ENTERPRISE TE PRODUCTS PIPELINE COMPANY LLC

December 13, 2013

Duke Energy Kentucky, Inc.
2100 Woodsdale Road
Trenton, Ohio 45067

Attention: Production Manager Woodsdale Station

Re: Todhunter Cavern Services Agreement

Reference is made to Section 14 of that certain Todhunter Cavern Service Agreement ("Agreement") entered into on the 31st of July, 2007, by and between Enterprise TE Products Pipeline Company LLC ("Enterprise"), as successor-in-interest, and Duke Energy Kentucky, Inc. ("Duke Kentucky").

In our letter to you of May 25, 2012, we informed you that, as a result of the loss of integrity in one of the Todhunter caverns, the Stored Capacity of Duke Kentucky would be reduced.

Since that time propane has been detected in the soil on our property. Enterprise has been working with local, state and federal agencies for over a year in an attempt to ascertain the area of the leaks, respond with safety initiatives in the area of the caverns, and test the integrity of the caverns. As of this date, we have been unable to successfully test these caverns, and it is apparent to Enterprise that it will be unable to satisfy the government agencies with respect to the caverns integrity. Enterprise is now proceeding to decommission all Todhunter caverns and, as a result, will no longer be able to provide Commercial Services to Duke Kentucky as defined in Section 3 of the Agreement. Enterprise anticipates that this force majeure event will continue through the remainder of the term of the Agreement.

Please do not hesitate to contact me if you have any questions regarding this notice.

Yours truly,

Russell Kovin
Vice President
Enterprise TE Products Pipeline Company LLC

Exhibit 7
Page 1 of 1

ITEM	EQUIPMENT NAME
1	FUEL OIL STORAGE TANK AND FOUNDATION
2	EARTHEN BERM CONTAINMENT
3	FUEL OIL MECHANICAL AND ELECTRICAL EQUIPMENT BUILDING
4	FUEL OIL TANK AREA FIRE PROTECTION VALVE AND FOAM ROOM
5	ROADWAY
6	FUEL UNLOADING SKID
7	HYDRANTS
8	OILY WATER SEPARATOR
11	FUEL OIL DRAIN TANK (6)
12	FUEL OIL PIPE TRENCH
13	UNDERGROUND FIRE PROTECTION PIPING
14	EXISTING UNDERGROUND DUCTBANK
15	HP FUEL OIL FORWARDING BUILDING
16	NEW FIRE PROTECTION BRANCH
17	TRUCK UNLOADING PAD
23	UNIT FOAM FIRE SUPPRESSION
26	PARKING
27	FUEL OIL ELECTRICAL EQUIPMENT BUILDING
28	EXISTING PROPANE STORAGE AREA
29	EXISTING PROPANE FLARE
30	EXISTING PROPANE TRUCK UNLOADING STATION

FOR PERMITTING PURPOSES ONLY

80' 0 80' 160' 240'
GRAPHIC SCALE

NORTH

FOR PERMIT APPLICATION

FUEL OIL SYSTEM ADDITION
SITE GENERAL ARRANGEMENT (PHOTO)

WOODSDALE GENERATING STATION

DUKE ENERGY.

DGN: AK
DFTR: AK
CHKD: -
ENGR: -
APPD: -

DATE: 04-27-2017

DRAWING NO. SK-GA-04272017
REVISION A

WDC00004-31 Woodsdale, Install Fuel Oil System

Estimate Charge Type (Power Plan)	Description	Total
AFUDC Debt (99970)	Power Plan - calculated labor loadings	$ 1,841,715
AFUDC Equity (99971)		$ 1,331
Company Labor - Exempt (11000)	PM, PE, Env-TGS-SME-Plant Support (2016 thru 2019)	$ 829,395
Company Labor - Union (11002)	Plant Support, Startup, Training (2018 & 2019)	$ 237,602
Company Material (21000)	Storeroom Supplies to Support Project, 2018 & 2019 (ie: valves, instr, flex conduit, piping & tubing fittings, ss tubing, elect matls, threaded rod, plugs, fire blanket, fire ext, safety supplies)	$ 256,788
Contract Labor (69000)	Scheduler, Elec Engr, Mech Engr, Ctls Engr, IM, Safety Specialist - 2017 thru 2019	$ 954,683
Contract Labor (69000)	Contract Labor-S&L Est (Demo, Civil, Concrete, Architectural, Painting & Coating, Mech Eqpt, Piping-Valves-Supports, Insulation, Elec Eqpt, Raceway-Cable-Conduit, Cable, Control & Instr)	$ 2,614,163
Contract Material (31000)	Contract Material-S&L Est (Civil, Concrete. Architectural, Painting & Coating, Piping, Insulation, Elect Eqpt, Raceway-Cable Tray-Conduit, Cable, Control & Instr, Escalation)	$ 4,304,652
Labor Loadings - Exempt (18001)	Power Plan - calculated labor loadings	$ 564,136
Labor Loadings - Union (18001)	Power Plan - calculated labor loadings	$ 133,033
Labor Loadings (18000)	Power Plan - calculated labor loadings	$ 596
Other	Subcontract L&M Cost - S&L Est(Ctls, Redundant Mech & Elec Eqpt & Associated Controls.$1.2M Fire Pr.)	$ 23,894,449
Other	Fuel Oil - Testing / Tuning / Commissioning / RATA	$ 3,491,341
Other	Subcontract - Process Eqpt + Construction Eqpt Amount	$ 1,434,220
Other	Construction Indirects, S&L Engineering, GE / Alstom Engineering	$ 5,999,678
Contingency	Contingency - S&L, Contingency - GE	$ 5,213,233
Overhead (78000)	Power Plan - calculated overhead	$ 1,815,149
Stores Loading Allocation (28002)	Power Plan - calculated overhead	$ 25,165
Retirements - Overhead (78000)	Power Plan - calculated overhead	$ (2,231)
Retirements	Demo Propane - Labor Cost + Constr Indirect & Contingency	$ 1,744,960
Retirements	Demo Propane - Subcontract Cost	$ 157,247
Retirements - Salvage (99416)	Demo Propane - Scrap Value	$ (61,969)
	Total Cost =	$ 65,449,337

Contract Labor - S&L Estimate	
$ 49,357	Demolition
$ 304,432	Civil Work
$ 212,517	Concrete
$ 3,490	Architechtural
$ 3,066	Paint & Coat
$ 574,456	Mech Eqpt
$ 1,063,871	Pip'g,Vlvs,Suppt
$ 12,284	Insulation
$ 118,141	Elec Eqpt
$ 235,778	Raceway,Cable Tray,Conduit
$ 33,478	Control & Instrumentation
$ 3,293	Misc
$ 2,614,163	Total

Contract Material - S&L Estimate	
$ 488,304	Civil Work
$ 796,011	Concrete
$ 11,000	Architechtural
$ 1,120	Paint & Coat
$ 1,292,850	Piping
$ 4,898	Insulation
$ 353,515	Electrical Equipment
$ 138,114	Raceway,Cable Tray,Conduit
$ 358,184	Cable
$ 715,000	Control & Instrumentation
$ 145,656	Escalation
$ 4,304,652	Total

Mechanical Equipment -S&L Estimate	
$ 5,000	Fire extinguishers
$ 5,700,000	(2) 2.54M gal F.O. tanks
$ 12,241,404	GE/Alstom - CT Fuel Conversion
$ 17,946,404	Total

Subcontract L&M - S&L Estimate	
$ 10,000	Civil Work
$ 10,230	Concrete
$ 17,946,404	Mech Eqpt
$ 20,000	Piping
$ 5,000	Insulation
$ 140,000	Electrical Equipment
$ 18,131,634	Total

↓

$ 18,453,634	Subcontract Cost - S&L Estimate
$ 1,600,000	Fuel Oil Controls
$ 1,838,400	Redund.Mech & Elec Eqpt (Ctls Exclud'd)
$ 1,200,000	Foam Fire Protection Systems
$ 85,000	FRP Plan & Permitting ($ 60K + $ 25K)
$ 717,415	Escalation
$ 23,894,449	Total

Fuel Oil Used - Gallons & Cost Estimate
RATA testing - (3) 12 hr days full load
6 units; 1,100 mmBTU/hr : 1,709,352 gal
Test/tune - 130,000 gal/unit; 780,000 gal
2,489,352 gal x 0.139 mmBTU/gal x
$10.09/mmBTU = $ 3,491,341

Equipment - S&L Estimate	
$ 14,864	Demolition
$ 120,007	Civil Work
$ 75,556	Concrete
$ 982	Architectural
$ 431	Painting & Coating
$ 118,171	Mech Eqpt
$ 320,843	Piping
$ 35,567	Elec Eqpt
$ 6,246	Raceway,Cable Tray,Conduit
$ 38,943	Cable
$ 1,253	Control & Instrumentation
$ 732,863	Total

Process Equipment - S&L Estimate	
$ 77,500	F.O. forwarding pump skid
$ 198,000	(4) F.O. unloading pump skids
$ 297,000	(6) F.O. Elec htrs w/ctl panel
$ 75,000	Oil / Water separator
$ 647,500	Total

$ 734,594	Equipment
$ 647,500	Process Eqpt
$ 52,126	Escalation
$ 1,434,220	Total

Construction Indirects - S&L Estimate	
$ 163,492	Labor Supervision
$ 54,497	Show-up Time
$ 533,127	Cost Due to OT 5-10's
$ 589,838	Construction CM
$ 362,590	Field Office Expenses
$ 91,906	Pre-Operational Testing
$ 75,484	Site Services
$ 44,231	Temporary Facilities
$ 48,469	Temporary Utilities
$ 46,615	Mobilization/Demob
$ 6,886	Legal Expenses/Claims
$ 88,286	Small Tools & Consumables
$ 29,429	Scaffolding
$ 29,429	General Liability Insurance
$ 7,298	Constr. Equip. Mob/Demob.
$ 205,015	Freight on Material
$ 696,709	Contractors G&A
$ 995,298	Contractors Profit
$ 4,068,599	Total

Construction Indirects & Engineering	
$ 4,126,735	Contruction Indirects
$ 951,943	Engineering - S&L
$ 877,000	Engineering - GE
$ 5,955,678	Total

Contingency on S&L Estimates	
$ 172,236	Contingency on Constr.Eqpt
$ 1,007,443	Contingency on Material
$ 1,156,665	Contingency on Labor & SO
$ 999,516	Contingency on Subcontr.
$ 129,500	Contingency on Process Eq.
$ 190,389	Contingency on Indirects
$ 3,655,749	Total

Contingency	
$ 3,655,749	Contingency - S&L Estimate
$ 1,557,484	Contingency - GE / Alstom
$ 5,213,233	Total

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	)	Case No. 2017-00186
Necessity for Construction of a Number 2	)	
Distillate Fuel Oil System at the Company's	)	
Woodsdale Natural Gas-Fired Generating	)	
Station	)	

DIRECT TESTIMONY OF

JOSEPH A. MILLER, JR.

ON BEHALF OF

DUKE ENERGY KENTUCKY, INC.

May 31, 2017

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I. INTRODUCTION AND PURPOSE

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Joseph A. Miller Jr., and business address is 526 South Church Street, Charlotte, North Carolina.

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

A. I am Vice President of Central Services for Duke Energy Business Services, LLC (DEBS). DEBS 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 graduated from Purdue University with a Bachelor of Science degree in Mechanical Engineering. I also completed twelve post-graduate level courses in Business Administration at Indiana State University. My career with Duke Energy began with Duke Energy Indiana, LLC., (Duke Energy Indiana) f/k/a Public Service of Indiana, in 1991 as a staff engineer at Duke Energy Indiana's Cayuga Generating Station. Since that time, I have held various roles of increasing responsibility in the generation engineering, maintenance, and operations areas, including the role of station manager, first at Duke Energy Kentucky's East Bend Generating Station (East Bend), followed by Duke Energy Ohio's Zimmer Generating Station. I was named General Manager of Analytical and Investments Engineering in 2010 and became General Manager of Strategic Engineering in 2012 following the merger between Duke Energy and Progress Energy, Inc. I became the Vice President of Central Services in 2014.

Q. WHAT ARE YOUR DUTIES AS VICE PRESIDENT OF CENTRAL SERVICES?

A. In this role, I am responsible for providing engineering, environmental compliance planning, generation and regulatory strategy, technical services, and maintenance services, for Duke Energy's fleet of fossil, hydroelectric, and solar (collectively, "Fossil/Hydro") facilities.

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

A. Yes. Most recently, I provided testimony in support of the Company's application to convert the existing wet bottom ash handling system at East Bend to a dry ash disposal system in Case No. 2016-00268.

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

A. I will provide an overview of the Company's two electric generating stations, East Bend Unit 2 (East Bend) and the six-unit Woodsdale natural gas combustion turbine station (Woodsdale). I also provide a summary of the need for the Company's proposal to construct an ultra-low sulfur diesel distillate dual fuel system at Woodsdale (ULSD Fuel System).

II. GENERAL DESCRIPTION OF DUKE ENERGY KENTUCKY'S GENERATING STATIONS

Q. PLEASE DESCRIBE EAST BEND.

A. East Bend is a 648 megawatt (MW) (nameplate rating) coal-fired base load unit located along the Ohio River in Boone County, Kentucky, that was commissioned in 1981. Previously, Duke Energy Kentucky jointly owned East Bend with the Dayton Power and Light Company (DP&L). Duke Energy Kentucky now owns 100 percent of the station, having purchased DP&L's 31 percent interest in the station in 2014.

The nameplate ratings are the ratings provided by the manufacturer of the generating equipment and these ratings are actually engraved on a nameplate that is affixed to the equipment. The net ratings represent the net amount of power that we can dispatch from the plants after some portion of the gross power output is used to power the plant machinery. The net rating for East Bend is 600 MW. The station has river facilities to allow barge deliveries of coal and lime. East Bend is designed to burn eastern bituminous coal. The Company maintains a fuel reserve through an onsite coal pile and manages the inventory to maintain an approximate 45-day supply of coal.

The major pollution control features are: 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 an ash pond, which together are used for the storage and disposal of waste products resulting from the Company's FGD system and other waste material.

Q. PLEASE DESCRIBE WOODSDALE.

A. Woodsdale is a six-unit, simple cycle, combustion turbine (CT) station located in Butler County, Ohio, just north of Cincinnati, with a collective net winter capability of 564 MW and a net summer capability of 492 MW (including inlet cooling). Woodsdale was designed to provide peaking service and to have black start and dual fuel capability. Woodsdale's primary fuel source is natural gas provided through a connection to the Texas Eastern Transmission Company (TETCO), which transports the natural gas to supply the station. Although the station previously had a connection to Texas Gas Transmission Company (TGT), such is no longer the case. The Texas Gas pipeline connection is no longer usable. This is due to the physical location of the station on the TGT system and the pipeline's inability to guarantee minimum gas pressures desired to serve Woodsdale. The TGT interconnection is simply not a viable, reliable, or reasonable source of natural gas supply to the station. The restrictions placed upon Woodsdale by TGT made the source not usable for the station and continued investment and maintenance of the connection became unreasonable.

Q. PLEASE EXPLAIN WHY WOODSDALE BEING DESIGNED FOR PEAKING CAPABILITY IS SIGNIFICANT.

A. By design, peaking units run infrequently for short periods to meet peak demand. As a result peaking units have a much lower capacity factor than base load units or intermediate load units. As Duke Energy Kentucky witness Mr. John Verderame describes in his direct testimony, Woodsdale, like most natural gas CTs are generally dispatched in response to market price signals. These units have great flexibility in terms of operation and can start, ramp up and down very quickly in response to changes in the energy markets and reliability. Consequently, their higher production cost versus a base load coal station like East Bend or an intermediate combined cycle generating station makes Woodsdale (and all peaking units) fall higher on the list in terms of resource dispatch stacking.

Q. WHAT IS BLACK START CAPABILITY?

A. Black start capability means that the station has the ability to initiate a recovery of a substantial portion of load without relying on energy from outside sources if the regional grid experiences a blackout. The black start capability is initiated by an Allison 501-KB gas turbine that serves as a back-up power source and allows the station to start generating energy without power from the electric grid.

Q. PLEASE EXPLAIN WOODSDALE'S DUAL FUEL CAPABILITY.

A. Woodsdale's dual fuel capability means that the station has the flexibility to operate on more than one fuel source. Previously the dual fuel capability was provided through the individual CT's ability to burn both natural gas and propane.

The propane dual fuel service was originally selected due to direct pipeline access to the nearby Todhunter Propane Storage Cavern (Todhunter). Todhunter was most recently owned and operated by, Enterprise TE Products Pipeline Company LLC (Enterprise). In 2007, following Duke Energy Kentucky's acquisition of Woodsdale, Duke Energy Kentucky and Enterprise entered into a propane service agreement where Enterprise agreed to store propane for Duke Energy Kentucky and deliver that propane to Woodsdale.

Q. IS PROPANE STILL VIABLE AS A SECONDARY FUEL FOR WOODSDALE?

A. No. In mid 2012, Enterprise notified Duke Energy Kentucky that it was experiencing cavern integrity issues and had to reduce the amount of storage available to the Company. Then in late 2013, Enterprise, citing a force majeure event, notified Duke Energy Kentucky that the Todhunter Cavern needed to be closed and permanently decommissioned due to structural integrity issues. Exhibit 6 is a copy of the letter the Company received from Enterprise.

Q. DID THE RETIREMENT AND CLOSURE OF THE TODHUNTER CAVERN HAVE AN IMMEDIATE IMPACT ON WOODSDALE'S OPERATION?

A. Initially, the loss of access to Todhunter Cavern was of little consequence to the Company. Duke Energy Kentucky only maintained the propane as a secondary fuel in the event of an emergency. The interruptible natural gas contract was a sufficient primary fuel source. The Company also maintained a level of onsite propane tank storage that provided approximately five hours of continuous burn for the station. This onsite propane storage could provide a sufficient cushion for limited station operation in the event of an emergency.

However, as explained by Mr. Verderame, recent rule changes in PJM Interconnection LLC (PJM), have caused the Company to look at fuel certainty and asset performance and maintenance practices with a new light. The design of Woodsdale as a peaking unit with low capacity factors does not support acquiring firm natural gas transportation through the available natural gas interstate pipelines. This has lead the Company to the conclusion that a new secondary fuel source is necessary for the Woodsdale station to continue operation and to qualify as a resource that the Company can continue relying upon to serve its Kentucky load in PJM.

Q. CAN THE COMPANY SIMPLY RELY UPON ITS EXISTING PROPANE SYSTEM TO MEET THESE NEW PJM RULES?

A. Unfortunately, this propane system is not sufficient to meet these new rules. Because of the loss of the ready access to propane, Woodsdale has essentially lost meaningful dual fuel capability. The station has limited onsite propane storage capability for sufficient propane reserves to run Woodsdale for more than a couple of hours.

The Company currently has only one Woodsdale unit that is rated to use propane. This is because once the propane cavern was decommissioned; the Company could no longer perform the required testing to enable continued use of propane as a second fuel for all six Woodsdale units. Even though the Company has limited onsite storage of propane, once the Company uses this stored fuel, it would be extremely expensive, difficult and time consuming to replenish this supply. Therefore, in order to maintain the availability of a back-up fuel supply for as long as possible and preserve the dual fuel capability, the Company did not perform the turbine testing to continue secondary propane as a fuel for all six of the units.

Refueling the onsite propane storage tanks is simply not economically or logistically feasible in a manner that can keep Woodsdale online in the event of an emergency. The Company simply cannot get propane fuel trucks into the station to offload propane fast enough during station operation. With the closure of the Todhunter Cavern, propane is no longer a locally available source of fuel. Additionally, because of the close relationship between propane and natural gas commodities in term of use and pricing, where there is a constraint on the ability to receive natural gas, so will there likely be a constraint on the propane supply. As I explain later in my testimony, and as further supported by Mr. Verderame, as a result of this change in circumstances and the need to meet new capacity performance requirements that exist in the PJM markets, the Company is seeking authorization to construct a new dual fuel system for Woodsdale.

III. DUKE ENERGY KENTUCKY'S CPCN PROPOSAL TO CONSTRUCT A ULSD FUEL SYSTEM AT WOODSDALE

Q. PLEASE DESCRIBE DUKE ENERGY KENTUCKY'S CPCN PROPOSAL TO CONSTRUCT A ULSD FUEL SYSTEM AT WOODSDALE.

A. As more fully explained by Duke Energy Kentucky witness Troy Wilhelm, the scope of the Woodsdale dual fuel project is to design, plan, construct, and commission a new ULSD Fuel System as the secondary fuel to natural gas for Woodsdale. The ULSD Fuel System includes equipment for unloading, storage, forwarding, and firing system for each of Woodsdale's six CTs. As further supported by Mr. Wilhelm, the ULSD Fuel System deliverables include fuel oil block hardware, burner modifications hardware, CT fuel oil drain system hardware, fuel oil piping, fuel oil pumping equipment, all necessary fire protection and detection, instrument air, service air, foundations, fuel oil storage tanks, earthen berm oil containment with drainage and oil/water separator, roadwork and paving, storm water drainage, pre-engineered buildings with HVAC, electrical, heat trace, cathodic protection, instrumentation/controls and NERC CIP considerations. The project scope also includes removal of the existing and no longer usable propane boilers on each CT to utilize the buildings for the new fuel oil blocks and oil preheaters.

The major fuel preparation and control components related to the now obsolete propane system will be removed or included in demolition. Any propane piping or propane storage tanks not removed or not included in the demolition will be decommissioned per environmental standards, blanked off, and evaluated for either full removal or abandonment in place. This includes the 4.1 mile propane supply pipeline from the Todhunter caverns to Woodsdale that must be abandoned due to the cavern closure. Exhibits 5 and 7 to the Company's application include maps depicting the location of the ULSD Fuel System at Woodsdale. Exhibit 5 is the Duke Energy-Woodsdale Station Fuel Oil System Installation Project Preliminary Engineering Report (Report). The Report also contains the copy of the drawings, specifications and schematics for the construction of the ULSD Fuel System that are stamped by a licensed Kentucky Engineer.

Because the construction is located on Duke Energy Kentucky property, it will not interfere with any other jurisdictional utilities' operations.

Q. WHAT IS THE DRIVING FACTOR FOR THE NEED TO CONSTRUCT A ULSD FUEL SYSTEM AT WOODSDALE?

A. Duke Energy Kentucky witness Mr. Verderame fully explains the need for the ULSD Fuel System in his direct testimony. In summary, the need for a ULSD Fuel System is a result of a change in PJM's rules for capacity performance that occurred in 2015 and 2016 as a result of the 2014 Polar Vortex. As a natural-gas fired CT, Woodsdale does not presently have a multiple-day available fuel source on site like a coal-fired generator such as East Bend. Although Woodsdale is connected to one interstate natural gas pipeline and is in close proximity to two others, firm transportation to the station was not the most economical solution in the long term to solving the fuel certainty needs for meeting capacity performance. As an interruptible transportation customer, the station is subject to natural gas flow restrictions on those natural gas pipelines making sole reliance upon natural gas as a fuel infeasible from both a practical and economic standpoint. Mr. Verderame explains the analysis the Company undertook to arrive at the decision that a ULSD Fuel System presented the best strategy in terms of cost and reliability for meeting capacity performance standards.

Q. DOES DUKE ENERGY KENTUCKY NEED DUAL FUEL AT WOODSDALE TO COMPLY WITH PJM CAPACITY PERFORMANCE RULES?

A. Duke Energy Kentucky understands that there is an expectation by PJM that all members will take action to ensure that their generation complies with its Capacity Performance construct. These compliance requirements are non-descript and is essentially an ex-post facto determination based upon whether or not a station performs when called upon. The strategies to ensure compliance are left to the individual utilities. But fuel certainty is a minimum expectation. The Company explored numerous possible strategies to provide Woodsdale with fuel certainty and has determined that a back-up fuel source, along with normal asset investments and maintenance schedules should be sufficient to allow the Company to meet PJM's capacity performance standards.

Q. WHAT WOULD HAPPEN IF DUKE ENERGY KENTUCKY TOOK NO ACTION AT WOODSDALE IN TERMS OF COMPLIANCE WITH PJM CAPACITY PERFORMANCE ACTIONS?

A. Mr. Verderame explains this fully in his testimony but, in summary, the Company could face significant financial assessments and lose the ability to use Woodsdale to meet any of its Kentucky customer's load obligations or to satisfy the Company's commitments to PJM. Per PJM's rules, by 2020, all capacity in PJM must meet capacity performance expectations. This includes capacity that is bid into the PJM Base Residual Auctions as well as, any capacity used as part of a Fixed Resource Requirement (FRR) plan. If Woodsdale does not qualify for capacity performance, the Company would have an immediate annual capacity deficiency of approximately 460 MWs in its FRR Plan on file with PJM. The Company would be required to remedy the deficiency with bilateral purchases of unit-specific complying capacity or face significant financial penalties.

Q DID DUKE ENERGY KENTUCKY CONSIDER ANY ALTERNATIVES TO THE ULSD FUEL SYSTEM TO MEET PJM CAPACITY PERFORMANCE REQUIREMENTS?

A. Yes. The Company evaluated many alternative strategies, including, but not limited to, Firm Gas transportation, options for leaving PJM, becoming a full PJM capacity auction participant, and using ethane pipelines as a back-up. Each of the strategies examined had additional costs, feasibility issues, economic risks to customers, and risks in terms of reliability or other operational constraints that made the proposed ULSD Fuel System the best alternative. Mr. Verderame discusses the Company's evaluation of these alternative strategies in his testimony.

Q. DOES DUKE ENERGY KENTUCKY HAVE ALL NECESSARY PERMITS TO CONSTRUCT THE ULSD FUEL SYSTEM AT WOODSDALE?

A. As Duke Energy Kentucky witness, Andrew Roebel explains, fuel oil combustion is currently reflected in the station's Title V permit. Given the existing station permits reflect the unit's ability to combust fuel oil and based on review of applicable regulations and initial discussions with Ohio Environmental Protection Agency (Ohio EPA) representatives, installation of fuel oil combustion hardware on the units will not trigger the need for any significant construction related permits.

Q. **HOW WILL DUKE ENERGY KENTUCKY CONSTRUCT THE ULSD FUEL SYSTEM AT WOODSDALE?**

A. Materials and labor will come from a variety of sources and will utilize a variety of contracting strategies. Most of the balance of plant components such as oil tanks, fuel skids, fuel piping, fire protection, demolition of propane tank/storage facilities and miscellaneous electrical work will be sourced using the competitive bidding process. The upgrades to the combustion system will be single sourced to GE-Alstom and the controls portion of work is expected to be awarded to Emerson Controls using Duke Energy's existing alliance agreements that provide favorable pricing across the Duke Energy enterprise and for use in all jurisdictions. In all cases, the method which is perceived to be most beneficial to Duke Energy and its customers will be used. A summary of the anticipated sources of construction is as follows:

- 50% - Competitive Bid (firm price) - Balance of plant and propane system demolition
- 30% - Single Source - GE-Alstom combustion system
- 12% - Duke Labor, project support, overheads
- 5% - Alliance - Controls, site support services
- 3% - Outside engineering support

As further discussed by Mr. Wilhelm, the Company is anticipating commencing construction activities in the first quarter of 2018 with a goal to have two units in service in the fourth quarter of 2018, and the remaining Woodsdale units completed and in service in the first and second quarter of 2019, in time for the capacity performance deadline.

Q. WILL THE CONSTRUCTION OF THE ULSD FUEL SYSTEM AT WOODSDALE ADVERSELY IMPACT THE OPERATION OF THE STATION?

A. Not at all. In fact, it is the Company's belief that a secondary fuel source other than propane will provide additional availability for Woodsdale that does not currently exist due to the lack of sufficient propane supplies and ability to deliver propane in the event of a curtailment on the natural gas pipeline.

Q. WHAT IS THE FULLY LOADED ESTIMATED COST OF CONSTRUCTION AND ONGOING OPERATION?

A. The estimated fully-loaded cost of construction for the project is approximately $55 million. The non-fuel estimated ongoing cost of operation is approximately $100,000 per year. The facility will require annual testing and fuel replenishing. The Company estimates the total yearly average of fuel oil usage to be approximately 976,000 gallons/year. Depending upon the price of fuel, the Company anticipates an annual fuel expense of approximately $1.7 million to $2.7 million per year. Mr. Wilhelm discusses and supports these cost estimates in his testimony.

Q. HOW DOES DUKE ENERGY KENTUCKY PROPOSE TO FINANCE THE CONSTRUCTION OF THE ULSD FUEL SYSTEM?

A. Company witness William Don Wathen explains in his direct testimony that the Company will eventually seek recovery of these costs in accordance with the Commission's rules and regulations as part of a future rate proceeding.

IV. FILING REQUIREMENTS SPONSORED BY WITNESS

Q. PLEASE DESCRIBE THE FILING REQUIREMENTS YOU SPONSOR.

A. I sponsor portions of the Report included in Exhibit 5 that address the need and scope of the ULSD Fuel System project. I also sponsor Exhibit 6, the letter informing the Company that the propane caverns that formerly supplied back-up fuel supply to Woodsdale would be decommissioned.

V. CONCLUSION

Q. WAS EXHIBIT 5 TO THE COMPANY'S APPLICATION PREPARED BY AT YOUR DIRECTION AND UNDER YOUR CONTROL AND SUPERVISION?

A. Yes.

Q. IS EXHIBIT 6 TO THE COMPANY'S APPLICATION A TRUE AND ACCURATE COPY OF THE LETTER INFORMING DUKE ENERGY KENTUCKY OF THE TODHUNTER PROPANE CAVERN DECOMMISSIONING?

A. Yes.

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

A. Yes.

VERIFICATION

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

The undersigned, Joseph A. Miller, Jr., Vice President of Central Services for Duke Energy Businees Services, LLC, being duly sworn, deposes and says that he has personal knowledge of the matters set forth in the foregoing testimony and that it is true and correct to the best of his knowledge, information and belief.

Joseph A. Miller, Jr., Affiant

Subscribed and sworn to before me by Joseph A. Miller, Jr. on this 27 day of April, 2017.

EVELYN G ROSEMAN NOTARY PUBLIC MECKLENBURG COUNTY, NC

Evelyn G. Roseman
NOTARY PUBLIC

My Commission Expires: Aug 18, 2019

COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In The Matter of:

The Application of Duke Energy Kentucky, Inc., for a Certificate of Public Convenience and Necessity for Construction of a Number 2 Distillate Fuel Oil System at the Company's Woodsdale Natural Gas-Fired Generating Station	))))))	Case No. 2017-00186

DIRECT TESTIMONY OF

JOHN A. VERDERAME

ON BEHALF OF

DUKE ENERGY KENTUCKY, INC.

May 31, 2017

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I. INTRODUCTION

Q. STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is John A. Verderame, and my business address is 526 S. South Church Street, Charlotte, North Carolina 28202.

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

A. I am employed by Duke Energy Progress, Inc. (Duke Energy Progress) as Managing Director, Power Trading and Dispatch. Duke Energy Progress is the utility formerly known as Progress Energy Inc., (Progress Energy) located in North and South Carolina. As part of the merger integration process, Duke Energy Progress now provides various administrative and other services to the regulated affiliated companies within Duke Energy Corporation (Duke Energy Corp.), including Duke Energy Kentucky, Inc., (Duke Energy Kentucky or the Company).

Q. PLEASE DESCRIBE BRIEFLY YOUR EDUCATION AND PROFESSIONAL EXPERIENCE.

A. I received a Bachelor of Arts degree in Economics from the University of Rochester in 1983, and a Masters in Business Administration in Finance from Rutgers University in 1985. I have worked in the energy industry for 16 years. Prior to that, from 1986 to 2001, I was a Vice President in the United States (US) Government Bond Trading Groups at the Chase Manhattan Bank and Cantor Fitzgerald. My responsibilities as a US Government Securities Trader included acting as the Firm's market maker in US Government Treasury securities. I joined Progress Energy, in 2001, as a Real-Time Energy Trader. My responsibilities as a

Real-Time Energy Trader included managing the real-time energy position of the Progress Energy regulated utilities. In 2005, I was promoted to Manager of the Power Trading group. My role as manager included responsibility for the short-term capacity and energy position of the Progress Energy regulated utilities in the Carolinas and Florida.

In 2012, upon consummation of the merger between Duke Energy Corp. and Progress Energy, Progress Energy became Duke Energy Progress and I was promoted to my current position.

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

A. Yes. I have previously testified in the Company's Fuel Adjustment Clause proceedings as well as other cases that have involved the Company's participation in energy and capacity markets.

Q. PLEASE SUMMARIZE YOUR DUTIES AS MANAGING DIRECTOR, POWER TRADING AND DISPATCH.

A. As Managing Director, Power Trading and Dispatch of Duke Energy Progress, I am responsible for Power Trading and Generation Dispatch on behalf of the Company's regulated utilities in the Carolinas, Florida, Indiana, Ohio, and Kentucky. I am primarily responsible for Duke Energy Kentucky's generation dispatch, unit commitment, 24-hour real-time operations, and plant communications related to short-term generating maintenance planning. I lead the team responsible for managing the Company's capacity position with respect to meeting its Fixed Resource Requirement (FRR) obligation as a member of PJM

Interconnection, L.L.C. (PJM), for the submission of the Company's supply offers and demand bids in PJM's day-ahead and real-time electric energy (collectively, Energy Markets) and ancillary services markets (Ancillary Services Markets), as well as managing the Company's short-term and long-term supply position to ensure that the Company has adequate economic resources committed to serve its retail customers' electricity needs. In that respect, my teams are also responsible for any financial hedging done to mitigate exposure to short-term energy prices and congestion risks.

Q. WHAT IS THE PURPOSE OF YOUR DIRECT TESTIMONY?

A. The purpose of my testimony is to support the Company's proposal and need to construct a new back-up fuel system consisting of ultra-low sulfur diesel (ULSD) burning capability at the Woodsdale Generating Station (ULSD Fuel System), located in Trenton, Ohio, to meet PJM's Capacity Performance (Capacity Performance) criteria, the risks to customers of non-compliance, and the analysis that was performed to arrive at the conclusion that the ULSD Fuel System was, on balance, the most reasonable strategy to meet that need.. In doing so, I provide an overview of PJM in terms of its capacity market and how the Company operates as a FRR entity in PJM. I discuss PJM's Capacity Performance structure and why it was implemented. I then discuss the Company's need to construct the ULSD Fuel System and how the Company analyzed various strategies for Capacity Performance compliance, alternatives to remaining in PJM, and managing non-performance risks. This discussion details how Duke Energy Kentucky ultimately concluded, upon a balancing of the various risks, including likelihood of strategies meeting minimum compliance requirements, mitigating risks of non-performance, operating impacts, feasibility, and where possible a quantification of long-term and short term capital and operating and maintenance costs, that the ULSD Fuel System was the optimal solution. Finally, I summarize the presented opportunities and risks.

II. DUKE ENERGY KENTUCKY'S OPERATIONS IN PJM

A. OVERVIEW OF PJM

Q. PLEASE GENERALLY DESCRIBE PJM.

A. PJM is the nation's first fully functioning Regional Transmission Operator (RTO) that operates the power grid and wholesale electric market for all or parts of thirteen states and the District of Columbia. The PJM electric market consists of energy markets, capacity markets, ancillary services markets, and a financial transmission rights (FTR) market. PJM's operation is governed by agreements approved by the Federal Energy Regulatory Commission (FERC) including the Operating Agreement, Open Access Transmission Tariff (OATT),[1] and the Reliability Assurance Agreement (RAA).[2] As a member of PJM, Duke Energy Kentucky is subject to these agreements, which among other things, require Duke Energy Kentucky to offer all of its available generation to PJM through its Capacity Market, Energy Markets, and Ancillary Services Markets; and to provide sufficient customer capacity and purchase customer energy load from the PJM Day-Ahead or Real-Time Energy Markets.

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[1] http://www.pjm.com/media/documents/merged-tariffs/oatt.pdf (last visited May 9, 2017)
[2] http://www.pjm.com/media/documents/merged-tariffs/raa.pdf (last visited May 9, 2017).

Q. PLEASE BRIEFLY DESCRIBE THE PJM ENERGY MARKET.

A. PJM administers its Energy Markets utilizing locational marginal pricing (LMP). LMP can be broadly defined as the value of one additional megawatt of energy at a specific point on the electric grid. In PJM, the LMP is composed of three components: the system energy price, the marginal congestion price, and the marginal loss price. Both the Day-Ahead and Real-Time Energy Markets are based on supply offers and demand bids submitted to PJM by market participants, including both generator owners (as sellers) and load serving entities (as buyers). The Day-Ahead Energy Market provides a means for market participants to mitigate their exposure to price risk in the Real-Time Energy Market. The Day-Ahead Energy Market also provides meaningful information to PJM regarding expected real-time operating conditions for the next day, which enhances PJM's ability to ensure reliable operation of the transmission system. The Real-Time Energy Market functions as a balancing market between generation and load in real-time. Through the PJM Energy Market and the LMP price signals, PJM provides a market-based solution to value, and thus manage energy production, transmission congestion, and marginal losses in the PJM region.

Q. PLEASE DESCRIBE THE PJM CAPACITY MARKET.

A. PJM's capacity market is called the Reliability Pricing Model (RPM). The purpose of RPM is to provide a market construct that enables PJM to secure adequate generation resources to meet the reliability needs of the RTO. The RPM construct and the associated rules regarding how PJM members participate in the PJM Capacity Market is described within the PJM OATT and RAA. The PJM

Capacity Market operates on a planning period that spans twelve months beginning June 1st and ending May 31st of each year (Delivery Year). In PJM, the Capacity Market structure is intended to provide transparent forward market signals that support generation and infrastructure investment. There are two ways for a PJM member to participate in the RPM capacity structure: 1) through the RPM baseline procurement auctions; or 2) as a self-supply FRR entity.

Q. PLEASE DESCRIBE THE BASELINE PROCUREMENT AUCTION PROCESS.

A. The baseline procurement auction is called a base residual auction (BRA). BRAs are conducted three years in advance of the actual Delivery Year in order to allow bidders to complete construction of projects that clear the BRA. The PJM Capacity Market is designed to provide incentives to encourage the development of generation, demand response, energy efficiency, and transmission solutions through capacity forward-looking market payments.

Another important component of RPM is that price signals are locational, and designed to recognize and quantify the geographical value of capacity. PJM divides the RTO into multiple sub-regions called locational delivery areas (LDA) in order to model the locational value of generation.

Q. PLEASE BRIEFLY EXPLAIN PJM'S FRR PROCESS.

A. The PJM OATT and RAA specify the obligations and compensation to load serving entities (LSE) for supplying capacity. The FRR process is an alternative capacity strategy to the BRA for a PJM LSE such as Duke Energy Kentucky to satisfy its customer capacity obligation under the PJM RAA. Under the FRR construct, an LSE must annually submit a preliminary capacity plan (FRR Plan) that identifies the unit-specific capacity resources (generating or demand response) that the LSE will use to meet load obligations (including reserves) for the Delivery Year three years forward. The FRR entity must also prepare its final FRR Plan for the upcoming delivery-year that again, identifies the unit specific resources that will be used to satisfy the FRR load obligation. Both of these FRR Plan submittals must meet the PJM-defined customer capacity obligation. The FRR process allows the LSE to match its customer reliability requirement to its own generation, demand response, energy efficiency and/or transmission resources, while still being permitted to sell some or all of its excess supply into RPM.

B. DUKE ENERGY KENTUCKY'S OPERATIONS IN PJM

Q. PLEASE EXPLAIN HOW THE COMPANY MEETS ITS ENERGY NEEDS THROUGH THE PJM ENERGY MARKET.

A. Consistent with its PJM membership, the Company meets all of its energy needs through the PJM Energy Markets and does not purchase any energy outside of PJM. Through PJM's Day-Ahead Energy Market, market participants can mitigate their exposure to real-time price risk by selling available generation and purchasing forecasted demand in the Day-Ahead Energy Market. Duke Energy Kentucky submits demand bids and supply offers as both a load serving entity and a generator owner, respectively. Thus, the Company simultaneously functions as both a buyer and seller to serve its retail electric customers.

Q. HOW DOES DUKE ENERGY KENTUCKY PARTICIPATE IN PJM'S RPM CAPACITY MARKET STRUCTURE?

A. Duke Energy Kentucky participates in the RPM as an FRR entity. This is consistent with the Commission's Order in Case No. 2010-00203 whereby the Commission required the Company to participate in PJM as an FRR entity until such time as it received Commission approval to participate in the PJM capacity auctions. To date, Duke Energy Kentucky has not requested such permission, but will do so if the Company determines that a change would be in the best interests of its customers and should be made. The Company continues to evaluate the merits of exiting the FRR and becoming a full RPM auction participant.

As an FRR entity, Duke Energy Kentucky annually submits both a preliminary and a final FRR Plan to PJM that identifies specific resources to satisfy its load obligations.

Q. PLEASE EXPLAIN WHAT BEING AN FRR ENTITY MEANS FOR DUKE ENERGY KENTUCKY.

A. As an FRR entity, Duke Energy Kentucky must secure and commit unit-specific generation resources to meet the peak load capacity requirements for all of its customers in advance of the PJM's annual BRA through its FRR Plan. Presently, the load requirements include both the forecasted load of Duke Energy Kentucky's customers, as well as the reserve requirement for that load mandated by PJM.

Q. FOR WHICH UPCOMING DELIVERY YEARS HAS DUKE ENERGY KENTUCKY ALREADY SUBMITTED FRR PLANS TO PJM TO MEET ITS KENTUCKY CUSTOMER LOAD OBLIGATIONS?

A. As the FRR plan timeline follows the RPM auction timeline, the Company has already submitted its initial FRR Plan for the delivery period spanning June 1, 2020, through May 31, 2021, and will adjust its final FRR plan for the delivery period spanning June 1, 2017, through May 31, 2018.

The Duke Energy Kentucky FRR capacity plan currently includes East Bend 2 and Woodsdale generating stations, some demand response, as well as any bilateral capacity purchases required to meet customer demand. Duke Energy Kentucky would face severe penalties and limitations on its ability to choose the FRR option if PJM were to deem either its initial or final FRR plans to be insufficient or its generation otherwise non-compliant with PJM requirements.

C. RECENT CHANGES TO THE PJM CAPACITY MARKET

Q. PLEASE EXPLAIN THE RECENT CHANGES TO THE CAPACITY MARKET CONSTRUCT THAT PJM HAS IMPLEMENTED.

A. In a stated effort to improve the reliability of generating resources in the PJM footprint, PJM has redesigned the RPM construct with the newly coined "Capacity Performance" construct. In doing so, it is redefining its capacity products and proposing new performance-based incentives and assessments for non-performance. With Capacity Performance, PJM is adopting a "no-excuses" policy in order to improve reliability.[3] Specifically, PJM established two classes of capacity, "Capacity Performance" Capacity and for a limited transitional period, "Base Capacity." Also during the transitional period the current annual capacity product will continue to exist for FRR participants.

Q. WHAT IS THE DISTINCTION THAT PJM HAS CREATED FOR CAPACITY PERFORMANCE RESOURCES VERSUS THE PRE-CAPACITY PERFORMANCE ANNUAL CAPACITY PRODUCT?

A. Complying capacity performance resources must be capable of sustained, predictable operation that provides energy and reserves during performance assessment hours throughout the Delivery Year. Performance assessment hours will be determined in real-time based on system conditions. They are not pre-determined, but are anticipated to occur during seasonal peak periods. Capacity performance resources are subject to non-performance assessments during emergency conditions throughout the entire Delivery Year. Base Capacity resources are required to meet the Capacity Performance standard from June through September. Base Capacity will no longer be a Capacity Market product after the transition period. Capacity Performance resources will be required to be available to PJM during periods of high load demand or system emergency, or face substantial non-performance assessments. Conversely, over-performance will be rewarded with performance-based bonuses.

Q. WHEN WILL THE CAPACITY PERFORMANCE MODEL BECOME FULLY IMPLEMENTED IN PJM?

[3] *See e.g.,* PJM Press release, May 24, 2016; describing Capacity Performance "the new no excuses" standard. *Available at* http://www.pjm.com/~/media/about-pjm/newsroom/2016-releases/20160524-rpm-auction-results-for-2019-20-news-release.ashx (Last visited May 16, 2017).

A. In this new construct, PJM established the goal of transitioning all capacity in the PJM footprint to Capacity Performance by the 2020-2021 Delivery Year. In other words, by June 1, 2020, all capacity purchased on behalf of load through RPM or eligible for inclusion in FRR capacity plans must meet the Capacity Performance criteria.

When PJM achieves full transition to Capacity Performance for the 2020-2021 Delivery Year, every resource in the PJM footprint that is not on a PJM-approved planned outage will be obligated to be available for PJM dispatch. The obligation extends during any hour that PJM determines there to be a compliance hour throughout the entire delivery year. Compliance hours are generally set during periods of capacity or operational stress on the PJM system; and are expected by PJM to average approximately thirty hours per year over time.

Q. WHY DID PJM TAKE THIS ACTION TO IMPLEMENT A CAPACITY PERFORMANCE CONSTRUCT?

A. During the winter months of 2013 through 2014, much of the country experienced a severe cold weather event known as the Polar Vortex where temperatures dropped to historically low levels. This weather event also saw demands, and subsequently prices for energy rise due to constrained availability of resources and fuel. PJM alone experienced forced outage rates exceeding 20%. PJM determined the drivers behind these outage rates to be mechanical outages due to extreme cold and demand or weather driven fuel unavailability.

In a concerted effort to avoid a repeat of resource scarcity and reliability concerns, PJM filed with FERC, and was approved to implement, the Capacity

Performance construct. The Capacity Performance construct is a substantial rewrite to the existing PJM capacity market design. PJM's intent was to drive generation owners to make investments to fortify reliability of their capacity and to enhance energy market supply by both increasing the financial rewards for compliant capacity value and the risk exposure to non-performance.

Q. WHEN DID THE CAPACITY PERFORMANCE RULES GO INTO EFFECT?

A. PJM described a transitional period to achieve 100% Capacity Performance over four years, some years for which it had already conducted the three-year forward Base Auctions under the old construct. PJM has conducted transitional auctions at increasing percentages of Capacity Performance for the 2016-2017 Delivery Year through the 2019-2020 Delivery Years. Generation included in FRR capacity plans must eventually meet Capacity Performance requirements, and be eligible for the same performance bonuses and subject to the same non-performance assessments. FERC granted a limited Capacity Performance transition period for FRR entities like Duke Energy Kentucky that includes an exemption and step-up towards 100% Capacity Performance compliance for all FRR Plan resources in the 2018-2019 Delivery Year. Following the transitional percentages applied to the general market, Duke Energy Kentucky has since filed a preliminary FRR plan for the 2019-2020 Delivery Year that includes 80% of its obligation as Capacity Performance capacity. The preliminary FRR plan that Duke Energy Kentucky filed this year, for the 2020-2021 Delivery Year required 100% Capacity Performance capacity.

Q. WHAT EXACTLY DOES PJM CAPACITY PERFORMANCE ELIGIBILITY REQUIRE?

A. PJM Capacity Performance compliance does not have a strict or bright line set of guidelines. PJM's rules do not provide specific eligibility requirements or qualifications that a generation resource must meet in order to qualify as a Capacity Performance resource. Instead, the RAA provides that Capacity Performance resources are those that to the extent they cleared in the RPM auction or are otherwise committed as a capacity resource, are obligated to deliver energy during the relevant Delivery Years as scheduled or dispatched by the Office of Interconnection during the Performance Assessment Hours.[4] PJM has stated in its Capacity Performance tariff filing that "the fundamental attribute of a Capacity Performance Resource is that it shall provide energy and reserves when called upon by PJM during emergencies."[5] The tariff further provides that the capacity market seller (or FRR entity) shall provide to PJM and the Independent Market Monitor (IMM), upon their request, all supporting data and information requested by either PJM or the IMM to evaluate whether "the underlying Capacity Resource can meet the operational and performance requirements of Capacity Performance Resources."[6] The best a utility can do is manage the risks and make appropriate and prudent investments to maintain and, if possible, enhance the reliability of its assets to reduce the likelihood of the asset not being able to perform when called upon during a PJM-determined event. The Capacity Performance rules provide broad discretion on the part of PJM and the IMM to

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[4] *See* PJM OATT Section 5.5A
[5] *See* PJM OATT Tariff Section 5.5A
[6] *See* PJM OATT Section 5.5Aa(i)

challenge generators as being Capacity Performance compliant.[7] That said, there are some minimum strategies that Duke Energy Kentucky can take in terms of ensuring there is a reliable source of fuel, and maintaining regular and proactive maintenance schedules and activities, which I describe later in my testimony.

D. DUKE ENERGY KENTUCKY'S COMPLIANCE WITH CAPACITY PERFORMANCE

Q. PLEASE SUMMARIZE WHAT THE PJM CAPACITY PERFORMANCE CONSTRUCT NOW MEANS FOR DUKE ENERGY KENTUCKY.

A. Duke Energy Kentucky, as a FRR entity, provides its own specific generation to PJM to meet customer load; but is nonetheless held to the same performance standards as full participants in the PJM capacity market. In order to maintain its status as an FRR entity, and to meet maintaining generation capacity sufficient to meet its load obligation, all generation committed to meet Kentucky load must comply with the minimum Capacity Performance requirements set by PJM.

Q. HOW WOULD YOU CLASSIFY THE DUKE ENERGY KENTUCKY'S EAST BEND STATION IN TERMS OF PJM CAPACITY PERFORMANCE COMPLIANCE AND RESPONSE?

A. The Company believes that East Bend currently meets the minimum requirements of a Capacity Performance resource in that it is a coal fired facility with a significant reserve of fuel stored on-site. The Company is taking proactive steps to invest in the maintenance of East Bend through "asset hardening" strategies designed to reduce the possibility, likelihood, and duration of forced outages.

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[7] *See* PJM Tariff Section 5.5A

Q. HOW WOULD YOU CLASSIFY DUKE ENERGY KENTUCKY'S WOODSDALE STATION IN TERMS OF CAPACITY PERFORMANCE COMPLIANCE?

A. In my expert opinion, the Woodsdale facility does not currently meet minimum Capacity Performance requirements due to its lack of fuel certainty. Fuel certainty is a minimum requirement to meet Capacity Performance expectations. To understand the nuances of the PJM Capacity Performance impact, one must appreciate the distinctions and interplay between energy and capacity in PJM. While PJM treats the two commodities differently, one cannot completely dissect the two, especially when it comes to serving customer load in the most economic and reasonable manner.

Q. PLEASE DESCRIBE THE CURRENT FUEL SITUATION AT WOODSDALE ITS OPERATION AS A SIMPLE CYCLE COMBUSTION TURBINE.

A. The six units at Woodsdale were designed to be simple cycle combustion turbines (CT) that operate as peaking station in terms of ability to produce energy to meet load obligations. The station has great flexibility to start quickly, ramp up and ramp down between full and minimum loads, all to meet the instantaneous demands of the Company's customers. From a PJM Capacity Market perspective, Woodsdale provides the Company with up to 492 MWs of unit-specific capacity to meet our PJM load obligations.

Duke Energy Kentucky designed its resource stack to balance construction costs against expected utilization to meet customer load demands. Even with the relatively small size of Duke Energy Kentucky a tiered resource stack consisting of base load and peaking unit is appropriate. From an energy perspective, Woodsdale was not designed to operate continually like a base load asset such as East Bend. It is a higher incremental cost unit that was designed, intended, and is in fact used to meet instantaneous demand and peak load conditions for Duke Energy Kentucky. Consequently, Woodsdale has historically maintained very low utilization. One of the primary benefits of membership in PJM is access to the PJM Energy Markets. The PJM Energy Markets allow Duke Energy Kentucky customers to benefit from lower cost resources in the market to displace its owned generation through market purchases. Market purchases are made during periods when its base load unit, East Bend, is offline, and when peaking resources can be procured below the cost of Woodsdale. In an organized market like PJM the primary value of Woodsdale to customers is in the capacity market, not the energy market. Consequently due to very low energy utilization, Woodsdale has not historically contracted for firm natural gas transportation.

The primary fuel at Woodsdale is natural gas that historically has been delivered under a non-firm (interruptible) delivery contract. The pipeline serving Woodsdale station, Texas Eastern Transmission Company (TETCO) has declared operational flow orders (OFOs) and other limitations that could impact gas availability and pipeline flexibility during Capacity Performance compliance events during peak periods. This means that the pipeline is placing restrictions on the deliverability of gas supply which could affect gas usage at the facility. In the event that natural gas was unavailable at the site, due to delivery limitations on the natural gas pipeline, the station would not be able to meet an immediate demand for energy from PJM during a Capacity Performance event. From a dispatch and energy market perspective, it has been, and remains to be, uneconomic and not in the customer's best interest to maintain a much higher cost firm transportation contract for natural gas at a peaking facility that was intended and designed only to operate intermittently during system peaks.

Notwithstanding the energy and dispatch costs I previously mentioned, the fact that Woodsdale is capable of providing approximately 492 MWs of unit-specific capacity has been a significant benefit to Duke Energy Kentucky. Combined with the approximate 600 MWs of East Bend capacity, these two stations have provided the Company with sufficient capacity to satisfy its FRR Plan obligations, prior to the advent of Capacity Performance.

Q. IF WOODSDALE IS NOT CURRENTLY CAPACITY PERFORMANCE COMPLIANT, HOW CAN DUKE ENERGY KENTUCKY INCLUDE WOODSDALE IN ITS PRELIMINARY FRR PLANS FOR THE 2019/2020 AND 2020/2021 DELIVERY YEARS?

A. Because these FRR Plans are forward looking, the Company can include Woodsdale under the assumption that it meets the Capacity Performance compliance expectations in those future Delivery Years. Thus the reason for the Company's Application in this proceeding. Duke Energy Kentucky believes that improving Woodsdale provides the optimal solution to meeting PJM Capacity Performance compliance and risk mitigation and is in the best interests of customers. As such it was included in the preliminary plans. The Company believes that construction of ULSD Fuel System capability at Woodsdale provides customers with the most effective and efficient upgrade strategy.

If the Commission does not approve an investment at Woodsdale, Duke Energy Kentucky has the ability to modify its Final FRR Plan prior to the start of the 2019/2020 Delivery Year to substitute Woodsdale with some other unit-specific complying capacity, assuming the Company is able to procure it.

Q. HAS DUKE ENERGY KENTUCKY CONSIDERED WHAT IT WILL HAVE TO DO IF WOODSDALE DOES NOT MEET CAPACITY PERFORMANCE EXPECTATIONS?

A. Yes. Duke Energy Kentucky could strand the capacity value of Woodsdale and potentially replace the Woodsdale Capacity in the FRR Plan with bilaterally purchased compliant capacity for the 2019/2020 and 2020/2021 Delivery Years. This strategy, of course, will come at a significant cost because Woodsdale would become unusable in the eyes of PJM and the Company would have to purchase or acquire other capacity to fill the hole left by Woodsdale.

Alternatively, Duke Energy Kentucky could seek accelerated approval from the Commission to move from FRR participation to full RPM participation starting with the 2021/2022 Delivery Year. Likewise, a move to full participation in RPM is not without additional cost. Such a strategy would also necessitate stranding the Woodsdale MWs of capacity that are currently included in the Company's FRR Plan because they would not be usable in PJM, and require the ongoing purchase of an equivalent amount of capacity MWs through the RPM auction process. This strategy exposes Duke Energy Kentucky customers to capacity market prices. As example, at $120/ MW-Day, 462 MWs[8] of RPM capacity would cost roughly $20 million per year. Although Duke Energy Kentucky customers could still rely on Woodsdale to provide a hedge against Day Ahead and Real Time energy prices, given the peaking nature of Woodsdale and the low capacity factor, maintaining Woodsdale as an energy only resource would not prove a good or efficient hedge.

Q. ISN'T WOODSDALE ALREADY CAPABLE OF DUAL FUEL OPERATION?

A. Although Woodsdale was historically capable of running on propane as a secondary fuel, unfortunately, such is no longer the case.

As explained by Company witness Joseph Miller, until a few years ago, Woodsdale had the benefit of being located in close proximity to a propane cavern that acted as a de facto remote storage and back-up fuel source for the station. In 2013, this cavern, owned and operated by a third party, was decommissioned due to safety concerns.

Unlike natural gas, sustained propane generation at Woodsdale is not feasible through direct deliveries from propane pipeline liquid flows. It must be batch delivered from remote storage in quantities no larger than the onsite storage at the station. While there is some limited propane storage capability at the site, this existing storage capacity is insufficient to sustain Woodsdale's continuous operation for more than a very few hours. Replenishing propane supply absent the cavern requires truck transportation. From a practical perspective, it is not

[8] The amount of stranded Woodsdale capacity if the station does not meet Capacity Performance expectations.

operationally feasible to expand or replenish propane supplies by truck, especially during a Capacity Performance event that is triggered by winter weather. Thus, propane is not a viable, reliable, or cost-effective solution for Woodsdale to prudently meet Capacity Performance expectations. The Company must take action to ensure there is a reliable, yet cost-effective fuel supply for the station. As a result, the Company has proposed the construction of the ULSD Fuel System for Woodsdale.

Q. WHAT WOULD HAPPEN IF DUKE ENERGY KENTUCKY DID NOTHING AT WOODSDALE OR EAST BEND TO MEET CAPACITY PERFORMANCE EXPECTATIONS?

A. As I previously stated, beginning in 2020, all capacity in the RPM must be Capacity Performance compliant, including capacity included as part of an FRR Plan. PJM and the IMM both have authority to question a resource as being Capacity Performance compliant. PJM's Capacity Performance rules provide that PJM and the IMM shall review any requested supporting data and information, and PJM with the advice of the IMM shall "reject a request for a resource to offer as a Capacity Performance Resource if the Capacity Market Seller does not demonstrate that it can reasonably be expected to meet its Capacity Performance obligations consistent with the resource's offer by the relevant Delivery Year." The tariff provides a process for the generator to appeal this determination to FERC. When FERC approved the Capacity Performance rules pertaining to PJM reviewing Capacity Performance offers, FERC stated that the mechanism for PJM and the IMM to review generation offers will enable PJM to reject offers from resources that "(i) cannot reasonably be relied on to perform, as required, during emergency conditions; (ii) are purely speculative; or (iii) would otherwise undermine the intent of PJM's Performance Capacity construct."[9]

Given PJM's (and the IMM's) broad discretion in terms of reviewing and rejecting a resource for not being Capacity Performance compliant, and the fact that FERC would give significant deference to an eligibility determination made by PJM in an appeal, the Company firmly believes doing nothing is not an option.

Q. PLEASE EXPLAIN WHAT HAPPENS IF PJM OR THE IMM REJECTS A CAPACITY RESOURCE.

A. If a resource is rejected as failing to meet Capacity Performance expectations, it will be rejected from the RPM. For Duke Energy Kentucky, this means that any station that is rejected by PJM or challenged by the IMM cannot be used or relied upon in its FRR Plan. If Woodsdale does not meet minimum capacity performance expectations, all MWs could be rejected, leaving Duke Energy Kentucky with a significant hole in its FRR Plan, approximately 460 MWs, to be filled immediately or else face significant penalties from PJM. Rectifying such a deficiency would be an expensive proposition because the Company must fill its FRR Plan with unit-specific capacity that is not otherwise committed elsewhere in the RPM. That means that the Company could not simply use the BRA as a stop-gap. The Company would have to look in the bilateral capacity market for uncommitted capacity that is deliverable into PJM.

Duke Energy Kentucky is highly concerned that submitting Woodsdale in its current arrangement could potentially be viewed as a PJM tariff violation. The

[9] *See* PJM Tariff Section 5.5A(a)

RAA states that if PJM rejects the FRR Capacity Plan the FRR entity has five days to cure the "insufficiency" or it will be assessed an FRR Commitment Insufficiency Charge, in an amount equal to two times the CONE for the relevant location, in $/MW-day, times the shortfall of Capacity Resources below the FRR Entity's capacity obligation (including any Threshold Quantity requirement) in the plan.[10] As an FRR entity, Duke Energy Kentucky does not believe it can acquire the approximately 460 MWs of FRR qualifying (Capacity Performance unit specific) capacity in the bilateral market in five days. The relevant FRR Commitment Insufficiency Charge for a 460 MW shortfall would exceed $133 million.

Q. WHAT IF THE COMPANY DOES NOTHING AND NEITHER PJM NOR THE IMM CHALLENGE WOODSDALE'S PRESENT CONFIGURATION?

A. The Company believes that without the ULSD Fuel System modification, and potential FERC-approved Tariff violations notwithstanding, even if the IMM or PJM did not challenge the ability of Woodsdale to meet the performance obligations, the station cannot meet the performance threshold established in Capacity Performance rules.

Specifically, without firm natural gas transportation or another reliable and sufficient secondary fuel capability, Woodsdale cannot meet the fuel availability component of Capacity Performance. The consequence of the Capacity Performance non-performance also has severe financial implications for customers. The non-performance assessment for Woodsdale alone could be as

[10] *See* RAA Schedule 8.1.D(7), page 130 of 240.

much as $1.6 million per hour if the station is unavailable during a Capacity Performance compliance assessment event, with the maximum single planning year assessment of $70.5 million. These non-performance assessments are different than FRR Commitment Insufficiency Charged for rejection as a capacity resource I previously described.

Q. DO YOU BELIEVE THE CHANGES THAT PJM MADE ARE BENEFICIAL TO DUKE ENERGY KENTUCKY OR ITS CUSTOMERS?

A. PJM has recognized a reliability issue in its footprint, and is acting in good faith to improve reliability of electric supply. The Capacity Performance changes are intended to incentivize investment in generating resources through enhancing the value of capacity meeting the performance guidelines and through the implementation of severe consequences for non-performance. To the extent that these changes improve reliability and cost efficiency in the PJM footprint, Duke Energy Kentucky's customers certainly benefit.

III. DUKE ENERGY KENTUCKY'S ULSD FUEL SYSTEM PROPOSAL

Q. PLEASE DESCRIBE DUKE ENERGY KENTUCKY'S ULSD FUEL SYSTEM PROPOSAL IN THIS PROCEEDING.

A. As more fully explained by Duke Energy Kentucky Witnesses Troy Wilhelm, the scope of the Company's application is to design, plan, construct, and commission a new ULSD distillate fuel oil system as the secondary fuel to natural gas at Woodsdale. Mr. Wilhelm and Mr. Miller discuss the actual construction and costs in their direct testimonies.

Q. PLEASE DESCRIBE HOW THE COMPANY ARRIVED AT THE CONCLUSION TO CONSTRUCT THE ULSD FUEL SYSTEM.

A. Shortly after the FERC approved PJM's application to implement Capacity Performance, the Company pooled together a cross-functional group of internal expertise, including individuals from my organization, station operations, fuels, legal, accounting, environmental compliance, engineering, rates, government and regulatory affairs, and resource planning, to examine the PJM Capacity Performance construct and potential compliance issues and strategies for Duke Energy Kentucky's assets. This group performed a facilitated Kepner-Tregoe (KT) Decision process to select a PJM Capacity Performance risk mitigation plan for Woodsdale that was intended to both identify any compliance issues and develop a strategy for meeting Capacity Performance expectations in a manner that minimizes customer exposure to Capacity Performance non-performance risks. The team met numerous times over the course of the year before it arrived upon its conclusions and ultimately the preferred solution. The proposed project solution was subsequently presented to, and received approval from, Duke Energy senior management to move forward with this application. Confidential Attachment JV-1 is a summary of the KT Decision Matrix that was used to evaluate the various Woodsdale compliance strategies.

Q. PLEASE SUMMARIZE THE COMPANY'S CONCLUSIONS.

A. The Company first concluded that East Bend met minimum Capacity Performance criteria and could appropriately balance reliability, risk, and cost through targeted and pro-active "asset hardening" maintenance strategies. By 'asset hardening," the Company means that capital and operating expense budgets will target investments and activities that serve to improve the long term mechanical reliability of East Bend, or position the station to minimize forced outage durations.

For Woodsdale, the Company proceeded to evaluate numerous potential compliance strategies and operational alternatives before arriving at the ULSD Fuel System solution. Generally as a mitigation strategy, a new ULSD Fuel System was preferable to a firm gas transportation contract or other options because it was less expensive in the long term and provided better protection and operational flexibility to mitigate the risk of non-performance assessments. Firm gas transportation was found to a much more expensive, ultimately less efficient mitigation as these contracts contain force majeure provisions and PJM has put severe restrictions on gas delivery force majeure as an excuse from performance.

While recognizing that no single strategy can provide complete mitigation or elimination of Capacity Performance risks, as a mechanical failure or depletion of fuel reserves during an extended Capacity Performance compliance period could still subject the Company to a compliance deficiency, the Company concluded that its ULSD Fuel System proposal strikes a reasonable balance of such risks and costs for customers.

Q. PLEASE DESCRIBE THE ALTERNATIVE STRATEGIES THAT WERE CONSIDERED FOR WOODSDALE BY THE COMPANY.

A. In addition to the ULSD Fuel System, the Company considered, evaluated, and where possible, analyzed the costs of, numerous operational and compliance strategies. The Company focused its initial evaluation on finding strategies that were prudent and defendable from both a compliance and risk mitigation view. The Company determined that viable strategies must both fit within Duke Energy's corporate strategy to enable customer growth and to maximize the alignment of our customer and shareholder interests. Other goals included maximizing the value of our generation for customers and to maintain competitiveness for dispatching, as well as, to minimize the exposure to non-performance assessments. The Company's evaluation focused on balancing these various interests, and overall risk mitigation (compliance and non-performance risks). The Company considered the need for regulatory approvals, operating impacts, feasibility, and where possible a quantification of long-term and short term capital and operating and maintenance costs.

Some of the strategies that were identified were so impractical from a Capacity Performance risk mitigation insufficiency (compliance or performance or both) or an overall operational perspective, they were eliminated. Others were eliminated because on balance, they resulted in greater risks and/or costs to customers than the ULSD Fuel System. The various strategies considered included the following:

- Exiting PJM and moving back to the Midcontinent Independent System Operator (MISO);
- Exiting PJM with Duke Energy Kentucky becoming its own balancing authority;

- Moving from an FRR entity to a full RPM auction participant in PJM and electrically pseudo-tie Woodsdale Station into the MISO market for dispatch.
- Purchasing of firm natural gas transportation;
- Investing in redundant non-firm natural gas infrastructure;
- Refurbishment of the existing propane system;
- Refurbishment of the existing propane system with refurbishment of Todhunter propane cavern; and
- Establishing a pipeline connection to a nearby ethane pipeline and conversion of Woodsdale to ethane firing ability.

Q. PLEASE IDENTIFY THE STRATEGIES THAT WERE ELIMIATED DUE TO INCREASES IN RISKS FOR CAPACITY PERFORMANCE COMPLIANCE, NON-PERFORMANCE, OR OPERATIONAL CONSIDERATIONS.

A. The strategies that were eliminated based primarily upon compliance, performance or operational risks were as follows:

- Exiting PJM and moving back to the Midcontinent Independent System Operator (MISO);
- Exiting PJM with Duke Energy Kentucky becoming its own balancing authority;
- Investing in redundant non-firm natural gas infrastructure;
- Refurbishment of the existing propane system;

- Refurbishment of the existing propane system with refurbishment of Todhunter propane cavern; and
- Establishing a pipeline connection to a nearby ethane pipeline and conversion of Woodsdale to ethane firing ability.

The strategies that were eliminated based upon cost analysis included: 1) Moving from an FRR entity to a full RPM auction participant in PJM; and 2) Firm Natural Gas Transportation.

Q. PLEASE SUMMARIZE THE COMPANY'S EVALUATION OF A STRATEGY TO EXIT PJM AND MOVE BACK TO MISO.

A. While moving Duke Energy Kentucky out of PJM and back to MISO may effectively mitigate PJM's Capacity Performance compliance penalty risks and performance assessment risks, there are strategic, operational, and legal reasons why a move back to MISO is not an overall effective solution.

Leaving PJM and reintegrating back into MISO is not without cost. Experience shows that the Company would experience some level of exit and integration costs to switch RTOs. Strategically, moving back to MISO may only delay exposure to a Capacity Performance structure. Capacity Performance is not unique to PJM. The concept was pioneered by the New England ISO in response to reliability issues in that region. It is possible that Duke Energy Kentucky could incur the significant expense required to facilitate such a move only to find that MISO develops its own Capacity Performance-like construct in response to some similar capacity crisis.

Operationally, Duke Energy Kentucky is a transmission dependent utility, relying upon the transmission system owned by Duke Energy Ohio, Inc., (Duke Energy Ohio). Duke Energy Ohio has no intention to move back to MISO, and indeed, would likely not be permitted to do so by its state regulatory Commission because all Ohio utilities are members of PJM. As a result, if Duke Energy Kentucky moved back to MISO it must build its own transmission system, purchase an existing transmission system or enter into an extremely complicated operational arrangement to continue its reliance upon Duke Energy Ohio's PJM-controlled system. Constructing or acquiring an existing transmission system were immediately discarded as being significant in terms of complication, costs (high-level est. $150 million) timing, and likelihood of various siting or regulatory approvals.

With the operational arrangement, Duke Energy Kentucky's generation would remain in PJM electrically, but would be subject to MISO dispatch using the PJM-controlled transmission system to deliver to its Kentucky load, which would be pseudo tied into MISO. As a transmission dependent utility, Duke Energy Kentucky would also be subject to the complications of this pseudo-tie arrangement with MISO for all of its generating assets. If Duke Energy Kentucky moved from PJM back to MISO and Duke Energy Ohio remained in PJM, Duke Energy Kentucky would likely have significant expense associated with its use of the Duke Energy Ohio transmission system, functionally operated by PJM, to serve any Kentucky load in MISO.

This is at best an impractical, complex, and likely expensive arrangement due to unknown congestion, and the availability and expense of long term firm transmission capacity between MISO and PJM. Unfortunately, due to the complexity of such an arrangement, these costs are somewhat unquantifiable absent actually pursuing realignment.

Moving back to MISO would expose the Company to other significant risks including transmission expansion planning costs. MISO Multi-Value Project (MVP) costs will rise exponentially over the next five years and beyond. To date, by leaving MISO in 2012, Duke Energy Kentucky has avoided having to pay for these projects.[11] If Duke Energy Kentucky moves back to MISO, its customers would once again be subject to MISO's transmission expansion plan costs, including its load-ratio share of MVP costs that are socialized to all load in MISO. The Company estimates its exposure to be hundreds of millions of dollars over the life of these projects, if fully constructed. Additionally, PJM would have to continue to plan the Duke Energy Ohio system to account for the Duke Energy Kentucky load, which suggests that Duke Energy Kentucky may not be able to avoid incurring PJM's own transmission expansion costs by realigning.

Finally, Duke Energy Kentucky understands that it would also need approval from both FERC and this Commission to move back to MISO. Even if the Commission were to support such a move, it is uncertain whether the Company could receive approval from FERC to realign with MISO. These unquantifiable known and potential risks and additional costs were deemed to outweigh the estimated costs of the ULSD Fuel System.

[11] Duke Energy Kentucky's ability to avoid these costs is currently under appeal by MISO.

Q. PLEASE DESCRIBE DUKE ENERGY KENTUCKY'S CONSIDERATION OF A STRATEGY TO EXIT PJM AND OPERATE AS A SEPARATE BALANCING AUTHORITY.

A. In the event that Duke Energy Kentucky was to become a stand-alone balancing authority, due to its relatively small size, not only would Duke Energy Kentucky customers forego the benefits of easy access to both economic and replacement energy in the PJM footprint, it could face significant challenges and increased customer costs under this configuration. As a stand-alone balancing authority, Kentucky would be responsible for all North American Reliability Corporation (NERC) balancing standards, and Transmission Operator (TOP) standards. The Company would also need to acquire the services of a contract Reliability Coordinator, at an unknown annual cost, and may well have to create an Open Access Transmission Tariff, which requires FERC approval. As such, Duke Energy Kentucky would experience increased annual operations and maintenance expense and significant changes to the operation of its generating stations as follows:

1) The Company would be required to operate East Bend differently, specifically more frequently in a load following mode changing unit output more often and at a lower output than current operation dictates;

2) The Company would be exposed to the risk of having the single largest contingency (East Bend) being equal to more than half its

load. If East Bend were to trip offline at full load conditions generation to load would be severely off balance;

3) The Company will need to staff Woodsdale station around the clock or add remote operation capability to supply required contingency reserves;

4) The Company would potentially change or add additional gas supply contracts, or dual fuel capability to allow Woodsdale units to be called upon to run for deployment of contingency reserves at any time without notice;

5) The Company would likely need to negotiate entry into a reserve sharing group;

6) As part of that reserve sharing agreement, the Company will likely be required to maintain at least one Woodsdale unit off-line at all times due to supply of contingency reserves creating a market exposure during periods where all of the East Bend and Woodsdale generation is required to be online to meet customer load; and

7) The Company will likely have to run Woodsdale generation around the clock when East Bend is off-line to meet both load and reserve requirements.

In addition, Duke Energy Kentucky would have to acquire trading services from a third party or an affiliate, or train generation dispatchers to purchase and sell hourly energy. Finally, since Duke Energy Kentucky's generation would be external to its balancing authority (assuming the transmission owner, Duke Energy Ohio, elects to stay in PJM), the generation resources would have to be dynamically scheduled to the new balancing authority, exposing Kentucky to additional PJM congestion and loss expenses, as well as, pay for additional transmission costs. While some costs resulting from all changes in operations necessary to pursue this strategy were unquantifiable, given the breadth of operational changes that would be required, the risks of substantial annual and ongoing cost impacts were determined to be significant. In short was decided that it would be very difficult to make a long term case to justify that a move away from an RTO to become a separate Balancing Authority would be a logical, prudent, or cost effective strategy for customers.

Q. PLEASE DESCRIBE THE COMPANY'S CONSIDERATION OF A STRATEGY TO REMAIN IN PJM AND BECOME A FULL RPM CAPACITY AUCTION PARTICIPANT, BUT MOVE WOODSDALE BACK INTO THE MISO MARKET.

A. Given its proximity to MISO, it is technically feasible to remove Woodsdale from PJM and create a transmission pseudo tie into the MISO market for just that station. This pseudo-tie strategy is currently used by Duke Energy Indiana to tie it's Madison Station, which is geographically situated in PJM and connected to PJM controlled transmission, back into MISO for dispatch. There would be transmission expense required to facilitate this move that could potentially be overcome by the ULSD Fuel System upgrade savings and Capacity Performance penalty risk mitigation; but there are several complications to the strategy making it impractical.

Moving Woodsdale to MISO would require approval by the Commission and FERC. It also means that Duke Energy Kentucky could no longer include Woodsdale capacity in an FRR Plan. Because Duke Energy Kentucky would no longer have sufficient generation to cover its capacity requirements, absent procurement of unit specific MWs of uncommitted capacity through a purchase power agreement or physical asset acquisition or construction, the Company would have to exit the FRR and move to full RPM auction participation.

With a greater number of MWs in terms of load obligation, than the owned and dedicated capacity being offered into PJM, Duke Energy Kentucky would become a net "purchaser" of capacity MWs in PJM. Under PJM rules the Company could no longer count on the Woodsdale capacity to satisfy our load obligations in PJM. As I described earlier in my testimony, the Company estimates that the annual cost to replace Woodsdale capacity in the PJM capacity market could exceed $20 million per year. Instead, the Company would follow MISO dispatch orders for Woodsdale and use any energy or capacity revenues in MISO as an offset to or hedge against the costs of purchasing energy or capacity to serve Kentucky load in PJM. The effectiveness of the offset as a hedge against capacity and energy prices would be a function of the capacity and energy price spread between MISO and PJM. These offsetting costs and revenues could either provide a benefit or a cost to Duke Energy Kentucky; but they would certainly not be neutral and would create an additional risk in terms of customer cost volatility.

Given the FRR requirement to maintain an FRR Plan that includes unit specific generation that is not otherwise committed in the PJM capacity market in order to maintain its FRR status, and the unknown likelihood of being able to purchase sufficient uncommitted generation, moving Woodsdale generation into MISO would also likely require Duke Energy Kentucky to move to full RPM auction procurement participation. The Company regularly evaluates the relative benefits of FRR and RPM BRA auction participation. The advantages of moving to RPM include access to the liquidity of the PJM capacity market. This access would be most valuable to Duke Energy Kentucky if it had a significantly long or short capacity position. Currently, depending on fluctuations in load requirements and generation performance, the Company maintains a relative neutral or "flat" position.

Leaving the FRR presents risks in and of itself. Duke Energy Kentucky's review of its participation status as a PJM member is both periodic and ongoing. From a periodic perspective, Duke Energy Kentucky can only change status at the beginning of the Planning Year. Duke Energy Kentucky intends to remain an FRR entity until it can prove to the Commission that there is sufficient customer benefit in moving to RPM. From an ongoing perspective, Duke Energy Kentucky is always watchful for signposts that the benefits of joining RPM outweigh potential risks. There are both pros and cons to full participation in RPM. To date the Company believes that customers are, on balance, better off remaining under the self-supply/FRR option. In summary, the operational and cost risks of moving a generating asset to MISO, the inability to quantify whether such a strategy would be a net cost to customers, the need to either acquire complying MWs of capacity to remain an FRR participant or to move to full RPM participation in PJM, made this complex construct an impractical solution.

Q. CAN YOU PLEASE FURTHER EXPAND UPON THE COMPANY'S CONTINUED BELIEF THAT REMAINING AN FRR ENTITY IN PJM IS THE MOST PRUDENT COURSE OF ACTION?

A. The key driver behind the ongoing decision to remain FRR or move to RPM will likely remain Duke Energy Kentucky's net generation position, the difference between generation available to serve as PJM capacity and the expected customer load obligation. For Duke Energy Kentucky, the primary benefit to customers from owned-generation is its use as a hedge against capacity and energy market prices. Additionally, the ability to utilize the market as a resource and to monetize the value of customer generation assets is a key benefit of participation in a market like PJM. Currently, the Company believes that near term net position to remain relatively flat. In other words, Duke Energy Kentucky does not expect to be a significant buyer or seller of capacity in the market; and when it does need to transact in the market for capacity outside of RPM the Company has found that there is adequate liquidity in that bilateral market for current needs. The Company is watchful however for changes in market liquidity, particularly in response to the Capacity Performance construct.

As the Company considers the future of the generation assets however, the net capacity position may move away from that relatively neutral position, forcing the Company to reevaluate its participation.

When Duke Energy Kentucky last retired a generating asset, Miami Fort 6, it was able to economically replace it with a similar amount of generation. If the opportunity or need to retire or replace another asset's capacity were to arise, it is possible that it would be beneficial to procure or sell capacity directly from or to the PJM (RPM) capacity market for some time, either from a long or short perspective. If that were the case, and the Company did not feel that it could efficiently cover or monetize the position in the bilateral market, there could be an argument supporting a move to RPM.

While the deep liquidity of RPM is a benefit to full RPM participation, a moderate long position would not necessarily prompt an immediate status change. Duke Energy Kentucky remains watchful for indications of potential changes in PJM market rules that could have significant impacts on its customers. One of the more contentious market rules in PJM is the Minimum Offer Price Rule (MOPR). Currently, generation included in FRR Plans is not subject to the MOPR. The MOPR sets administratively defined generation class capacity market price floors for gas fired generation that has never cleared in an auction. The impact on generation owners that are not exempt from the rule is an increased risk that generation investments do not clear capacity auctions. While PJM has not filed specific changes to MOPR, it has identified a continuum of potential changes ranging from maintaining the status quo to the expansion of MOPR applicability to all existing generation assets supported under cost of service regulation in the PJM footprint. The later extreme has been endorsed by the PJM market monitor.

The direct impact of changes to the MOPR rule, current exemptions, and applicability to Duke Energy Kentucky would be the potential impact on investment decisions as Duke Energy Kentucky's load grows beyond its current generation capacity, or current generation resources either reach the end of their useful lives or become economically obsolete due to environmental regulation. While currently exempt from the MOPR under the Self-Supply exemption, if Duke Energy Kentucky and the Kentucky Public Service Commission determined a move to full participation in RPM would be beneficial to customers, either the elimination of that exemption, or the expansion of the MOPR to existing resources could expose Duke Energy Kentucky customers to the risk of paying twice for newly constructed or existing capacity, once through rates and again through a capacity allocation from PJM.

At this time, the Company does not consider a strategy including a move to full PJM auction participation to be a least cost mitigation for Duke Energy Kentucky customers to address Capacity Performance risks.

Q. PLEASE DESCRIBE DUKE ENERGY KENTUCKY'S CONSIDERATION OF A STRATEGY TO PURCHASE FIRM NATURAL GAS TRANSPORTATION FOR WOODSDALE.

A. Given the very low capacity factors at Woodsdale, firm transportation has not historically been a least cost or even reasonably justifiable fuel decision for the station. Consequently, Duke Energy Kentucky currently does not hold any firm natural gas transportation capacity for Woodsdale. Nonetheless, the Company did investigate such a strategy in light of the changes in PJM requiring Capacity Performance compliance.

In May 2015, the Company sought cost information for firm gas transportation capacity delivered to Woodsdale from each of the three gas pipelines in close proximity to Woodsdale. These pipelines are TETCO, Texas Gas Transmission LLC (TGT), and Rockies Express Pipeline (REX). The Company requested estimated firm daily transportations rates for several scenarios, including: 1) 50,000 MMBtu/day (estimated full burn of two units); 2) 75,000 MMBtu/day; and 3) 144,000 MMBtu/day (estimated full burn of all six units). All three pipelines responded to the RFP with a variety of potential options. In summary, estimated firm fixed transportation costs for the full quantity of 144,000 MMBtu/day ranged from approximately $8.4 million and $24.1 million, annually. Additionally, the proposals that were offered required twenty-year term commitments for the Company as part of a firm transportation agreement. Assuming a twenty year commitment, the required firm natural gas transportation capacity for the full burn quantity would cost approximately $168 million and $482 million for just firm fixed transportation (not including gas supply cost) on a nominal basis. This cost was significantly greater than the estimated costs of the ULSD Fuel System $55 million capital construction, even including the annual ongoing fuel and non-fuel operations and maintenance (O&M) of approximately $2.1 million per year. Confidential Attachment JV-2 includes the Company's analysis of firm natural gas transportation options.

Notwithstanding the inability to justify the expense of firm transportation for the station, there were also operational considerations related to how Woodsdale is dispatched by PJM in relation to securing potential firm gas transportation. The Woodsdale units are forecasted to continue to have a very low capacity factors. Thus, the fixed cost commitment to subscribing to a long-term firm gas transportation agreement given these very low capacity factors and the large fixed cost that is required over a long-term agreement was cost prohibitive and unsupportable in comparison to the estimated costs of the ULSD Fuel System.

Q. PLEASE DESCRIBE DUKE ENERGY KENTUCKY'S CONSIDERATION OF AN INVESTMENT IN REDUNDANT NON-FIRM NATURAL GAS INFRASTRUCTURE.

A. After consideration of this strategy, Duke Energy Kentucky determined that redundant interruptible gas supplies could neither meet Capacity Performance compliance expectations, nor provide effective mitigation against Capacity Performance assessment risks.

The availability of the natural gas commodity itself is not an issue for Woodsdale. As I previously described, Duke Energy Kentucky maintains interruptible gas transportation for Woodsdale on TETCO. However, Woodsdale's gas needs are actually delivered through a Fuel Supply and Management Agreement with Sequent Energy Management (Sequent). In this arrangement, Sequent is to utilize the Company's interruptible transportation agreement on TETCO for delivery to Woodsdale as required. However, Duke

Energy Kentucky also has the right to buy from other suppliers if they have a lower delivered price than Sequent. In practice, Sequent and other suppliers have, at times, delivered gas on a competitive firm price basis (when available) to Woodsdale with their own transportation rather than utilizing Duke Energy Kentucky's interruptible agreement with TETCO. Therefore, there is some access to other supply sources that is deliverable through the TETCO pipeline.

The Company evaluated the deliverability of natural gas from other geographically promixiate pipelines to determine whether compiling interruptible arrangements was a practical or cost-effective solution. It was ultimately determined that establishing redundant connections would require material capital investments and that having multiple interruptible contracts would still likely be insufficient to meet Capacity Performance compliance expectations, or if it did, would still be insufficient to mitigate non-performance assessment risks.

As I previously stated, TGT and REX are the two other interstate pipelines in close proximity to Woodsdale. At one time, TGT was previously connected to Woodsdale through a lateral pipeline. However, the interconnect was deactivated because it proved to be insufficient to sustain Woodsdale's operations due to the inability to maintain adequate pressure in the pipeline to support the deliverability of natural gas. In order to bring the lateral back into service, a casing repair estimated to cost $1.5 million would be required. Additionally, TGT would need to upgrade and repair its metering and regulation (M&R) station, which also has an estimated cost of $150,000. Neither of these issues would resolve the previously experienced pressure and operational limitations imposed by TGT. Nor would a second interruptible supply likely satisfy Capacity Performance compliance and reliability expectations.

Similarly, REX is located less than one mile from Woodsdale. However, Woodsdale has never had a interconnect with REX. Construction of a greenfield site interconnect and M&R station is estimated to cost $7.0 million. While the capital investment for a REX interconnection is less than that of the ULSD Fuel System, again, a redundant interruptible supply will not provide sufficient mitigation from Capacity Performance compliance and reliability expectations.

Additional interruptible transportation and supply has a low likelihood of reducing fuel supply risk in high demand situations because of risk of operational limitations that could result during OFOs during high demand periods. Woodsdale can only consume gas from one given pipeline during any given run. There is no feasible way for Woodsdale's fuel supply to be automatically diverted (without forced shutdown) between and among different pipelines while it is running. Woodsdale would need to be taken offline for the input pipe to be changed from one source to another. Thus an intra-day cut on one pipeline would not be able to be alleviated by another pipeline.

Additionally, there is a substantial likelihood that during a severe weather event like the 2014 Polar Vortex, that all three pipeline sources would initiate OFOs and restrictions to Woodsdale. This is because Woodsdale is part of the Lebanon Hub gas trading region in Lebanon Ohio. TETCO, TGT and REX are three of the seven interstate pipelines that comprise the Lebanon Hub. In a situation like the 2014 Polar Vortex, which precipitated the Capacity Performance construct, the Company believes that there is a substantial likelihood that if one of the pipelines comprising the Lebanon Hub experiences a flow restriction, then each of these pipelines would respond to restrict interruptible gas flow as well. The Company holds this expectation as it is likely all available firm transportation services will be utilized in the face of high demand and peak system conditions. Duke Energy Kentucky would expect pipeline restrictions for each of these pipelines, resulting in the curtailment of interruptible transportation from all sources thereby exposing customers to the risk of Capacity Performance assessments. Given both these concerns, the Company believes that multiple interruptible gas interconnects do not sufficiently diminish the risk of fuel supply curtailment during high demand days and, consequently, did not provide sufficient Capacity Performance compliance or non-performance risk mitigation for our customers.

Q. PLEASE DESCRIBE DUKE ENERGY KENTUCKY'S ANALYSIS OF A STRATEGY TO REFURBISH THE EXISTING PROPANE SYSTEM.

A. First, it must be acknowledged that propane is not a widely used fuel in the power generation industry because of the risks of potential supply constraints, onsite storage, and commodity price volatility. It is generally utilized in either remote or special purpose applications. The reason propane was initially used as a back-up fuel at Woodsdale was the station's proximity to the nearby storage caverns and the ability to have a "closed" refueling process with a direct connection by pipeline from the caverns to the station's generators. The proximity to the cavern enabled efficient refueling, and the "closed" nature of delivery via pipeline made delivery of this volatile fuel much safer. In fact, despite that Woodsdale did not produce a single megawatt of generation from propane in 2016; according to EIA 923 data it was the 4th highest consumer of propane in the U.S. power production sector at 5,793 gallons. This small amount of propane burned at Woodsdale was actually used to preheat the propane system for potential generation use during a cold weather event. Nevertheless, as the Company already had some propane storage at the site, it was worth exploring whether, on balance, the risks could be outweighed.

First, the Company evaluated the estimated cost of refurbishment, testing, and certification of Woodsdale's existing propane system for all six units. The estimated costs would be roughly $200,000, plus fuel required for testing. Current onsite propane storage capability is limited to roughly 485,000 gallons. This means that with existing capability, the station would only be available to PJM for less than five hours of full load burn, after which, the tanks would be empty and would require refilling. Due to the volume of fuel required to operate Woodsdale on propane and the logistics of propane delivery, there is no practicable way to run Woodsdale directly from trucks with real time resupply, especially 'on demand' during a Capacity Performance event that lasted longer than five hours. Consequently the current station configuration presents substantial risk that Woodsdale could run out of propane before arrangements for refueling could be made. Therefore, to continue relying on propane as a second fuel, the onsite propane storage capability would need to be significantly expanded in order to both meet and mitigate Capacity Performance compliance risks.

Q. DID THE COMPANY EVALUATE THE COSTS AND RISKS OF EXPANDING THE PROPANE STORAGE CAPABILITY AT THE STATION?

A. Yes. As I previously mentioned, the current five hours of propane supply is insufficient to effectively mitigate the risks of non-performance assessments. If the Company were to continue to use propane as the back-up fuel for Woodsdale, that capacity would need to be expanded. From a capital investment standpoint, the initial (high-level, pre-engineered) estimated cost of expanding the existing propane storage (approximately $40 million) was slightly less than the fully engineered cost of the ULSD System ultimately selected.

However, when the Company considered the other risks associated with expanding propane, the ULSD Fuel System scored better and provided a preferable risk mitigation strategy for customers. Expanded reliance upon propane, while modestly less expensive than the ULSD Fuel System, presented significant and additional risks of non-performance assessments than the ULSD Fuel System. Propane expansion was evaluated as less reliable in terms of fuel availability, had greater exposure to commodity price volatility, and presented significant operational constraints and greater risks in terms of safety. The Company believes that propane expansion does not provide as reasonable or sufficient mitigation of non-performance risks under Capacity Performance as the ULSD Fuel System.

Q. PLEASE FURTHER EXPLAIN THE RISKS OF PROPANE AVAILABILITY AT WOODSDALE.

A. Refilling the existing five hours of fuel tank capacity would require approximately 60 propane truck deliveries. Considerably more would be required if the onsite tank storage capacity were to be expanded to provide an equivalent number of run hours to that of the ULSD Fuel System. Initial estimates indicate that replenishing 5.8 million gallons of propane, the operational equivalent of a 72 hour ULSD fuel supply, would require roughly 700 standard truckloads of propane. The Duke Energy Kentucky fuels team believes that beyond securing that quantity of propane commodity, scheduling deliveries would be extremely difficult, especially during winter months.

Q. WHY WOULD PROPANE DELIVERY BE DIFFICULT?

A. There is little sufficient and readily available supply of propane that can be procured and delivered to Woodsdale in a timely manner due to geographic and transportation infrastructure limitations, especially during winter months.

Enterprise Products Partner's Todhunter fuel terminal is the only propane supply point within close proximity to Woodsdale. Beyond Todhunter, there are no other major propane supply centers within 100 miles of the station. The majority of significant supply sources are in the Marcellus shale (Pennsylvania and West Virginia), greater Chicago area, or Sarnia, Ontario sources), which are all in excess of 200 miles away. These distances and attendant truck turn times make it even more difficult to replenish propane supply. During cold weather periods, the propane trailer fleet is in high demand, and securing on-demand trailers and truck drivers with DOT hazmat certification for propane can be very challenging. The driver, truck, and trailer infrastructure that can transport diesel fuel is much more robust than that of propane. During any period where the station cannot run while awaiting tanks to be refueled, Capacity Performance assessments would be imposed by PJM if compliance hours were called.

Q. PLEASE DESCRIBE THE COMMODITY RISK EXPOSURE WITH PROPANE.

A. Propane demand is highly skewed toward the winter heating season. So to the expected likelihood of Capacity Performance events. This propane demand profile affects both seasonal pricing and physical availability of the commodity. Enterprise TEPPCO pipeline, the pipeline that supplies the Todhunter terminal delivery point nearest Woodsdale, can go into an "allocation" protocol during times of high demand. The allocation protocol is based on a pipeline shipper's shipping history over time, prioritizing the finite pipeline availability to higher volume purchasers. Given the nature of physical propane supply contracting, and low anticipated regular shipping of fuel, Duke Energy Kentucky expects that finding significant volumes of spot propane to refill storage during allocation periods would be nearly impossible. While it might be possible, at a significant price premium to the spot market, to procure several trucks a day during these high demand times, procuring several hundred would likely be impossible.

Q. PLEASE SUMMARIZE THE SAFETY AND OPERATIONAL CONCERNS WITH EXPANDING THE EXISTING PROPANE STORAGE AT WOODSDALE.

A. The Company has significant safety and operational driven concerns in maintaining such a large amount of propane storage. Propane is a highly combustible fuel maintained in storage as a liquid but heavier than air as a volatized gas; and storing such a large quantity in above-ground tanks in a single location is not typical. Consequently, a propane combustion incident would likely be more catastrophic and have the greater public impact than a fuel oil incident. Additional security and monitoring would be required for the Company to expand to such a large quantity of propane storage. And refueling propane storage by truck requires significant safety protocols, more so than ULSD delivery, to protect against incidental ignition. Any above-ground tank refueling requires use of an open system where pipes are connected and disconnected from the truck to the tank. With the volatility of propane and the nature of this open refueling process, the Company would essentially have to shut down all operations at the site during refueling to avoid any accidental ignition of the propane gas.

Given the logistical refueling hurdles, safety risks, commodity price volatility and supply availability risks, the Company decided that expanding propane, while it may require a somewhat lower initial capital investment than the ULSD System, is not a prudent course for customers.

Q. CAN YOU PLEASE SUMMARIZE WHY THE ULSD FUEL SYSTEM WAS DETERMINED AS A BETTER OPTION THAN EXPANDING PROPANE STORAGE?

A. Yes. In summary, the ULSD Fuel System, while slightly more expensive, provides greater operational flexibility, is more reliable in terms of availability, safer, and provides a lower safety risk than that of propane. Due to the relative heat content properties of propane and ULSD, more energy can be delivered with less trucks with ULSD in comparison to propane. The actual fuel oil product, ULSD is readily available at multiple terminals in the greater Cincinnati area, and diesel transport truck availability is significantly more robust than that of propane transport. Additionally, diesel does not have as strong of correlation to heating demand like propane and thus, is more readily available during times of extreme cold temperatures.

While the Company could manage its propane fuel supply to ensure there is sufficient tank storage during non-peak demand months where Capacity Performance risks are reduced, Duke Energy Kentucky's fuels team believes that if a longer term event occurred, especially during winter months where it is possible that natural gas pipeline restrictions described above can occur, securing additional quantities of propane commodity and scheduling deliveries would be very difficult, if not impossible. Conversely, because ULSD is available in the area, acquiring additional supply should only take days as opposed to weeks or longer with propane.

Q. PLEASE DESCRIBE DUKE ENERGY KENTUCKY'S CONSIDERATION OF A STRATEGY TO REFURBISH ITS EXISTING PROPANE SYSTEM ALONG WITH REFURBISHMENT OF TODHUNTER PROPANE CAVERN.

A. Historically, the source of propane as a secondary fuel for Woodsdale was from underground Todhunter propane storage caverns, with propane being transported to Woodsdale Station through 4.1 mile underground liquid propane (LP) pipeline. The location of the storage cavern is what made propane back-up a reasonable and cost-effective solution originally. Enterprise TE Products Pipeline Company LLC (Enterprise), the owner and former operator of the Todhunter storage cavern, has now decommissioned all the Todhunter propane caverns due to leaks. As explained by Mr. Miller, in a December 13, 2013 letter, Enterprise stated they were not able to successfully test the caverns and satisfy the government agencies with respect to the caverns integrity and that the Todhunter propane caverns would be retired permanently.

As part of the Company's Capacity Performance strategy evaluation, Duke Energy Kentucky expressed interest in inspecting the cavern as diligence for a potential purchase and refurbishment but the Company was not granted permission to inspect the facility. Despite attempts to gain permission, ultimately those discussions were not fruitful and the cavern purchase and refurbishment strategy was eliminated. Geographically, there are no additional economic options to transport propane from other propane caverns in Ohio without significant pipeline infrastructure investments. Therefore, refurbishing the caverns was determined to be an impossible course of action due to access restraints.

Q. PLEASE DESCRIBE DUKE ENERGY KENTUCKY'S ANALYSIS OF A STRATEGY TO ESTABLISH A PIPELINE CONNECTION TO THE NEARBY ETHANE PIPELINE AND CONVERSION TO ETHANE FIRING ABILITY.

A. The Woodsdale units could potentially be converted to burn ethane as a secondary fuel. An interstate pipeline transporting ethane, a natural gas byproduct used primarily in the petrochemical industry, is located very near the station. Prior to the Capacity Performance ruling, the station had been investigating potential conversion to ethane as an economic strategy to burn a fuel that did not suffer from seasonal shortage and could potentially provide an competitive advantage to Duke Energy Kentucky during periods of high demand for natural gas. Woodsdale could have been one of very few electric generators utilizing ethane as a fuel. Ultimately, the conversion cost could not be overcome in the market, and the Company could not justify assuming the first evolution risk of handling a volatile pressurized liquid. In the Capacity Performance mitigation risk analysis, with burner and fuel manager system conversion costs similar to conversion to fuel oil, batch delivery risks similar to propane, and without the potential safety implications, the ethane option was discarded.

Q. AFTER CONSIDERING ALL OF THESE ALTERNATIVE COMPLAINCE STRATEGIES, HOW DID THE COMPANY COME TO THE CONCLUSION TO PURSUE THE ULSD FUEL OIL SYSTEM?

A. As explained by Duke Energy Kentucky witness Mr. Wilhelm, the estimated cost of designing and constructing the ULSD Fuel System is approximately $55 million. The estimated annual ongoing costs of operations (non-fuel) are estimated to be approximately $100,000 per year. This cost was factored against the risks and costs, quantifiable and unquantifiable, of each of the scenarios identified above. With all of these considerations and after much discussion, the ULSD Fuel System was selected as the risk mitigation and compliance solution that was the most effective, operationally practical and least cost over the remaining life of Woodsdale. The ULSD Fuel System project was subsequently vetted though the management of the responsible Duke Energy functional departments (*e.g.,* fossil/hydro operations, fuels, etc.) and submitted for approval to Duke Energy's Senior Management.

IV. CAPACITY PERFORMANCE RISK EVALUATION

Q. WHAT IS THE LIKELIHOOD OF DUKE ENERGY KENTUCKY EVER EXPERIENCING A CAPACITY PERFORMANCE EVENT?

A. Over the past several years, if PJM Capacity Performance were in effect, yearly compliance hours would have ranged from 0 to 30 hours. Since 2005, PJM stated there were 20 days (3 days in January 2014) during which Capacity Performance hours would have been called. During the approval process at FERC, PJM stated that it expected a long-term average number of Capacity Performance hours of approximately 30 hours per year.[12] The 30 hour expectation is, in fact, built into the non-performance assessment calculation as a constant. PJM has also stated that if the Capacity Performance hour expectation changed through time, there was the possibility of adjusting that constant in the formula. The practical implication of such a change would be to increase the non-performance assessment charge proportionately. Since its inception on June 1, 2016, there have been zero Capacity Performance compliance hours.

Q. IS AVAILABLITY OF FUEL OIL DURING A CAPACITY PERFORMANCE EVENT A CONCERN LIKE AVAILABLITY OF PROPANE LIKE YOU DESCRIBED ABOVE?

[12] *See* PJM CP Filing Page 45, available at http://www.pjm.com/media/documents/etariff/FercDockets/1368/20141212-er15-623-000.pdf

A. No. As I previously stated, Woodsdale Station is in a densely populated industrial location with relatively close fuel oil suppliers. There are multiple terminals in the greater Cincinnati area that have diesel fuel that are sourced from both pipelines and barges.

If a Capacity Performance situation arises during a severe winter weather event like the 2014 Polar Vortex, a major snow event would be addressed with sufficient expediency to support needed fuel oil deliveries. The system is being designed to include four fuel oil unloading stations. With four unloading stations, Woodsdale Station would have the ability to refill the fuel oil tanks at a rate of 5 trucks per hour (42,500 gallons) with the units capable of burning 51,000 gallons per hour at full load. Starting with nearly 4 million gallons in fuel inventory at site would allow 72 hours of full load burn before the station would exhaust its supply of Fuel Oil with no refill.

Q. HOW ARE PJM CAPACITY PERFORMANCE ASSESSMENTS DETERMINED?

A. Non-performance charges will be assessed to a resource provider that had a performance shortfall for a performance assessment hour. Of the non-performance charge is equal to the performance assessment hour performance shortfall (MW) times the non-performance charge rate ($/MWh). The non-performance charge rate applied to shortfalls associated with Capacity Performance commitments is equal to the modeled LDA Net CONE for which the resource resides ($/MW-day in installed capacity terms) times 365 divided by 30. 30 represents anticipated long term annual performance hours. The formula below generally describes the non-performance charge for each assessment event hour,

$$Charge = \left[\left(Actual - (Committed * BR)\right)\right] * \left[\frac{Net\ Cone * 365}{30}\right]$$

The NET CONE is a known number for each Delivery Year. The unknown "BR" is the Balancing Ratio where PJM will apply by event. BR can be described as the total amount of actual performance for all generation resources, plus net energy imports, plus total demand response bonus performance for that hour divided by the total amount of committed unforced capacity of all generation capacity resources. "Actual" is the metered generation output in MW. "Committed" is the Capacity Performance MW committed to PJM in either RPM or FRR.

The maximum yearly non-performance charge is 1.5 times modeled NET CONE for which the resource resides ($/MWDay in installed capacity terms) times 365 times the maximum daily unforced capacity committed by the resource during June 1 of the Delivery Year through the end of the month for which the Non-Performance Charge was assessed. Below is the formula that describes the maximum yearly non-performance charge.

$$Max = Committed * 1.5 * Net\ Cone * 365$$

Q. WHAT WILL PJM DO WITH THE COLLECTED ASSESSMENTS?

A. Non-performance assessment collections will be distributed to resources dispatched by PJM that perform above their committed generation output. PJM remains neutral as the administrator of the market; but non-performance assessments and performance bonuses are two sides of the same Capacity Performance coin.

Revenue collected from payment of non-performance charges will be distributed to resources that perform above expectations. A resource with actual performance above its committed or expected performance is considered to have provided bonus performance; and will be assigned a share of the collected non-performance charge revenues based on the ratio of its bonus performance quantity to the total bonus performance quantity from all resources for the same performance assessment hour.

Q. WILL DUKE ENERGY KENTUCKY UNITS BE ELIGIBLE FOR BONUS PAYMENTS?

A. Yes. A Fixed Resource Requirements entity like Duke Energy Kentucky will be eligible for bonus payments beginning in June 2019, when it becomes subject to Capacity Performance performance requirements.

Q. DO YOU EXPECT THAT DUKE ENERGY KENTUCKY PLANTS WILL HAVE AN OPPORTUNITY TO RECEIVE BONUS PAYMENTS?

A. Yes. Duke Energy Kentucky resources will likely be available for dispatch during a performance event. The extent of that likelihood can generally be described by the historical forced outage rate of any particular generator. As example, assuming an equal distribution of event hours across the year, a resource with a 10% historical forced outage rate can be expected to be available during 9 out of 10 event hours, and unavailable 1 out of 10 events. Since that forced outage rate is also utilized by PJM to determine the megawatt amount that PJM credits Duke

Energy Kentucky for in the capacity market, it can also be used to determine the likely megawatts of generation available for bonus. If a fully committed 77 MW Woodsdale unit had a 10% forced outage rate, 69 megawatts would be committed to PJM and 8 megawatts would likely be available to receive a performance bonus.

Additionally, since the Woodsdale capacity ratings are measured during summer temperatures to meet summer peak loads, Duke Energy Kentucky can expect additional megawatts available for bonuses during winter months during which ambient temperatures produce conditions that allow outputs well in excess of 77 megawatts, nearing 100 megawatts. These additional megawatts would all be eligible for bonus. While Duke Energy Kentucky cannot be certain whether units will perform better or worse than their historical average, and it cannot predict whether or not performance hours will fall in an equal distribution across the forced outage distribution, the formula below generally describes the expected value of bonus payments in the long term. E= Expected Bonus.

$$E = \sum_{i=1}^{n} [(Actual_i - (Committed * BR)_i)] * \left[\left(\frac{Net\ Cone * 365}{30}\right) * Bonus\ Payout\ Ratio_i\right] * [1 - EFOR]$$

Additional unknowns in the formula are "n," the number of performance hours per year, "BR" the balancing ratio that PJM will apply to each event, and the Bonus Payout Ratio that PJM will also apply by event. As noted above, bonus payments from a reliable and dependable resource are the benefit side of the

Capacity Performance risk coin; and have the potential to offset some or all any assessment charges.

Similarly, the expected Charges can be described in the formula below, when actual generation is below committed generation.

$$Charge = \sum_{i=1}^{n} [(Actual_i - (Committed * BR)_i)] * \left[\frac{NetCone * 365}{30}\right] * EFOR$$

Q. HOW WILL CAPACITY PERFORMANCE COMPLIANCE AND ANY POTENTIAL ASSESSMENTS AND BONUS PAYMENTS IMPACT CUSTOMERS?

A. Duke Energy Kentucky's generating assets are used and dedicated to serving its Kentucky load requirements. Our customers enjoy the benefit of having some of the lowest rates in the Commonwealth, not to mention as compared to those across the Country. Our costs of operation are reflected in the rates we charge. As explained by Duke Energy Kentucky witness, William Don Wathen Jr., Duke Energy Kentucky will eventually seek to recover the costs of the ULSD Fuel System, like all prudent capital investments, through its base rates. At this juncture, Duke Energy Kentucky is focusing on bringing the fleet into compliance with market requirements in the least cost, most effective manner. Duke Energy Kentucky's customers are not yet exposed to any Capacity Performance bonus payments or non-compliance assessments. Nor will they be for at least the next two years. The Company intends to propose a recovery mechanism for Capacity Performance assessments and bonuses in a future rate case filing. The goal of that proposal will be to work with the Commission to define a mechanism that shares risks and opportunities fairly, and maintains the alignment of interests between Duke Energy Kentucky and the customers it serves.

Q. IS THE COMPANY EXPLORING ANY ADDITIONAL PJM CAPACITY PERFORMANCE RISK MITIGATION STRATEGIES?

A. While outside of the scope of this CPCN request, Duke Energy Kentucky is evaluating alternative insurance products as secondary risk mitigation. It is worth restating that insurance alone does not obviate the significant risk of Woodsdale not being accepted as a Capacity Performance compliant resource by PJM. Nor does insurance alone satisfy Capacity Performance criteria. It would act merely as a hedge against a non-performance assessment if an event occurs and one of the Company's assets fails to perform.

Q. DO YOU BELIEVE DUKE ENERGY KENTUCKY'S CUSTOMERS CONTINUE TO BENEFIT FROM THE COMPANY'S MEMBERSHIP IN PJM?

A. Yes. Duke Energy Kentucky's customers benefit significantly from PJM's centrally dispatched RTO construct. PJM dispatches generation in broad consideration of total RTO cost minimization, the benefits of which are directly passed to customers in the form of efficient access to lower cost energy alternatives to customer owned generation. Further, these markets provide an opportunity for non-native sales from the Company's generation, the majority proceeds of which flow back to Duke Energy Kentucky's customers through a credit on their bills. PJM's focus is on maintaining and improving reliability across its entire system, which directly translates to more efficient and reliable access to electric resources to serve Kentucky demand.

Duke Energy Kentucky does not itself own high-voltage transmission and is not of a sufficient size to be its own balancing authority. Therefore, it is far more cost effective for the Company to be a member of an RTO than for it to construct or invest in and operate its own bulk transmission system.

Q. DO YOU BELIEVE THE ULSD FUEL SYSTEM INVESTEMENT IS A REASONABLE AND NECESSARY COMPLIANCE STRATEGY?

A. Yes. Membership in PJM provides many benefits, as I described above. PJM's Capacity Performance construct is designed to improve reliability in the footprint as one of those benefits. On behalf of its customers, Duke Energy Kentucky manages the benefits and risks inherent in the other aspects of market participation and is managing specific Capacity Performance risks as well. Capacity is foundational to providing reliability to customers and to the market construct. Investments in resources like the ULSD Fuel System are part of a strategy to maintain generation availability both as a hedge for customers to market prices, and as part of an obligation to the PJM market construct. Duke Energy Kentucky believes that an investment in Woodsdale to be a Capacity Performance resource is in the best interests of customers and investing in the ULSD Fuel System provides a practical, efficient, and ultimately, on balance, the most reasonable and reliable hedge against Capacity, Energy, and Ancillary Service price exposure.

V. CONCLUSSION

Q. WERE CONFIDENTIAL ATTACHMENTS JV-1 AND JV-2 PREPARED BY YOU OR UNDER YOUR DIRECTION AND CONTROL?

A. Yes.

Q. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?

A. Yes.

VERIFICATION

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

The undersigned, John A. Verderame., Managing Director, Power Trading and Dispatch, being duly sworn, deposes and says that he has personal knowledge of the matters set forth in the foregoing testimony and that it is true and correct to the best of his knowledge, information and belief.

John A. Verderame Affiant

Subscribed and sworn to before me by John A. Verderame on this 28th day of April, 2017.

KATIE JAMIESON
Notary Public, North Carolina
Gaston County
My Commission Expires

Katie Jamieson
NOTARY PUBLIC

My Commission Expires: June 14, 2021

CONFIDENTIAL PROPRIETARY TRADE SECRET

ATTACHMENT JV-1

FILED UNDER SEAL

CONFIDENTIAL PROPRIETARY TRADE SECRET

ATTACHMENT JV-2

FILED UNDER SEAL

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 Construction of a Number 2	)	Case No. 2017-00186
Distillate Fuel Oil System at the Company's	)	
Woodsdale Natural Gas-Fired Generating	)	
Station	)	

DIRECT TESTIMONY OF

TROY A. WILHELM

ON BEHALF OF

DUKE ENERGY KENTUCKY, INC.

May 31, 2017

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I. INTRODUCTION

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Troy A. Wilhelm 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 Combustion Turbine (CT) Fleet Project Engineering Manager, Midwest Regional 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 Bachelor's of Science in Electrical Engineering from Rose Hulman Institute of Technology.

I began my professional career with Public Service of Indiana, (n/k/a Duke Energy Indiana, LLC)), a subsidiary of Cinergy Corp. in 1993 as an Engineer and rising to the level of Staff Engineer by 1999. I was employed by Cincinnati Test Systems in Cleves, OH from 1999 to 2005 as a project engineer. I then re-joined Cinergy Corporation (n/k/a Duke Energy Corp.) as a Project Engineer in 2005. Since re-joining the company, I have had various engineering and project management roles to present.

Q. PLEASE SUMMARIZE YOUR DUTIES AS CT FLEET PROJECT ENGINEERING MANAGER.

A. I am an engineering manager for the Midwest CT Fleet operated by Duke Energy Kentucky and its sister utility, Duke Energy Indiana, LLC. My group mostly manages capital improvement projects for nine Midwest CT sites throughout Ohio and Indiana, and located at the Woodsdale and Madison Generating stations. We support everything from small capital and maintenance projects to major unit overhauls on our combustion turbines.

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 ultra-low sulfur diesel distillate fuel system at Woodsdale (ULSD Fuel System) that is to be constructed at Duke Energy's Woodsdale Station. All 6 units at the plant are planned to be converted from dual fuel (Natural Gas/Propane) to dual fuel (Natural Gas/ No.2 distillate fuel oil).

II. <u>DISCUSSION</u>

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 design, plan, construct, and commission a new ULSD fuel system as the secondary fuel to natural gas for Woodsdale Dual Fuel to provide greater reliability and fuel certainty at the station so to meet the recently instituted capacity performance standards required by PJM Interconnection LLC (PJM).

Q. PLEASE BRIEFLY EXPLAIN WHY A ULSD FUEL SYSTEM IS NEEDED AT WOODSDALE.

A. It is my understanding that new rules have been instituted by PJM that require all generation owners in PJM to take action to ensure that generation capacity can meet more rigorous expectations for performance and availability in PJM. Duke Energy Kentucky witness, Mr. John Verderame explains this in more detail in his testimony.

Q. PLEASE DESCRIBE WHAT IS INCLUDED IN THE CONSTRUCTION OF THE DUAL FUEL SYSTEM.

A. The ULSD fuel system includes equipment for unloading, storage, forwarding, and firing systems for each of Woodsdale's six CTs. The ULSD fuel system deliverables will include fuel oil block hardware, burner modifications hardware, CT fuel oil drain system hardware, fuel oil piping, fuel oil pumping equipment, all necessary fire protection and detection, instrument air, service air, foundations, fuel oil storage tanks, earthen berm oil containment with drainage and oil/water separator, roadwork and paving, storm water drainage, pre-engineered buildings with HVAC, electrical, heat trace, cathodic protection, instrumentation/controls and NERC CIP considerations. The project scope also includes removal of the existing and no longer usable propane boilers on each CT to utilize the buildings for the new fuel oil blocks and oil preheaters.

The major fuel preparation and control components related to the now obsolete propane system will be removed or included in demolition. Any propane piping or propane storage tanks not removed or not included in the demolition will be decommissioned per environmental standards, blanked off, and evaluated for either full removal or abandonment in place. This includes the 4.1 mile propane supply pipeline from the Todhunter caverns to Woodsdale that must be abandoned or repurposed due to the cavern closure. Exhibit 7 to the Company's application is a map depicting the location of the Dual Fuel System at Woodsdale. Exhibit 5 is a copy of the Duke Energy-Woodsdale Station Fuel Oil System Installation Project Preliminary Engineering Report (Report) that contains the drawings, specifications and schematics for the construction of the Dual Fuel System. The Report is stamped by a licensed Kentucky Engineer.

Q. HOW WILL THE NEW FUEL SYSTEM BE CONSTRUCTED?

A. The Company intends to use a multi-faceted equipment and material sourcing strategy to complete the new ULSD fuel system construction. Materials and labor will come from a variety of sources and will utilize a variety of contracting strategies. Most of the balance of plant components such as oil tanks, fuel skids, fuel piping, fire protection, demolition of propane tank/storage facilities and miscellaneous electrical work will be sourced using the competitive bidding process. The upgrades to the combustion system will be single sourced to GE-Alstom, the original equipment manufacturer, and the controls portion of work is expected to be awarded to Emerson Controls using our existing alliance agreement. In all cases, the method that is perceived to be most beneficial to Duke

Energy Kentucky and its customers will be used. These two areas of work will thus be performed by the vendor that has the greatest level of expertise and familiarity with the project scope and requirements. A summary of the sourcing strategy is as follows:

- 50% - Competitive Bid (firm price) - Balance of plant and propane system demolition
- 30% - Single Source - GE-Alstom combustion system
- 12% - Duke Labor, project support, overheads
- 5% - Alliance - Controls, site support services
- 3% - Outside engineering support - S&L

Q. PLEASE DESCRIBE THE ANTICIPATED CONSTRUCTION SCHEDULE FOR COMPLETION OF THE ULSD FUEL SYSTEM.

A. In order to support the commencement of construction in 2018, and completion in time for capacity performance compliance, the Company needs to commence construction and procurement in fourth quarter 2017. Construction work is scheduled to occur from winter 2018 to spring 2019 with scheduled outages for all six units at Woodsdale in late 2018 to March 2019. A more detailed summary of the schedule is as follows:

- Purchase Long Lead Material 12/1/2017
- Obtain Air permit approval 4/15/2017
- Construction Begins 2/1/2018
- Final Engineering Design 3/1/2018

- Unit Outages staggered late 2018 through early 2019
- Unit #1 & #2 In Service Date 12/15/2018
- Construction Complete 4/15/2019
- Units #3, #4 In Service Date 3/31/19
- Units #5 and #6 In Service Date 4/30/2019

Q. WILL THE CONSTRUCTION OF THE ULSD FUEL SYSTEM INTERFERE WITH THE OPERATION OF THE STATION OR WITH THAT OF ANY OTHER KENTUCKY JURISDICTIONAL UTILITY?

A. No. Because the construction of the ULSD System will be located on Duke Energy Kentucky property. The construction will have no impact on the operation of the station and it will not interfere with any other jurisdictional utilities' operations.

Q. PLEASE PROVIDE A DETAILED SCHEDULE SHOWING THE COSTS OF CONSTRUCTION OF THE NEW FUEL SYSTEM.

A. Exhibit 8 to the Company's Application includes a detailed schedule of the estimated costs for the ULSD Fuel System construction. A summary of the estimated costs is as follows:

Cost Category	($000s)
Contract labor	$ 3,569
Contract materials	4,304
Subcontract labor and materials	23,894
Internal labor	1,324

Loadings and overhead	2,535
Contingency	5,213
Other	10,925
Fuel oil project cost before AFUDC	51,764
AFUDC	1,843
Fuel oil project cost including AFUDC	53,607
Propane system retirement and demolition	1,840
Total project cost	**$ 55,447**

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

A. Yes, each of the six CT units 'turbine control systems operating consoles controllers and communication equipment will be upgraded as part of this project. This scope of work will be performed at the same time as the new fuel oil balance of plant (BOP) and unit distributed control system (DCS) remote input/output I/O systems are being commissioned for operation.

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

A. The estimated ongoing cost of operation for non-fuel related O&M once the project is completed is approximately $100,000 per year. The Company estimates the total yearly average of fuel oil usage to be approximately 976,000 gallons/year. Depending upon the price of fuel, the Company anticipates an annual fuel expense of approximately $1.7 to $2.7 million per year.

III. FILING REQUIREMENTS SPONSORED BY WITNESS

Q. PLEASE DESCRIBE THE FILING REQUIREMENTS YOU SPONSOR.

A. I sponsor Exhibits 5, 7, which includes the ULSD System Project Report that includes detailed drawings and schematics, maps showing the location of the ULSD System, and cost estimates, respectively. I also sponsor Exhibit 8 which includes a schedule that details the estimated total costs of constructing the ULSD System.

IV. CONCLUSION

Q. WERE EXHIBITS 5, 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, Troy A. Wilhelm, Combustion Turbine Fleet Project Engineering Manager, being duly sworn, deposes and says that he has personal knowledge of the matters set forth in the foregoing testimony and that it is true and correct to the best of his knowledge, information and belief.

Troy A. Wilhelm, Affiant

Subscribed and sworn to before me by Troy A. Wilhelm, on this 1 day of MAY, 2017.

NOTARY PUBLIC

NOTARIAL SEAL
STATE OF OHIO

Sarah Mendenhall
Notary Public, State of Ohio
My Commission Expires 06-16-2020

My Commission Expires: 6/16/20

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	)	Case No. 2017-00186
and Necessity for Construction of a Number 2	)	
Distillate Fuel Oil System at the Company's	)	
Woodsdale Natural Gas-Fired Generating	)	
Station	)	

DIRECT TESTIMONY OF

ANDREW ROEBEL

ON BEHALF OF

DUKE ENERGY KENTUCKY, INC.

May 31, 2017

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I. INTRODUCTION AND PURPOSE

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Andrew Roebel. 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 Senior Environmental Specialist in the Environmental Permitting and Compliance 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 hold a bachelor's degree in environmental science from the University of Cincinnati and a master's degree in organizational leadership from Mount St. Joseph University. I worked as an environmental consultant prior to working for Duke Energy. At Duke Energy I have worked in air emissions monitoring as well as air permitting and compliance. I served as the site Environmental Coordinator at Duke Energy's W. C. Beckjord Station for 4 years.

Q. PLEASE SUMMARIZE YOUR DUTIES AS SENIOR ENVIRONMENTAL SPECIALIST.

A. As Senior Environmental Specialist, I am the subject matter expert for air permitting for the Duke Energy Kentucky generating stations. I have responsibility for permitting and specializing in air permitting and compliance. I obtain permits for the Company's generating facilities, such as, Woodsdale Generating Station and East Bend Generating Station, and then assist with monitoring, record keeping, reporting and other facets of our compliance program.

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 discuss the environmental requirements applicable to the Company's operation of Woodsdale and the permits that specifically relate to the Company's proposal to construct a distillate fuel oil system at the Woodsdale Generating Station combustion turbine (Woodsdale) site as an alternate fuel source to natural gas (ULSD Fuel System), and retire the existing on-site propane system equipment.

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

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

A. Duke Energy Kentucky is proposing to construct and install a ULSD Fuel System at Woodsdale. The station currently has capability to operate firing natural gas as a primary fuel. The station was originally equipped to fire propane as a secondary fuel. However, this ability is no longer sustainable.

Q. WHAT ARE THE MOST SIGNIFICANT ENVIRONMENTAL REGULATIONS CURRENTLY IMPACTING DUKE ENERGY KENTUCKY'S WOODSDALE STATION AND ITS PROPOSAL TO CONSTRUCT THE ULSD FUEL SYSTEM?

A. While there are several programs promulgated by the U.S. Environmental Protection Agency (EPA) under the Clean Air Act (CAA) that impact all of the Company's generating stations, including Woodsdale, the CAA is directly applicable to the Company's ULSD Fuel System proposal.

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. PLEASE EXPLAIN HOW THE CAA IMPACTS DUKE ENERGY KENTUCKY'S WOODSDALE STATION.

A. Title V of the federal Clean Air Act reauthorization (1990) requires each state to develop a Permit-to-Operate system and emission fee program for major sources of air pollution. The operating permit program streamlines the way federal, state, tribal and local authorities regulate air pollution by consolidating all air pollution control requirements into a single, comprehensive "operating permit" that covers all aspects of a source's year-to-year air pollution activities. The program is designed to make it easier for sources to understand and comply with control requirements, and results in improved air quality.

Woodsdale is physically located in Trenton, Ohio giving the Ohio EPA jurisdiction over Title V permitting of the station. Ohio's rules for this program became effective on April 20, 1994. The Title V permit for major sources is enforceable by Ohio EPA and U.S. EPA. Major sources must certify compliance with the terms of their permits annually.

Q. WHAT IS A TITLE V PERMIT?

A. Title V permits identify all "applicable requirements" that are established through facility compliance including emission limits and standards, as well as monitoring, record-keeping and reporting requirements. Records of required monitoring must be submitted periodically based on the reporting deadline(s) established in the issued final permit. All Title V permit holders must certify annually that they have complied with the terms of their Title V permit.

Under Title V, major sources are those with a potential to emit:

- 100 tons per year or more of any one regulated pollutant (PM 10, nitrogen oxides, sulfur dioxide, carbon monoxide, volatile organic compounds and lead);
- 10 tons per year or more of any one hazardous air pollutant (HAP); or
- 25 tons per year or more of any two or more HAPs (U.S. EPA currently lists 188 hazardous air pollutants in Section 112 of the 1990 Clean Air Act.)

Q. PLEASE DESCRIBE WOODSDALE'S TITLE V AIR PERMIT.

A. Woodsdale was commissioned for commercial operation in the early 1990s and has maintained a Title V Air permit through the Ohio EPA. The Title V Air permit identifies the applicable emissions limitations or control measures that must be met while the emissions units are in operation. It also identifies the applicable rules and requirements of the CAA that are the basis for the emissions limitations or control measures. The Title V permit also identifies any operational restrictions that must be met in order to ensure compliance with the emissions limitations. It also spells out the monitoring and/or recordkeeping requirements, reporting requirements, and testing requirements necessary to demonstrate compliance.

A copy of the current Title V Air permit is included as Exhibit 2 to the Company's Application. Exhibit 3 is a letter from the Ohio EPA that confirms the Company's proposed fuel oil system falls within the station's existing Title V permit.

Q. WILL DUKE ENERGY KENTUCKY NEED TO MODIFY ITS CURRENT TITLE V AIR PERMIT TO CONSTRUCT THE ULSD FUEL OIL SYSTEM PROPOSED IN THIS CASE?

A. Fuel oil combustion is currently reflected in Woodsdale's Title V permit that was issued when the station was commissioned in the early 1990s. Given the existing station permits reflect the unit's ability to combust fuel oil and based on review of applicable regulations and initial discussions with Ohio EPA representatives, installation of fuel oil combustion hardware on the units will not trigger the need for any new construction related permits. Rather, the installation and operation of fuel oil related combustion hardware will be incorporated into the existing station permit via a Title V permit modification.

Q. ARE THERE ANY OTHER PERMITS THAT WILL BE NECESSARY FOR THE INSTALLATION OF THE ULSD FUEL SYSTEM?

A. In addition to modifications associated with the unit's combustion hardware, the project will require installation of a bulk oil storage tanks at the facility. These tanks will require submittal of a permit-to-install (PTI) application and will also be incorporated into the station Title V permit as part of the permit modification described above. No specific emission limitations are anticipated in relation to installation/operation of the tanks. Emission controls associated with the tanks will need to meet Best Available Technology (BAT) which will be comprised of submerged fill and a sealed floating roof.

The air permit related activities described above are anticipated to take 9 to 12 months to execute from the point of initial application submittal to ultimate approval by Ohio EPA.

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

A. Yes, Duke Energy Kentucky has applied for or received the necessary permits or concurrences required to date. As I previously discussed, the station's Title V permit currently allows fuel oil combustion. The Title V permit modification application is not required to be submitted until the fuel oil storage tanks are constructed. Title V permit modification are to be submitted within 12 months of completing construction of the emissions units. Duke Energy Kentucky received a letter of concurrence from Ohio EPA on May 4, 2017, that installation of fuel oil combustion hardware on the units will not trigger the need for any new construction related permits. A copy of this concurrence letter is included as Exhibit 3 to the Company's Application. And finally, Exhibit 4 is a copy of the Company's Permit to Install (PTI) application submitted on May 8, 2017. The Company does not anticipate any difficulty in obtaining approval by the Ohio EPA.

III. FILING REQUIREMENTS SPONSORED BY WITNESS

Q. PLEASE DESCRIBE THE FILING REQUIREMENTS YOU SPONSOR.

A. I sponsor Exhibits 2, 3 and 4, the various permits, letter, and permit application I previously described.

IV. CONCLUSION

Q. WERE EXHIBITS 2, 3 AND 4 TO THE COMPANY'S APPLICATION TRUE AND ACCURATE COPIES OF THE ACTUAL PERMITS, LETTER 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, Andrew Roebel, Senior Environmental Specialist, being duly sworn, deposes and says that he has personal knowledge of the matters set forth in the foregoing testimony and that it is true and correct to the best of his knowledge, information and belief.

Andrew Roebel, Affiant

Subscribed and sworn to before me by Andrew Roebel, on this 9th day of May, 2017.

NOTARY PUBLIC

ANTOINETTE TROUTMAN
Notary Public, State of Ohio
My Commission Expires 11-15-2019

11/15/2019
My Commission Expires:

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 Construction of a Number 2 Distillate Fuel Oil System at the Company's Woodsdale Natural Gas-Fired Generating Station	))))))	Case No. 2017-00186

DIRECT TESTIMONY OF

WILLIAM DON WATHEN JR.

ON BEHALF OF

DUKE ENERGY KENTUCKY, INC.

May 31, 2017

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PAGE

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 discuss the estimated impacts of the project to the Company's rates.

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 and install a No. 2 distillate ultra-low sulfur diesel fuel oil system at the Company's Woodsdale Natural Gas-fired Combustion Turbine Generating Station (Woodsdale) site (ULSD Fuel System) as an alternate fuel source to natural gas, and retire the existing on-site propane system equipment that is no longer usable and sufficient to meet the newly enacted and soon to be enforced Capacity Performance (CP) requirements of PJM Interconnection LLC (PJM).

Q. WILL THE CONSTRUCTION OF THE ULSD FUEL SYSTEM 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 ULSD FUEL SYSTEM?

A. Based upon information provided by Mr. Wilhelm, the fully loaded total estimated cost of the ULSD Fuel System is approximately $55.4 million. The estimated ongoing costs of operation and maintenance (non-fuel) is approximately $100,000 per year.

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. Not immediately. While the Company will seek to include the cost of construction and operation and maintenance of the ULSD Fuel System in its electric base rates at some point, the Company is not seeking cost recovery in this application. The Company will eventually seek to include cost recovery through a traditional base rate case. The Company acknowledges that Commission approval will be required in order to recover these costs.

III. <u>FILING REQUIREMENTS SPONSORED BY WITNESS</u>

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. <u>CONCLUSION</u>

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, being duly sworn, deposes and says that he has personal knowledge of the matters set forth in the foregoing testimony and that it is true and correct to the best of his knowledge, information and belief.

Don Wathen

William Don Wathen Jr., Affiant

Subscribed and sworn to before me by William Don Wathen Jr., on this 31st day of May, 2017.

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