

PUBLIC VERSION

COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

THE BACKUP POWER SUPPLY PLAN) Case No. 2021-00086
OF DUKE ENERGY KENTUCKY, INC.)

**BACK-UP POWER SUPPLY PLAN OF
DUKE ENERGY KENTUCKY, INC.**

I. Introduction

Duke Energy Kentucky, Inc., (Duke Energy Kentucky or the Company) submits the following backup power supply plan, as required pursuant to Paragraph 3 of the Kentucky Public Service Commission's (Commission) April 28, 2020, Order in Case No. 2020-00089 (Order). A backup power supply plan is necessary in the event Duke Energy Kentucky experiences outages with its generating facilities. On March 31, 2020, the Company filed an application to extend the deadline for filing its next backup power supply plan from March 1, 2020 until March 1, 2021, and for authority to continue its current plan through May 31, 2021. Thus, the Company's current Commission-approved backup power supply plan is set to expire on May 31, 2021.

The Commission's Order set forth a two-step procedural process regarding future backup power supply plan filings. First, Duke Energy Kentucky was directed to inform the Commission, in writing, of its intentions concerning future backup power supply plans no later than 6 months prior to the expiration of the then current plan. Second, Duke Energy Kentucky is required to submit any future backup power supply plans for review

PUBLIC VERSION

and approval, no later than 90 days prior to the effective date of the new plan. By letter dated on or about September 18, 2020, Duke Energy Kentucky notified the Commission of its intention to file a new backup power supply plan.

Accordingly, Duke Energy Kentucky hereby submits its proposal for its new Backup Power Supply Plan to extend through the next three PJM delivery years beginning June 1, 2021 through May 31, 2022; June 1, 2022 through May 31, 2023; and June 1, 2023 through May 31, 2024 (New Plan).¹

II. Background

A. PJM Participation

In connection with its realignment to PJM Interconnection LLC (PJM), effective January 1, 2012, Duke Energy Kentucky participates in PJM under the Fixed Resource Requirement (FRR) option for purposes of meeting PJM's Resource Adequacy requirement. This initial election generally required the Company to remain as an FRR entity for a minimum term of five consecutive Delivery Years.²

Under the FRR election, Duke Energy Kentucky avoids direct participation in the PJM capacity Reliability Pricing Model (RPM) Base Residual (BRA) and Incremental auctions. Instead, the Company is required to submit an FRR capacity plan to satisfy the unforced capacity (UCAP) obligation for all loads in the Company's FRR Service Area, including all expected load growth in the FRR Service Area. Upon expiration of the initial five-year FRR commitment in June 2016, Duke Energy Kentucky now has the ability to exit the FRR option and, if it so chooses, participate in a future PJM base residual auction for capacity procurement in a future delivery year thereby transitioning

¹ The PJM "Delivery Year" is a twelve-month period beginning June 1 through May 31.

² Duke Energy Kentucky's five-year FRR commitment expired on June 1, 2016.

PUBLIC VERSION

away from the FRR self-supply. Under PJM regulations, the transition from an FRR entity to a full BRA participant requires a three-year transition. This is because PJM's BRA is for a delivery year that's three years into the future. Duke Energy Kentucky regularly evaluates the merits of exiting the FRR option in light of its relative capacity position, and changing PJM, FERC, or environmental rules. To date, Duke Energy Kentucky has not determined that a move from FRR to RPM is in the best interests of customers and accordingly, has not sought Commission authorization to become a full participant in the BRA and has not decided to abandon its status as an FRR entity in PJM.

Based on the Company's installed capacity position and historical forced outage rate, Duke Energy Kentucky has secured sufficient UCAP to comply with the PJM Resource Adequacy requirements under its FRR Plan for the 2022-2023 delivery year. Due to the delay of the 2023-2024 and 2024-2025 Base Residual Auctions, Duke Energy Kentucky has not been required to submit its FRR Plan for these delivery years. Even though PJM accepted Duke Energy Kentucky's FRR Plan for the 2022-2023 delivery year, PJM can still assess penalties to Duke Energy Kentucky if its resources, whether from generation or demand response, fail to comply with PJM's Resource Performance Assessments as outlined in Sections 8 and 9 of PJM Manual 18.

In deriving this New Plan, Duke Energy Kentucky used standard forecasting methods to calculate its back-up power supply needs. Duke Energy Kentucky considered supply options available from: (1) the PJM energy markets and (2) Request for Proposals (RFP) issued by Duke Energy Kentucky on September 9, 2020. In evaluating these supply options and selecting an appropriate back-up power supply plan, Duke Energy Kentucky's primary goal was to balance cost and risk mitigation.

PUBLIC VERSION

Similar to the current plan, the New Plan consists of fixed-priced financial swap contracts to lock-in the price of power during scheduled outages and PJM energy market purchases during forced outages. In a Regional Transmission Organization (RTO) construct such as PJM the primary value of customer owned generation is to provide a physical hedge against capacity and energy prices to serve native load requirements that customers are exposed to as part of participation in the RTO. Duke Energy Kentucky has two generating stations consisting of seven generation units. East Bend Unit 2 (East Bend) is Duke Energy Kentucky's 600 MW (net rating) base load coal fired unit. Woodsdale Station is Duke Energy Kentucky's 462 MW (summer net rating) six unit simple cycle combustion turbine facility (Woodsdale). As a base load unit, East Bend provides the majority of the energy hedge to PJM energy prices, while Woodsdale station provides a hedge against very high energy prices during coincident periods of peak load in the RTO and the Duke Energy Kentucky load zone. The Company proposes to implement its New Plan for the next three delivery years, 2021-2022, 2022-2023, and 2023-2024. During the three-year New Plan period, Duke Energy Kentucky will continue to evaluate its current back-up power supply plan and will make any adjustments necessary due to changing conditions.

B. Data Considered

1. Load Forecast

The Duke Energy's load forecasting group develops the load forecast by: (1) obtaining service area economic forecasts primarily from Moody's Analytics; (2) preparing an energy forecast by applying statistical analysis to certain variables such as number of customers, economic measures, energy prices, weather conditions, etc.; and

PUBLIC VERSION

(3) developing monthly peak demand forecasts by statistically analyzing weather data. The Company uses the same load forecasting technique to prepare its integrated resource plans. The Company updates the load forecasts on a regular basis and the updated load forecasts are used for all modeling analysis.

2. Generating Resources & Fuel Costs

Table 1 – General Description of Plants for Delivery Year 2021-2022

Plant	Fuel	Type	Winter Rating³ in MWs	Spring/ Fall Rating in MWs	Summer Rating in MWs	UCAP for Delivery Year 2021-2022 in MWs⁴
East Bend 2	Coal	Base load	600	600	600	
Woodsdale 1-6	Gas	Peaking	564	516	462	
		Total:	1,164	1,116	1,062	

Duke Energy Kentucky determined that it needed to consider back-up power supply options for East Bend because it is a relatively low-cost base load unit and the Company relies upon it as its primary hedge against customer load demand energy purchases. Since the Woodsdale units have lower capacity factors, back up power supply options are not cost effective and not required for this facility. Thus, the RFP and analysis focused upon East Bend back-up power supply alternatives.

3. Scheduled and Forced Outages

Duke Energy Kentucky estimated the number and expected timing of forced outages, using the definition of forced outages contained in the Commission's Fuel Adjustment Clause (FAC) regulation, 807 KAR 5:056, as follows: non-scheduled losses of generation or transmission that (1) require substitute power for a continuous period in

³ Duke Energy Kentucky now owns 100% of East Bend.

⁴ Duke Energy Kentucky UCAP resources as of 2/1/2021.

PUBLIC VERSION

excess of six hours; and (2) result from faulty equipment, faulty manufacture, faulty design, faulty installations, faulty operation, or faulty maintenance.

The Company used the current known scheduled outages for the PJM delivery years 2021-2022, 2022-2023, and 2023-2024. Duke Energy Kentucky plans the following scheduled outages during the next three PJM delivery years are as follows:

Table 2 -- Scheduled Outages

Plant	2021-2022 DY (in weeks)	2022-2023 DY (in weeks)	2023-2024 DY (in weeks)
East Bend 2	■	■	■

The Company estimated the forced outages using the historical Equivalent Forced Outage Rates (EFOR) for East Bend. The EFOR is a measurement that takes the number of forced outage hours and equivalent forced derate hours relative to the number of service hours and forced outage hours. The EFOR forecast data is as follows:

**Table 3 -- EFOR projection for
2021/2022, 2022/2023, 2023-2024 DY**

Plant	Annual EFOR
East Bend 2	■

4. GenTrader Projection of Energy Needs

The Company used the GenTrader software tool to project its annual energy positions for Delivery Year 2021-2022, 2022-2023, and 2023-2024.

PUBLIC VERSION

[REDACTED]						
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

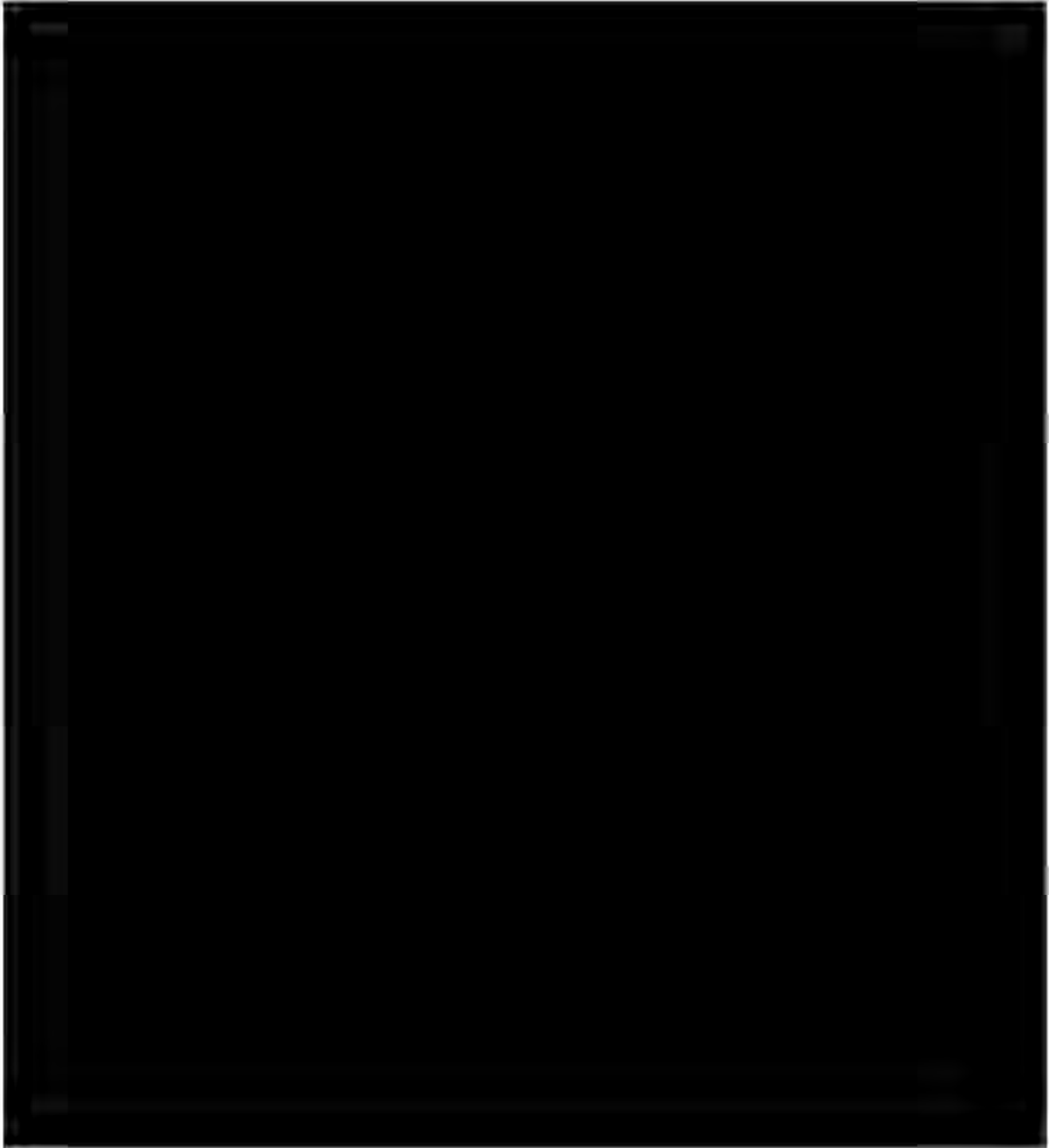
III. Request for Proposals

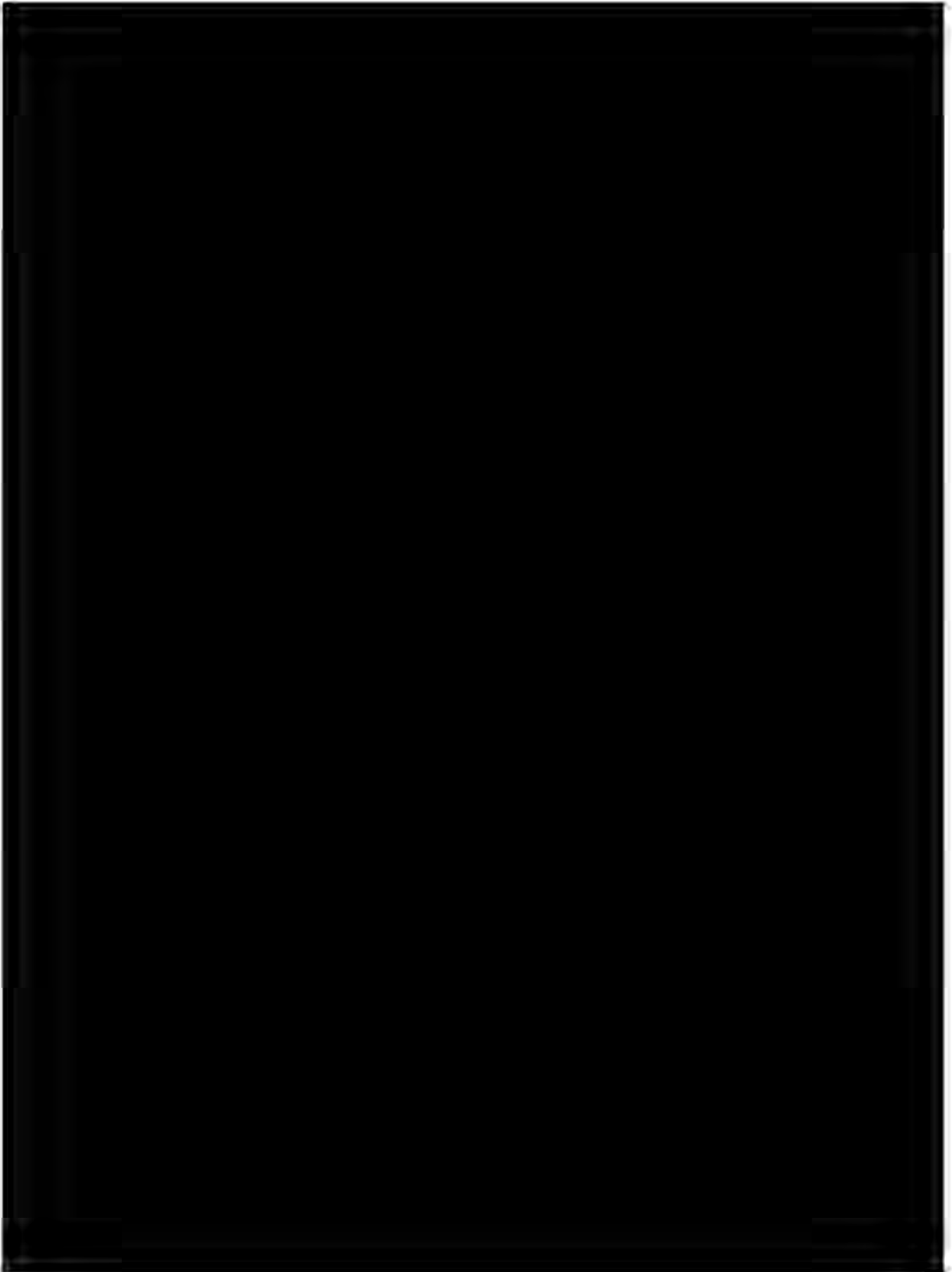
Duke Energy Kentucky used the Power Advocate software to implement the RFP for back stand energy. PowerAdvocate is a web-based platform that provides centralization of proposals and communications from RFP issuers while maintaining confidentiality among respondents. On September 9, 2020, Duke Energy Kentucky issued an RFP through a targeted bidder list of active Midwest energy providers and former back stand RFP bidders on Power Advocate. The Company sought bids for the following types of supply options: (1) Back Stand Energy Call Options; (2) Daily Call Options; and (3) Insurance Products. Both back stand energy call options and insurance products are directly tied to unplanned outages at East Bend. The daily call options are independent of any outages at East Bend, and therefore are directly compared to the market. The RFP sought supply options to take effect on June 1, 2021 and continue for

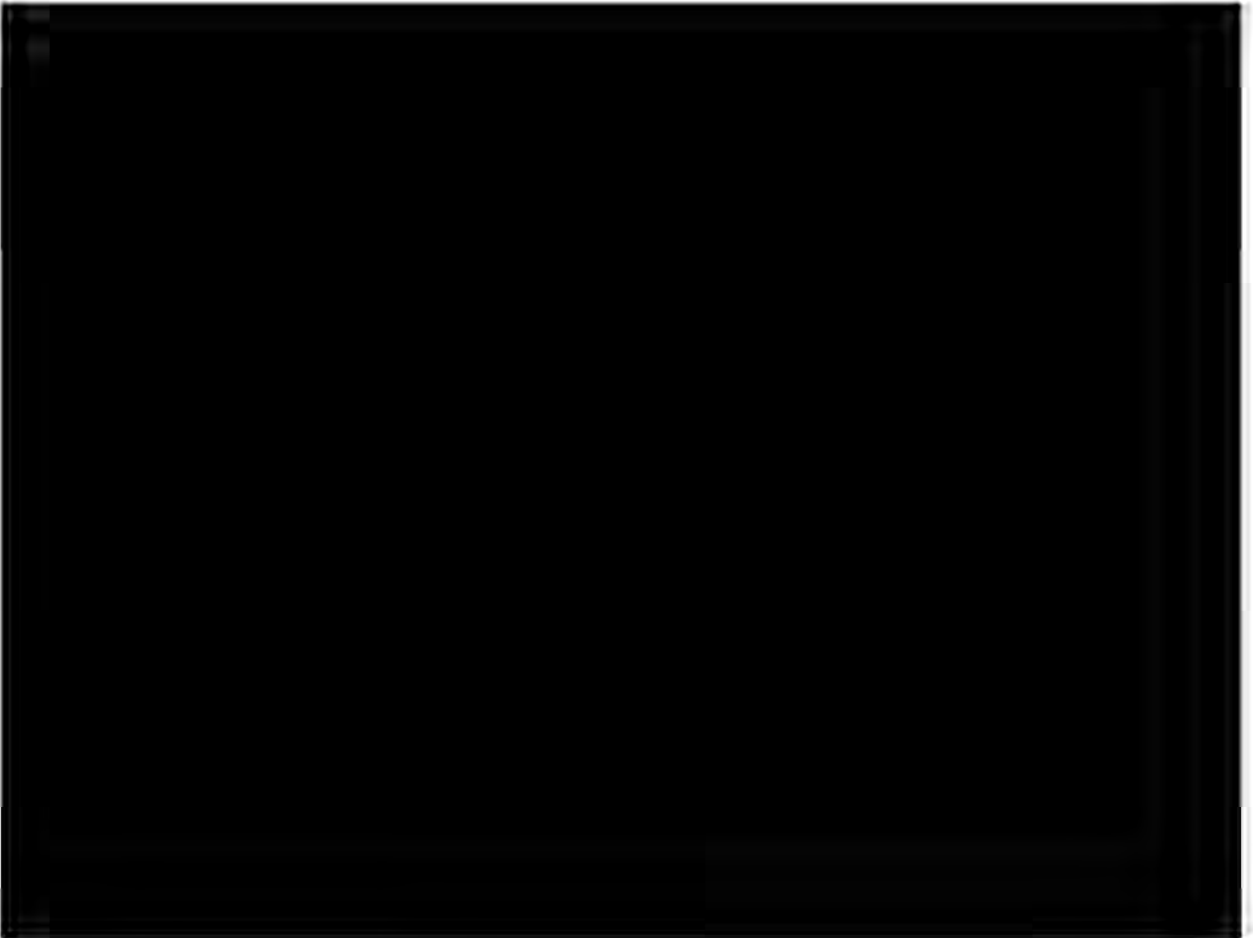
PUBLIC VERSION

two to three years. The Company didn't receive any proposals for supply option (1), i.e., Back Stand Energy Call Options.

Duke Energy Kentucky received a total of two hundred and thirty-four (234) bid alternatives from four different bidders. The following three tables provide an overview of the bids that were submitted as a result of the RFP:







IV. Analysis Methodology

A. Analysis of Daily Call Bids

Duke Energy Kentucky received 204 iterations of daily call bids that had no tie to East Bend's forced outages. The daily call bids can be utilized whenever the [REDACTED] [REDACTED], so the comparison is with the market. Bids were analyzed hourly, averaging the [REDACTED] [REDACTED] and comparing to the American Electric Power Dayton Hub market (AD Hub) prices for the same period. When the call is in the money, it is exercised for the [REDACTED] [REDACTED] is reached. Total cost of the strike costs plus premium costs is compared to the total market cost in the

PUBLIC VERSION

same timeframe. If the call cost is [REDACTED], then the call is of value to Duke Energy Kentucky.

Since the daily calls are dependent on market pricing assumptions, analysis was performed using both AD Hub market price forecast and a high market sensitivity case (increase of 20% over the Hub).

1. [REDACTED]

[REDACTED] submitted thirty-six bids for analysis (Table 5A) with options in 100 MW blocks which increase in cost with each additional MW block. For instance, the first 100 MW block is cheaper than the second 100 MW block which is cheaper than the third 100 MW block and so on. For this reason, only the first 100 MW block was analyzed (highlighted in Table 5A) since they are lowest cost. If the first tier was cost effective, then other tiers would be analyzed. For each 100 MW block, the [REDACTED] strike price, [REDACTED] heat rate and [REDACTED] heat rate alternatives were used for analysis. When a heat rate option is used, the strike price is developed using the given heat rate and the [REDACTED] gas price. During the analysis, [REDACTED] withdrew their [REDACTED], so only [REDACTED] were examined.



In Table 5D above, the [REDACTED] results can be seen. [REDACTED] their call options to [REDACTED]. The premium [REDACTED]

PUBLIC VERSION

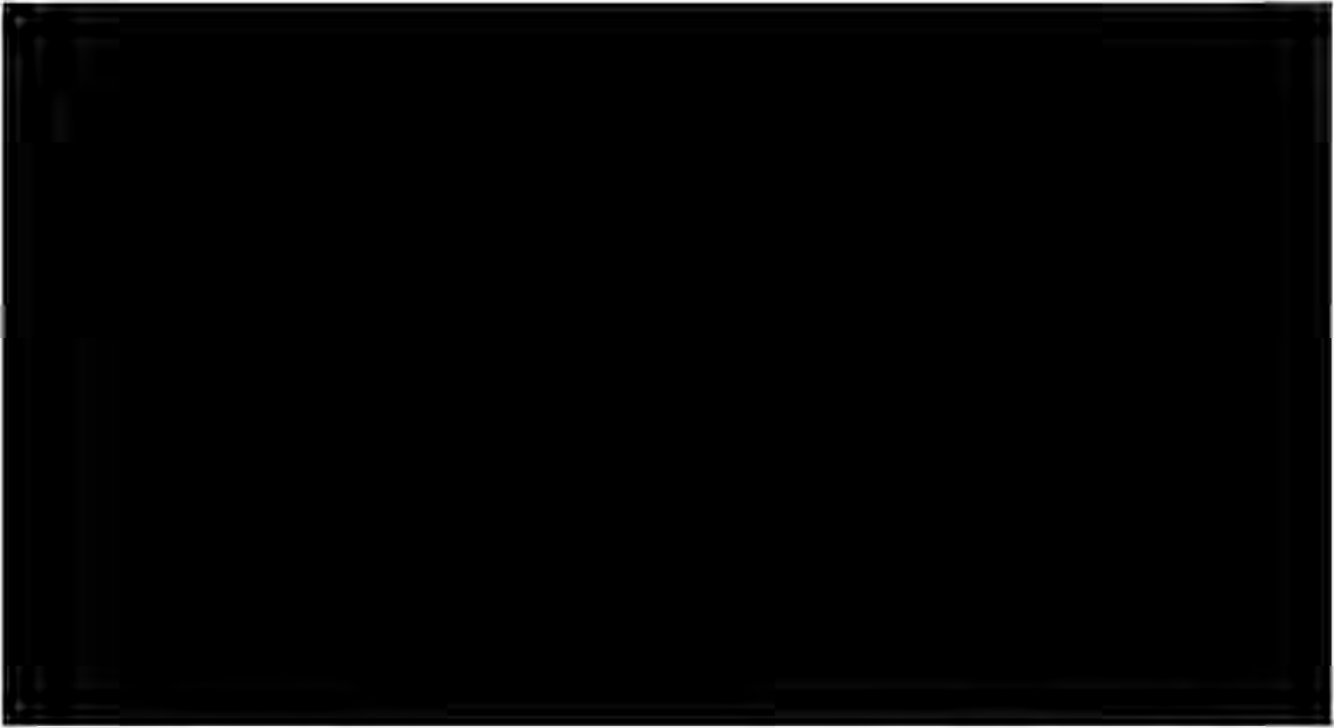
and the [REDACTED] are summed and compared to the market cost. The call option cost [REDACTED]. When the [REDACTED] is [REDACTED], the call is [REDACTED], and when the [REDACTED], the call is [REDACTED].

As can be seen above, the [REDACTED] did not provide value because of the [REDACTED]. In the [REDACTED] sensitivity runs, limited value was seen in only a few cases.

2. [REDACTED] Analysis

For the [REDACTED] bids, there were [REDACTED] as can be seen in Table 5B above. Since every [REDACTED] [REDACTED] [REDACTED]. Bids highlighted in Table 5B were analyzed with both [REDACTED] considered.

Options were evaluated by first checking the [REDACTED] and comparing to the AD Hub market prices for the same period. When the call option provides value, it is exercised until [REDACTED] [REDACTED] in the same timeframe. If the call cost is [REDACTED] [REDACTED] value to Duke Energy Kentucky. The results of the [REDACTED] analysis are seen in Table 5E below.



[REDACTED] bids are limited by number of [REDACTED]. The [REDACTED] is derived from the [REDACTED]. The [REDACTED] are summed and compared to the [REDACTED]. When the [REDACTED], the call is [REDACTED]. [REDACTED], the call is [REDACTED]. [REDACTED].

As can be seen in the Table 5E above, no [REDACTED] had value over the PJM AD Hub market prices. Analysis of the [REDACTED] case also showed no value.

3. Summary

In summary, the [REDACTED] did not provide enough value to Duke Energy Kentucky over the market to justify their fixed costs.

PUBLIC VERSION

B. Analysis of Insurance Bids

Back stand insurance proposals were analyzed to evaluate possible benefits of reducing the Company’s exposure to higher energy costs due to loss of East Bend’s 600 MWs as a result of unscheduled outages.

The insurance bids are tied to outages, so the modeling evaluated a base forced outage rate of [REDACTED] and extreme outage sensitivity cases of a major Summer outage (June, July and August sustained outage) and a major Winter outage (January and February sustained outage).

When an outage occurs, the models checks weekday values for being “in the money” by [REDACTED] and comparing them to [REDACTED]. Modeling also checks for [REDACTED]. When there is an outage and the [REDACTED] in the money, the model will [REDACTED] daily until it [REDACTED] or the outage ends.

For each contract year, the model sums the margin (total strike-total market cost) and compares it to the deductible. If the [REDACTED] [REDACTED] [REDACTED]. Since the deductible [REDACTED] [REDACTED]. These totals are summed for Total Contract Cost. [REDACTED] [REDACTED]. In the base case, no options met the deductible.

PUBLIC VERSION

The insurance results are seen in Table 5F below. When the total contract cost is [REDACTED], this means the call costs are [REDACTED] and the call provides [REDACTED] to Duke Energy Kentucky. Since the base outage case of [REDACTED] had all [REDACTED] results, no insurance bids provided value as compared to the market. In the extreme sensitivity cases, the Winter outage case showed that bids with 180 day limits provided [REDACTED] few with 21 day limits provided [REDACTED] the 180 day limit cases. In the [REDACTED] [REDACTED].



PUBLIC VERSION

In summary, the insurance bids only provide value under [REDACTED] conditions, so Duke Energy Kentucky does not feel the fixed cost is justified at this time.

V. Non-RFP Supply Options Evaluated

As in past back-up power supply plans, Duke Energy Kentucky evaluated various back-up power supply alternatives consisting of market energy purchases. One alternative considered energy purchases through the PJM energy markets for all outages (Alternative A). A second alternative considered fixed-priced financial swap contracts to lock-in the price of power during scheduled outages and PJM energy market purchases for the duration of forced outages (Alternative B). This is consistent with previous practice.

The Company considered Alternative A, relying solely on the PJM daily energy markets for back-up power needs for both planned and forced outages. Alternative A has the potential to expose the Company to possible price spikes during scheduled outage periods. The Company determined that it would not be feasible to make fixed forward price purchases for forced outages because the Company would not know in advance when such outages would occur. These outages would not align with the standard monthly unit of fixed forward power products, and as it would not be economical to purchase power at fixed forward prices for the entire peak month period, these purchases would increase rather than decrease risk.

Duke Energy Kentucky evaluated the merits of Alternative B, fixed-priced purchases during scheduled outages, to mitigate the risk of potential price spikes. Duke Energy Kentucky would use the Intercontinental Exchange (ICE) or bilateral over the counter (OTC) broker market to make these fixed-priced financial swap or future contract purchases. The ICE is a well-established electronic marketplace for trading energy-

PUBLIC VERSION

related products. Among other product types, ICE offers trading in bilateral contracts for energy at fixed forward prices. The contract terms (such as hours of the day covered, the index price, credit, and liquidated damages provisions) are clearly defined, to enable trading in standardized products. The Company will use PJM energy market purchases for forced outages.

VI. Conclusion

Based upon its analysis, the Company finds the call bid responses to the RFP do not offer incremental economic value compared to expected market priced energy. Simply put, the high-risk premiums assigned to these options compared to the expected utility of the actual energy calls are too high of an economic hurdle to exceed. In addition, most of the call responses were daily calls. The very nature of forced outages is its unpredictability, but the daily call bids cover the entire duration of the plan regardless of whether East Bend is in outage or not. The product does not align well with forced outage risk exposure. The Company continues to believe that PJM energy market products will continue to play an effective role in the overall back up power supply hedging strategy. Both Alternative A and Alternative B plans involve purchasing power through the PJM daily energy markets and are the least-cost supply plans based upon current projections for energy markets. Based on prior analysis, the Alternative A Plan is less costly than the Alternative B plan but presents greater risk. Alternative A calls for the Company to obtain its full back-up power requirements (scheduled and forced outages) from the PJM daily energy markets; however, it provides very little protection against possible price spikes. The Duke Energy Kentucky model forecasts future power prices based on observable forward wholesale market prices. If the forward power

PUBLIC VERSION

market curve is underrepresenting actual real time future prices, then this plan may prove more costly than the other plans.

Alternative B plan provides that Duke Energy Kentucky will obtain back-up power through the PJM daily energy market during forced outages and use fixed forward contract purchases during scheduled outages. This mitigates the risk of price spikes during scheduled outages because the price for back-up power would be fixed.

Alternative B Plan provides the flexibility to optimize the actual outage schedule under changing power market and unit availability conditions. Since the ICE and/or OTC markets are liquid, Duke Energy Kentucky can make its forward contract purchase a few months in advance of the scheduled outages, without paying a premium to lock in the prices now for a three-year time period. If prices appear to be increasing, the plan provides the flexibility to make the forward contract purchases for long-term periods. If prices are flat or falling, the Company can postpone these purchases. Alternative B plan provides flexibility to modify executed forward contract positions if scheduled outage dates are modified by utilizing the liquidity of the ICE or OTC broker market to unwind existing contracts and purchase new contracts to match new scheduled outage dates.

PUBLIC VERSION

Finally, as noted, the insurance bids only really provide value under extreme Winter outage conditions, so Duke Energy Kentucky does not feel the fixed cost is justified at this time. The Company will continue to use the Alternative B plan as its back-up plan as it has done since 2006.

Respectfully submitted,

DUKE ENERGY KENTUCKY, INC.

/s/Rocco D'Ascenzo

Rocco O. D'Ascenzo (92796)

Deputy General Counsel

Duke Energy Business Services, LLC

139 East Fourth Street, 1303-Main

Cincinnati, Ohio 45202

Phone: (513) 287-4320

Fax: (513) 287-4385

E-mail: rocco.d'ascenzo@duke-energy.com

PUBLIC VERSION

CERTIFICATE OF SERVICE

This is to certify that the foregoing electronic filing is a true and accurate copy of the document being filed in paper medium; that the electronic filing was transmitted to the Commission on March 1, 2021; that there are currently no parties that the Commission has excused from participation by electronic means in this proceeding; and the original filing in paper medium will be delivered to the Commission pending further instruction from Case No. 2020-00085.⁵

John G. Horne, II
The Office of the Attorney General
Utility Intervention and Rate Division
700 Capital Avenue, Ste 118
Frankfort, Kentucky 40601

/s/Rocco D'Ascenzo
Rocco D'Ascenzo

⁵ *In the Matter of Electronic Emergency Docket Related to the Novel Coronavirus COVID-19, Order, Case No. 2020-00085 (Ky. P.S.C. March 16, 2020).*