with operating this technology at Cliffside		
	Capable of handling and cooling large clinkers			
	Multi-hopper arrangement allows for online maintenance			
Cons	Cost	No redundancy	Sluicing CCR materials is a risk.	Sluicing CCR materials is a risk.
	Longer Outage Duration	Only has 4 hour storage capacity for online maintenance	High cost	High cost
	Not widely used on large units	Continual normal maintenance for chain and flights (3-5 year replacement schedule)	Uncertainty regarding regulations could impact how this water is handled if unexpected events require system to be drained or if system has leaks. A maintenance tank is included that will eliminate any planned discharges	Uncertainty regarding regulations could impact how this water is handled if unexpected events require system to be drained or if system has leaks. A maintenance tank is included that will eliminate any planned discharges
	Potential for pipe erosion issues	Longer outage duration	Existing sluice system remains in service and requires frequent maintenance and repairs. (2 fully functioning systems to maintain)	Existing sluice system remains in service and requires frequent maintenance and repairs. (2 fully functioning systems to maintain)
	May require re-opening air permit		New equipment is far from the plant making O&M more difficult	New equipment is far from the plant making O&M more difficult
	Plant already short on FD Fan air		Potential Total Suspended Solids (TSS) and carryover risks associated with handling the economizer ash with this sytem	Potential Total Suspended Solids (TSS) and carryover risks associated with handling the economizer ash with this sytem
			Long distance runs of pipe (additional maintenance)	Long distance runs of pipe (additional maintenance)
			Not a proven technology. Only 3 systems operational in the United States	Not a proven technology. Only 3 systems operational in the United States

STAFF-DR-01-006

REQUEST:

Refer to the Application, Exhibit 4, page 23 of 78.

a. Explain the basis for determining that a 15 percent markup factor is appropriate for this project.

b. Explain the basis for determining that a 3 percent escalation factor for materials and labor is appropriate for this project.

c. Explain the basis for determining that a 10 percent project definition contingency is appropriate for this project.

d. Explain the basis for determining that a 5 percent owner contingency is appropriate for this project.

RESPONSE:

a. A 15% mark-up (overhead and fee) is included on both materials and labor for subcontracted work. This is based on recent contractor feedback and pricing.

b. Escalation is assumed to average 3% per year for materials and labor. 3% escalation per year is based on Global Insights projections for the next 2 to 3 years for material supply and labor installation.

c. Due to the limited level of design completed and the subsequent anticipated accuracy of the estimate, 10% Contingency has been included. This is included to cover accuracy of pricing and commodity estimates for the defined project scope.

This contingency is not intended to cover changes in the general project scope nor major shifts in market conditions that could result in significant increases. At this stage of the project estimate, contingency can typically range between 8% and 15%.

d. Owner contingency has been added to cover general project scope additions due to scope items not able to be identified at the current estimate development stage. At this stage of the project estimate, owner contingency can typically range between 3% and 8%.

PERSON RESPONSIBLE: Daniel Hartmann

STAFF-DR-01-007

REQUEST:

Refer to the Application, Exhibit 4, Appendix H. Explain whether Duke Kentucky intends to issue Requests for Proposals ("RFP") for each of the contracts as recommended by Burns & McDonnell, or whether Duke Kentucky will use another method to select its vendors and contractors.

RESPONSE:

Yes, Requests for Proposals will be issued for each of the contracts listed.

PERSON RESPONSIBLE: Daniel Hartmann

STAFF-DR-01-008

REQUEST:

Refer to the Direct Testimony of Joseph Miller ("Miller Testimony"), pages 3 and 6. Explain whether Duke Kentucky is required by permit to combine its fly ash, scrubber slurry, and lime to make Poz-O-Tec for placement in its landfill, or whether that is Duke Kentucky's choice.

RESPONSE:

Duke Energy Kentucky is required by the Special Waste Facility Permit, Permit No. SW00800006, to make a fixated scrubber sludge (Poz-O-Tec) for placement in the landfill. While the permit allows some flexibility in the fixated scrubber sludge "recipe" or ratios; fly ash, scrubber sludge, and lime additives are required in order to fixate the material properly in the landfill. Raw scrubber sludge cannot be placed in the landfill. Proper fixation binds the soluble scrubber sludge constituents to form a fairly insoluble material and provides a structurally sound landfill material. Additionally, the fixation of this material assists Duke Energy Kentucky in meeting its ELG compliance by eliminating FGD wastewater discharge.

PERSON RESPONSIBLE: Tammy Jett

STAFF-DR-01-009

REQUEST:

Refer to the Miller Testimony, pages 5. Provide an update on the evaluation process regarding the closure and repurposing of the east pond at the East Bend station, including the time frame when an application will be filed.

RESPONSE:

Our evaluation process for the closure and repurposing of the east pond is complete. Scope has been determined, preliminary design drawings completed and cost estimates generated. Duke Kentucky is applying for the necessary permits needed for the work with the hope that they can be in-hand prior to submitting the CPCN application for this work. Our target date for submittal of the application is fourth quarter 2016.

PERSON RESPONSIBLE: Daniel Hartmann

STAFF-DR-01-010

REQUEST:

Refer to the Miller Testimony, pages 10, regarding the modification to the existing Title 5 permit.

a. Fully explain the reason for the modification.

b. Does Duke Kentucky anticipate any issues regarding receiving approval for the modification?

c. Explain the impact on the bottom ash project if Duke Kentucky does not receive approval.

RESPONSE:

a. Major sources of regulated air pollutant emissions in Kentucky are required to obtain a Title V operating permit from the Kentucky Division for Air Quality. Duke Energy Kentucky, Inc., East Bend Station is considered a major source of regulated air pollutant emissions and, therefore, subject to the permitting requirements of Title V of the Clean Air Act. Under Kentucky's regulations governing Title V permits (401 KAR 52:020), sources subject to Title V permitting shall "not construct, reconstruct, or modify without a permit or permit revision issued under this administrative regulation…". The dry bottom ash is a potential source of fugitive particulate matter emissions at the facility, and must be included in the Title V permit. Since the potential fugitive particulate matter emissions of the project are not significant, the permit modification is considered a minor revision.

The ELG Final Rule creates a compliance obligation that prohibits the discharge of bottom ash transport water. East Bend currently operates with a wet hopper bottom ash collection and disposal system. A Dry Bottom Ash system will be installed to collect the bottom ash for disposal. The reason for the modification is to include fugitive emission points associated with the Dry Bottom Ash System into the current Title V permit. Fugitive emissions are small in magnitude and result from the physical handling of the dry ash that is removed from the system.

b. Based upon initial indications, Duke Kentucky does not anticipate any issues in obtaining the permit revision to incorporate the Dry Bottom Ash modification. The Company expects that this minor revision will be incorporated into the current significant permit revision once the public comment period ends.

c. Construction of the bottom ash handling system cannot commence without approval of the minor revision to the Title V permit. Given the very small magnitude of this change, it is highly likely that Duke Energy Kentucky will receive the air permit modification to support the conversion to the dry bottom ash system.

PERSON RESPONSIBLE: Tammy Jett

Duke Energy Kentucky
Case No. 2016-00268
Staff's First Set Data Requests
Date Received: September 14, 2016

STAFF-DR-01-011

REQUEST:

Refer to the Direct Testimony of Brandon Delis ("Delis Testimony"), page 7, and Exhibit 4, Appendix K, page 76 of 78.

a. Indicate where on Exhibit K the amounts for AFUDC debt and equity are shown.

b. Confirm that the items listed under Duke Internal Cost in the amount of $1,125,802 on page 7 of the Delis Testimony are not included on Appendix K.

c. Page 7 of the Delis Testimony shows a project total of $23,172,311, and Exhibit 4, Appendix K, page 76 of 78, shows a total project cost of $20,638,280. Reconcile these two amounts.

RESPONSE:

Since the CPCN application was filed in July, a revised cost estimate was issued by Burns & McDonnell for the dry bottom ash conversion. Please see the revised estimate attached hereto as STAFF-DR-01-011 Attachment. The estimate from Burns & McDonnell includes the direct "contracted" cost for the project only and does not include any Duke internal costs such as Duke Energy labor, Duke Energy Overheads, or AFUDC. A revised total project estimate is provided in the table below. The direct cost of $22,702,434 from the Burns & McDonnell estimate is included in the Contract Labor (Engineering), Contract Labor (Construction), Contract Material, and Retirement Contract Labor (Construction) cells shown below:

East Bend Dry Bottom Ash Conversion Estimate

AFUDC Debt		$ 508,891
AFUDC Equity		$ 6,865
Additions		
Company Labor		$ 365,244
Labor Loading		$ 255,683
Contract Labor (Engineering)		$ 1,384,782
Contract Labor (Construction)		$ 14,765,610
Contract Material		$ 5,501,025
Overheads		$ 1,035,542
Retirement		
Contract Labor (Construction)		$ 1,051,017
Overheads		$ 37,837
Total		**$ 24,912,496**

PERSON RESPONSIBLE: Daniel Hartmann

ENG CAPITAL COST ESTIMATE
DUKE ENERGY
EAST BEND - SFC
88669.10
UNION, KY

Area / Discipline	Direct MHRS	Labor Cost	Engr Equip/ Material Cost	Subcontract Cost	Const. Equipment Cost	Total Cost
Equipment Supply			$4,107,000	$196,000		$4,303,000
Equipment Install	6,720	$898,617		$585,000	$59,808	$1,543,425
Civil	94	$9,548	$8,065	$500,456	$925	$518,993
Deep Foundations	1,176	$118,867	$467,902	$91,778	$31,560	$710,106
Concrete	8,326	$777,758	$354,749	$99,628	$71,930	$1,304,065
Structural Steel	961	$120,288	$121,056		$11,532	$252,876
Architectural	958	$101,339	$63,294	$285,400	$14,365	$464,398
Coatings						
Piping	17,478	$2,185,989	$460,969	$5,075	$131,083	$2,783,116
Insulation				$57,060		$57,060
Electrical	13,684	$1,545,106	$548,967	$428,578	$101,957	$2,624,608
Instrument & Control	731	$81,357	$78,277		$5,479	$165,113
Misc Directs	750	$87,127		$250,000	$5,625	$342,752
Total Direct Cost	**50,877**	**$5,925,996**	**$6,210,280**	**$2,498,975**	**$434,263**	**$15,069,514**

Rev.	Revision Date
0	04/01/16
1	09/09/16

	% Dir	
Construction Mgmt & Indirects	13.9%	$2,096,000
Engineering	9.4%	$1,422,535
Start-Up	4.5%	$672,000
Insurance / Surety / Permits		
Warranty	0.1%	$19,000
Escalation	2.5%	$376,738
Total Indirect Cost		**$4,586,273**
Total Direct and Indirect Costs		**$19,655,787**
	% Dir	
Project Contingency	10%	$1,965,579
Total Project Cost		**$21,621,366**
Owner Cost - General		
Owner Cost - Taxes		
Owner Cost - Owner Contingency	5%	$1,081,068
Total Project Cost Incl. Owner Cost		**$22,702,434**

BURNS McDONNELL

V2.0

PROJECT CLIENT: **DUKE ENERGY**
PROJECT DESC: **EAST BEND - SFC**
PROJECT # : **88669.10**

SUMMARY
EQUIPMENT SUPPLY

EST LEVEL: **STUDY**
ESTIMATE DUE DATE:
ESTIMATOR:

DESCRIPTION		LABOR		MATERIAL	SUBCON	EQUIPMENT	TOTAL
		MH	COST	COST	COST	RENT / STS	COST
P 2	BOTTOM ASH			3,817,000			**3,817,000**
P 3	MECHANICAL EQUIPMENT						
P 4	ELECTRICAL EQUIPMENT			290,000			**290,000**
P 5	DCS				196,000		**196,000**
	ESTIMATE TOTALS			**$4,107,000**	**$196,000**		**$4,303,000**

PROJECT CLIENT: **DUKE ENERGY**
PROJECT DESC: **EAST BEND - SFC**
PROJECT # : **88669.10**

SUMMARY
EQUIPMENT INSTALL

EST LEVEL: **STUDY**
ESTIMATE DUE DATE:
ESTIMATOR:

DESCRIPTION		LABOR MH	LABOR COST	MATERIAL COST	SUBCON COST	EQUIPMENT RENT / STS	TOTAL COST
P 2	BOTTOM ASH	4,120	549,777		500,000	36,668	**1,086,445**
P 3	EQUIPMENT						
P 4	DEMO/RELOCATE	2,600	348,840		85,000	23,140	**456,980**
	ESTIMATE TOTALS	**6,720**	**$898,617**		**$585,000**	**$59,808**	**$1,543,425**

PROJECT CLIENT: **DUKE ENERGY**
PROJECT DESC: **EAST BEND - SFC**
PROJECT # : **88669.10**

SUMMARY
CIVIL

EST LEVEL: **STUDY**
ESTIMATE DUE DATE:
ESTIMATOR:

DESCRIPTION		LABOR MH	LABOR COST	MATERIAL COST	SUBCON COST	EQUIPMENT RENT / STS	TOTAL COST
P 2	EXISTING SITE DEMOLITION	94	9,548	8,065	500,456	925	**518,993**
P 3	SITE PREP						
P 4	EARTHWORK						
P 5	UNDERGROUND UTILITIES						
P 6	SURFACING						
P 7	FENCING						
P 8	MISC ITEMS						
	ESTIMATE TOTALS	**94**	**$9,548**	**$8,065**	**$500,456**	**$925**	**$518,993**

PROJECT CLIENT: **DUKE ENERGY**
PROJECT DESC: **EAST BEND - SFC**
PROJECT # : **88669.10**

SUMMARY
DEEP FOUNDATIONS

EST LEVEL: **STUDY**
ESTIMATE DUE DATE:
ESTIMATOR:

DESCRIPTION		QTY	UOM	LABOR MH	LABOR COST	MATERIAL COST	SUBCON COST	EQUIPMENT RENT / STS	TOTAL COST
P 2	DEEP FOUNDATIONS	105	EA	1,152	116,519	467,902	40,000	29,558	**653,979**
P 3	SPOIL HAUL OFF			23	2,348			2,002	**4,350**
P 4	TESTING						51,778		**51,778**
	ESTIMATE TOTALS			**1,176**	**$118,867**	**$467,902**	**$91,778**	**$31,560**	**$710,106**

PROJECT CLIENT: **DUKE ENERGY**
PROJECT DESC: **EAST BEND - SFC**
PROJECT # : **88669.10**

SUMMARY
CONCRETE

EST LEVEL: **STUDY**
ESTIMATE DUE DATE:
ESTIMATOR:

DESCRIPTION		QTY	UOM	LABOR MH	LABOR COST	MATERIAL COST	SUBCON COST	EQUIPMENT RENT / STS	TOTAL COST
P 2	AIR RECEIVER BLDG	260	CY	481	44,886	57,355	17,732	7,677	**127,650**
P 3	UNDERBOILER FOUNDATION	225	CY	334	31,178	46,414	12,700	8,261	**98,553**
P 4	STACK OUT FOUNDATION	765	CY	5,053	472,034	210,438	59,660	27,258	**769,389**
P 5	PIPE RACK FOUNDATIONS	85	CY	1,392	130,063	29,466	7,140	14,977	**181,645**
P 6	SFC - STACKOUT PAD SUMP	31	CY	1,066	99,598	11,077	2,396	13,757	**126,828**
			ESTIMATE TOTALS	**8,326**	**$777,758**	**$354,749**	**$99,628**	**$71,930**	**$1,304,065**
	Total CY this Page =		1,366						
	Total MH/CY =		6.10						
	Total $/CY =		$954.66						

PROJECT CLIENT: **DUKE ENERGY**
PROJECT DESC: **EAST BEND - SFC**
PROJECT # : **88669.10**

SUMMARY
STRUCTURAL STEEL

EST LEVEL: **STUDY**
ESTIMATE DUE DATE:
ESTIMATOR:

DESCRIPTION		QTY	UOM	LABOR MH	LABOR COST	MATERIAL COST	SUBCON COST	EQUIPMENT RENT / STS	TOTAL COST
P 2	INDOOR STEEL	33.8	TN	815	102,073	121,056		9,785	**232,914**
P 3	OUTDOOR STEEL		TN						
P 4	MISCELLANEOUS STEEL			146	18,215			1,746	**19,962**
	ESTIMATE TOTALS			**961**	**$120,288**	**$121,056**		**$11,532**	**$252,876**
	Total Structural Steel (TN)	**33.8 TN**		28.4	3,559	3,582			7,482

PROJECT CLIENT: **DUKE ENERGY**
PROJECT DESC: **EAST BEND - SFC**
PROJECT # : **88669.10**

SUMMARY
ARCHITECTURAL

EST LEVEL: **STUDY**
ESTIMATE DUE DATE:
ESTIMATOR:

DESCRIPTION				LABOR		MATERIAL	SUBCON	EQUIPMENT	TOTAL
				MH	COST	COST	COST	RENT / STS	COST
		QTY	UOM						
P 2	AIR RECIEVER BUILDING- 2,250 SF	2250	sf	958	101,339	63,294	285,400	14,365	**464,398**
			ESTIMATE TOTALS	**958**	**$101,339**	**$63,294**	**$285,400**	**$14,365**	**$464,398**

PROJECT CLIENT: DUKE ENERGY
PROJECT DESC: EAST BEND - SFC
PROJECT # : 88669.10

SUMMARY
COATINGS

EST LEVEL: STUDY
ESTIMATE DUE DATE:
ESTIMATOR:

DESCRIPTION				LABOR		MATERIAL	SUBCON	EQUIPMENT	TOTAL
				MH	COST	COST	COST	RENT / STS	COST
		QTY	UOM						
P 2	PIPE								
P 3	EQUIPMENT								
P 4	STEEL								
P 5	MISC								
		ESTIMATE TOTALS							

PROJECT CLIENT: **DUKE ENERGY**
PROJECT DESC: **EAST BEND - SFC**
PROJECT # : **88669.10**

SUMMARY
PIPING

EST LEVEL: **STUDY**
ESTIMATE DUE DATE:
ESTIMATOR:

DESCRIPTION		QTY	UOM	LABOR MH	LABOR COST	MATERIAL COST	SUBCON COST	EQUIPMENT RENT / STS	TOTAL COST
P 2	UG LARGE BORE PIPE		LF						
P 3	UG SMALL BORE PIPE		LF						
P 4	UG LB MISC ITEMS		LS						
P 5	UG SB MISC ITEMS		LS						
P 6	AG LARGE BORE PIPE	5615	LF	10,732	1,342,217	364,756		80,486	**1,787,460**
P 7	AG SMALL BORE PIPE	530	LF	950	118,819	2,458		7,125	**128,402**
P 8	AG WELDING	1706	DI	2,209	276,223	2,044		16,564	**294,831**
P 9	AG BOLTUPS	260	DI	156	19,511	1,430		1,170	**22,111**
P 10	AG SUPPORTS	315	EA	2,270	283,915	81,481		17,025	**382,421**
P 11	AG VALVES		EA						
P 12	AG SPECIALS		EA						
P 13	AG LB TESTING	5615	LF	842	105,342		4,275	6,317	**115,934**
P 14	AG SB TESTING	530	LF	80	9,943		800	596	**11,340**
P 15	TIE-INS	8	EA	240	30,017	8,800		1,800	**40,617**
P 16	PIPE REROUTES	2100	LF						
P 17	PIPE REROUTES (CONT)	2000	LF						
			ESTIMATE TOTALS	**17,478**	**$2,185,989**	**$460,969**	**$5,075**	**$131,083**	**$2,783,116**

PROJECT CLIENT: **DUKE ENERGY**
PROJECT DESC: **EAST BEND - SFC**
PROJECT # : **88669.10**

SUMMARY
INSULATION

EST LEVEL: **STUDY**
ESTIMATE DUE DATE:
ESTIMATOR:

DESCRIPTION				LABOR		MATERIAL COST	SUBCON COST	EQUIPMENT RENT / STS	TOTAL COST
				MH	COST				
		QTY	UOM						
P 2	PIPE INSULATION	1,493	LF				57,060		57,060
P 3	EQUIPMENT INSULATION								
	ESTIMATE TOTALS						$57,060		$57,060

PROJECT CLIENT: **DUKE ENERGY**
PROJECT DESC: **EAST BEND - SFC**
PROJECT # : **88669.10**

SUMMARY
ELECTRICAL

EST LEVEL: **STUDY**
ESTIMATE DUE DATE:
ESTIMATOR:

DESCRIPTION				LABOR		MATERIAL	SUBCON	EQUIPMENT	TOTAL
				MH	COST	COST	COST	RENT / STS	COST
		QTY	UOM						
P 2	D-BANK & GRND			791	88,616	72,728		5,930	**167,275**
P 3	MV CABLE	6,120	LF	386	43,212	53,721		2,892	**99,825**
P 4	PWR CABLE	32,150	LF	828	92,797	87,713		6,210	**186,719**
P 5	CNTRL, INSTR, OTHER CABLE	41,610	LF	933	104,587	30,919		6,999	**142,505**
P 6	TERMS	1,480	EA	700	78,475	5,580		5,251	**89,307**
P 7	CONDUIT	10,910	LF	2,839	318,211	43,388		21,291	**382,891**
P 8	TRAY	3,140	LF	2,563	287,208	125,478		19,220	**431,906**
P 9	LIGHTING	110	EA	1,682	199,894	90,178		11,941	**302,012**
P 10	MISC. SMALL EQUIP			94	10,558	5,355		707	**16,619**
P 11	MISC INSTALLATION								
P 12	HEAT TRACE, LIGHTNING PROT, CATH						178,578		**178,578**
P 13	MAJOR ELEC EQUIPMENT			908	101,765			6,810	**108,575**
P 14	DCS & UPS EQUIPMENT								
P 15	TEMPORARY			1,961	219,782	33,908		14,708	**268,397**
P 16	MISC OTHER								
P 17	MISC. RELOCATES / DEMO ALLOWANCE						250,000		**250,000**
			ESTIMATE TOTALS	**13,684**	**$1,545,106**	**$548,967**	**$428,578**	**$101,957**	**$2,624,608**

PROJECT CLIENT: **DUKE ENERGY**
PROJECT DESC: **EAST BEND - SFC**
PROJECT # : **88669.10**

SUMMARY
INSTRUMENT & CONTROL

EST LEVEL: **STUDY**
ESTIMATE DUE DATE:
ESTIMATOR:

DESCRIPTION				LABOR		MATERIAL	SUBCON	EQUIPMENT	TOTAL
				MH	COST	COST	COST	RENT / STS	COST
		QTY	UOM						
P 2	INSTRUMENT SUPPLY					11,385			**11,385**
P 3	INSTRUMENT INSTALL			258	28,675	45,100		1,931	**75,707**
P 4	INSTRUMENT CALIBRATION			69	7,684			518	**8,201**
P 5	INSTRUMENT TUBING & STANDS			404	44,998	21,792		3,031	**69,821**
	ESTIMATE TOTALS			**731**	**$81,357**	**$78,277**		**$5,479**	**$165,113**

PROJECT CLIENT: **DUKE ENERGY**
PROJECT DESC: **EAST BEND - SFC**
PROJECT # : **88669.10**

SUMMARY
MISC DIRECTS

EST LEVEL: **STUDY**
ESTIMATE DUE DATE:
ESTIMATOR:

DESCRIPTION	LABOR		MATERIAL COST	SUBCON COST	EQUIPMENT RENT / STS	TOTAL COST
	MH	COST				
P 2 LABOR ADD-ONS						
P 3 HEAVY CRANES						
P 4 HEAVY HAUL / FREIGHT / TARRIFS						
P 5 UNDERGROUND WORK				175,000		**175,000**
P 6 CONSTRUCTION TESTING				75,000		**75,000**
P 7 CRAFT START-UP SUPPORT	750	87,127			5,625	**92,752**
ESTIMATE TOTALS	**750**	**$87,127**		**$250,000**	**$5,625**	**$342,752**

PROJECT CLIENT: **DUKE ENERGY**
PROJECT DESC: **EAST BEND - SFC**
PROJECT # : **88669.10**

SUMMARY INDIRECTS

EST LEVEL: **STUDY**
ESTIMATE DUE DATE:
ESTIMATOR:

DESCRIPTION		LABOR		MATERIAL COST	SUBCON COST	EQUIPMENT RENT / STS	TOTAL COST
		MH	COST				
P 2	CONSTRUCTION MGMT & INDIRECTS	9,210	2,016,000		80,000		**2,096,000**
P 3	ENGINEERING	8,897	1,422,535				**1,422,535**
P 4	START-UP	2,930	661,000		11,000		**672,000**
P 5	INSURANCE / SURETY / PERMITS						
P 6	WARRANTY				19,000		**19,000**
P 7	ESCALATION				376,738		**376,738**
	ESTIMATE TOTALS	**21,037**	**$4,099,535**		**$486,738**		**$4,586,273**

STAFF-DR-01-012

REQUEST:

Refer to the Direct Testimony of Daniel Hartmann ("Hartmann Testimony"), page 2. Explain Duke Kentucky's current process for collecting and handling of fly ash produced at East Bend. Explain what changes, if any, to this process will occur because of the wet bottom ash conversion project.

RESPONSE:

The fly ash and bottom ash are very different and are not handled together. Fly ash is collected dry from the electrostatic precipitator hoppers at East Bend Station. The ash is transferred by vacuum to an ash silo located next to the precipitator. The fly ash is then transferred by pressure to a storage silo located by the Waste Stabilization Plant which is approximately a half mile away. At the Waste Stabilization Plant, dewatered FGD scrubber solids are mixed with fly ash and lime to form a solid called Poz-o-Tec which is then placed in the landfill. The Poz-o-Tec sets up much like a low grade concrete. This system will not undergo any changes as a result of conversion to dry bottom ash.

PERSON RESPONSIBLE: Daniel Hartmann

Duke Energy Kentucky
Case No. 2016-00268
Staff's First Set Data Requests
Date Received: September 14, 2016

STAFF-DR-01-013

REQUEST:

Refer to the Hartmann Testimony, page 3. Fully explain the bottom ash, economizer ash and pyrites dewatering process after the Submerged Flight Conveyor system is installed.

RESPONSE:

The Submerged Flight Conveyor (SFC) will be located directly under the boiler where the current ash hopper is located. Bottom ash falls from the combustion process in the boiler into the water-filled, upper trough of the SFC that quenches, fractures, and cools the ash. The ash particles fall to the bottom of the SFC where chains and flights move the ash along the horizontal trough at the bottom of the SFC and up a dewatering ramp. At the top of the ramp, the ash falls through a discharge chute into a concrete bunker where it continues to dewater. Ash from the pile will be loaded into trucks for final disposal in the landfill. The flights continue through the lower (dry) chamber to the rear of the conveyor and then return to the upper trough. Economizer ash will continue to be collected in the economizer hoppers. The economizer ash will be transported by dry flight conveyor and discharged into the SFC where it will be collected with the dry bottom ash as explained above. The pyrites will be collected wet as they currently are and transported to the SFC and discharged. The pyrites will be collected with the bottom ash and economizer ash as described above. Currently, all three streams are sluiced to the ash pond.

PERSON RESPONSIBLE: Daniel Hartmann