COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

Duke Energy Kentucky, Inc.'s Application for Approval of a Special Contract and for Waiver of 807 KAR 5:041, Section 6(2)(c)	)))	Case No. 2021-00192

Final Report of Duke Energy Kentucky, Inc., and Northern Kentucky Water District

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I. Background:

By Order dated March 4, 2022, the Kentucky Public Service Commission approved an Agreement between Duke Energy Kentucky, Inc., (Duke Energy Kentucky) and the Northern Kentucky Water District (NKWD) and certain waivers of 807 KAR 5:041, Section 6(2)(a) and (c) for a three year period to allow for the reasonable operation of NKWD's Mary Ingles Pumping Station (Agreement).[1] As was explained during the course of the above-styled proceeding, and acknowledged in the Commission's Order, Duke Energy Kentucky serves the Mary Ingles Pumping Station from its Wilder 46 circuit, which is a 12.47 kV electric distribution circuit, that also provides service to other businesses and residences in the Company's Norther Kentucky service territory.[2] NKWD takes service under the terms and conditions of Duke Energy Kentucky's Time -Of-Day Rate for Service at Distribution Voltage, Rate DT. Rate DT includes summer on-peak demand and energy charges, winter on-peak demand and energy charges and an off-peak demand and energy charges.[3]

[1] *In the Matter of the Electronic* Application of Duke Energy Kentucky, Inc. for Approval of a Special Contract and for Waiver of 807 KAR 5:041, Section 6(2)(c), Case No. 2021-00792, (K.Y. PSC)(Mar. 4, 2022).
[2] *Id.*
[3] *Id.* p. 2.;The off-peak hours under Rate DT are 8 p m. to 11 a.m. in the summer and 9 p m. to 9 a.m. and 2 p m. to 5 p.m. in the winter

NKWD primarily operates the pumps at the Mary Ingles Pumping Station during off-peak hours to manage its energy costs so to take advantage of the off-peak pricing and avoid the on-peak pricing. When NKWD's pumps draw a large amount of power during their start-up cycles until reaching normal operating levels, causing a voltage drop on Wilder 46 circuit of typically six to eight percent. The pump station in its current form has been in place since 1997. The pump station pumps raw water from the Ohio River up a substantial elevation to NKWD's Fort Thomas Treatment Plant.

To mitigate the effects of these pump starts on the Mary Ingles Pumping Station, Duke Energy Kentucky and NKWD developed the Agreement and submitted it for Commission approval. Among other things, the Agreement set forth agreed upon operating conditions to mitigate these voltage impacts during pump start-up in a way that does not also penalize NKWD from a rate impact perspective under Rate DT. While the Agreement provided a way to mitigate the voltage impacts, it did not eliminate them altogether. As such, the Company also requested and was granted specific waivers to enable the Agreement to go into effect.

The Commission granted the requested relief for a three-year period to provide Duke Energy Kentucky and NKWD to investigate potential permanent solutions to the voltage drops.[4] In doing so, the commission directed the companies to investigate all potential solutions to the voltage drops, including conducting any engineering analysis necessary to determine the effectiveness and cost of motor soft start controls and voltage compensation mitigation.[5] Further, the Commission directed the companies to file a report (either jointly or separately) discussing these potential solutions (or combination thereof) that were investigated, and explain whether the solutions are expected to be effective, detailing the expected costs and identify and explain which

[4] *Id.*pg. 12.
[5] *Id.*

solution would be the most practical.[6] Finally, the Commission directed Duke Energy Kentucky to continue monitoring the Wilder 46 circuit performance.[7]

II. Report and Analysis

As directed in the Commission's Order, the companies worked together to develop the report of potential solutions to resolve voltage drop issue. In doing so, the companies engaged an independent third party, McGill Power S&E Inc., to gather data and create a basis for a final evaluation and mitigation of the voltage issue caused by the water pump operations (McGill Study). A copy of the McGill Study is included as Confidential Attachment 1 to this Report. The McGill Study considered three solutions to reduce and/or mitigate the voltage drop issue: 1) Alternate Electric Utility Distribution Feeder; 2) Dynamic Reactive Energy Devices; and 3) Variable Frequency Drive (VFD)/Drive Sync Transfer Scheme (DSTS).

Following the completion of the McGill Study, NKWD proceeded to further investigate the Variable Frequency Drive (VFD)/Drive Sync Transfer Scheme (DSTS). NKWD retained HDR Engineering to do a further analysis and report on the viability and costs of installing a solution in Mary Ingles Pumping Station. A copy of the HDR Technical Memorandum is included as Confidential Attachment 2 to this Report.

Additionally, Duke Energy Kentucky has continued to monitor the voltage on the Wilder 46 circuit when NKWD starts its pumps. NKWD has been complying with the pump starting requirements under the Agreement resulting in the timing of the drops to occur during less impactful times of day and the frequency of these drops reducing as intended. Confidential Attachment 3 depicts the circuit's voltage performance over a representative period under the terms of the Agreement. As indicated in Attachment 3, while timing voltage drops has shifted to

[6] *Id.* pg. 13.
[7] *Id.*

periods less impactful to customers, and the frequency of such system impacts has been reduced under the Agreement, there has been no measurable reduction in the percentage of voltage drop during NKWD's pump start-up process. Such was not the purpose of the Agreement. The pumps continue to cause the voltage on the circuit to fall below the minimum amount set forth under regulations during pump start up. While Duke Energy Kentucky has complete records of the voltage during the period under review, due to file size, the Company is providing a representative period. Duke Energy Kentucky will make the entire two-years of data available for Commission inspection upon request.

III. Conclusion

Duke Energy Kentucky supports the outcome of the McGill Power study and takes no position on the results of NKWD's Technical Manual report. The solutions identified and evaluated are not guaranteed to fully mitigate the momentary voltage drop experienced upon pump startup. A permanent solution, in any form, will take time to design, construct, and implement, including any necessary certificate of public convenience and necessity approvals that may be required. Both Duke Energy Kentucky and NKWD are willing to meet with the Commission to discuss the reports and work on a solution that is reasonable for all stakeholders, including the customers of both Duke Energy Kentucky and NKWD.

Respectfully submitted,

/s/Rocco D'Ascenzo
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/s/Tom Edge (per email authority 3/1/2024)
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Counsel for Northern Kentucky Water District

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 4, 2024; that there are currently no parties that the Commission has excused from participation by electronic means in this proceeding.

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

CONFIDENTIAL PROPRIETARY TRADE SECRET

CONFIDENTIAL ATTACHMENT 1

FILED UNDER SEAL

Technical Memorandum

Northern Kentucky Water District

Ohio River Pump Station No. 1

Power System Review

Fort Thomas, Kentucky

February 2024

This document is considered project proprietary and confidential

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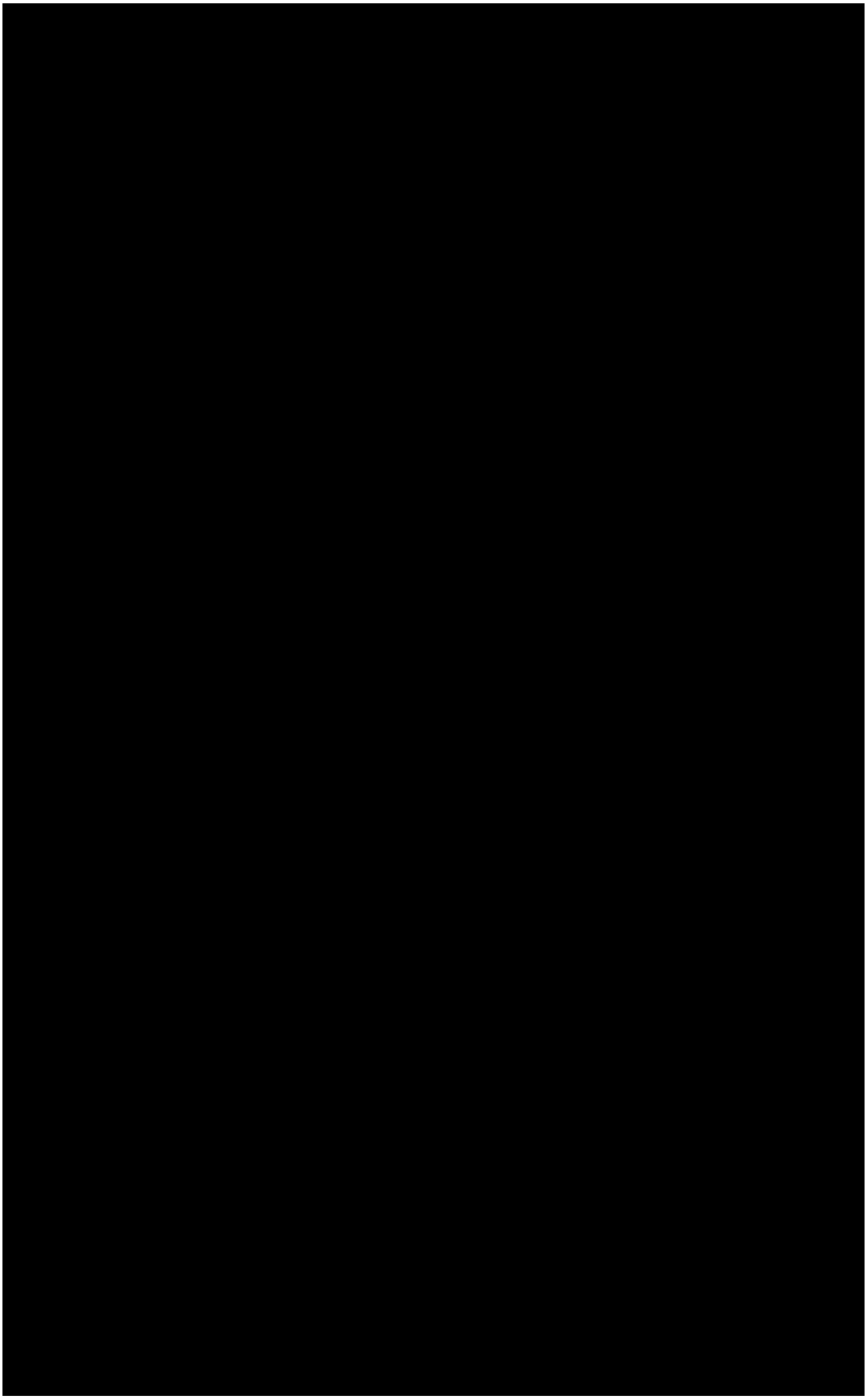

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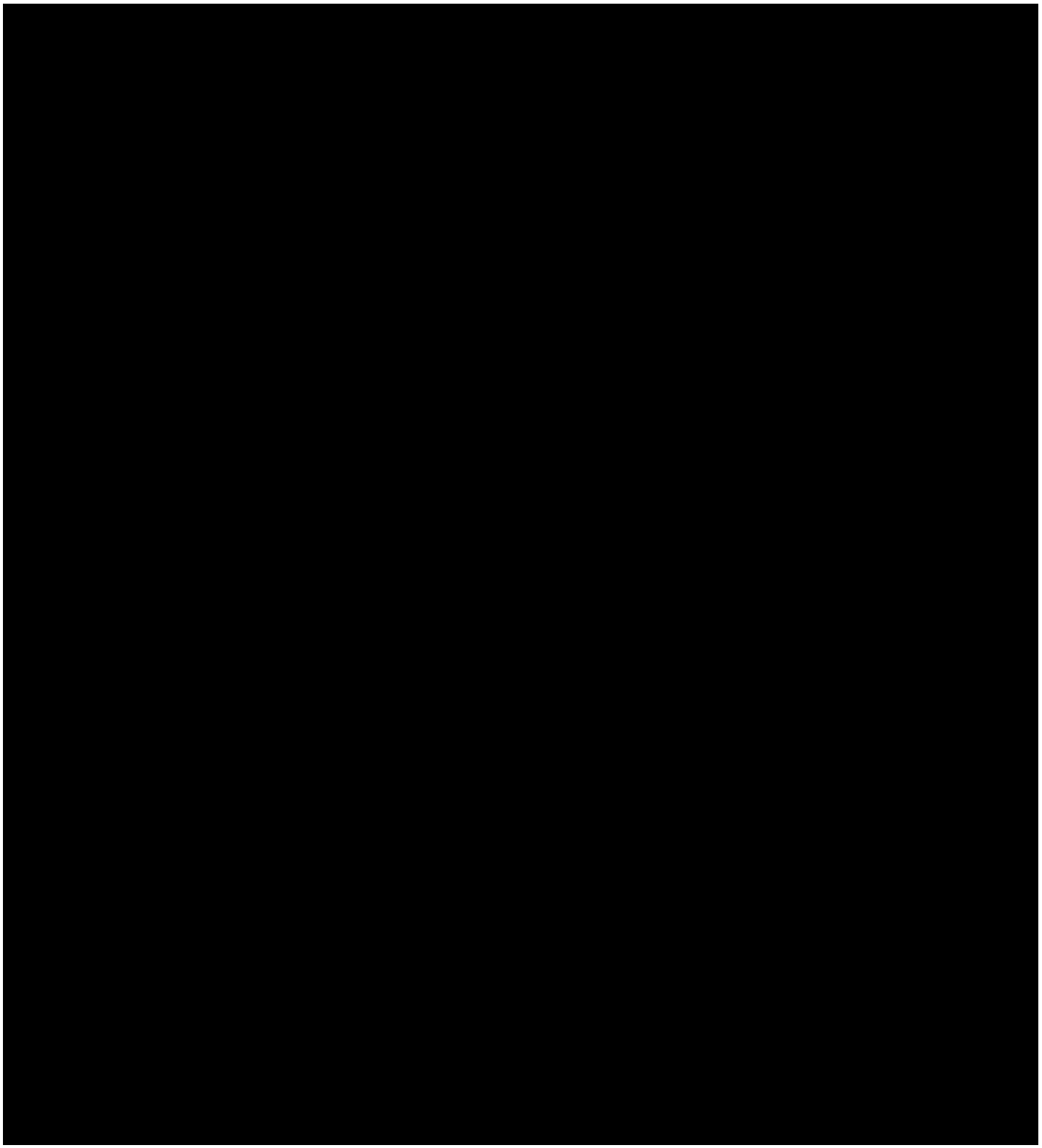

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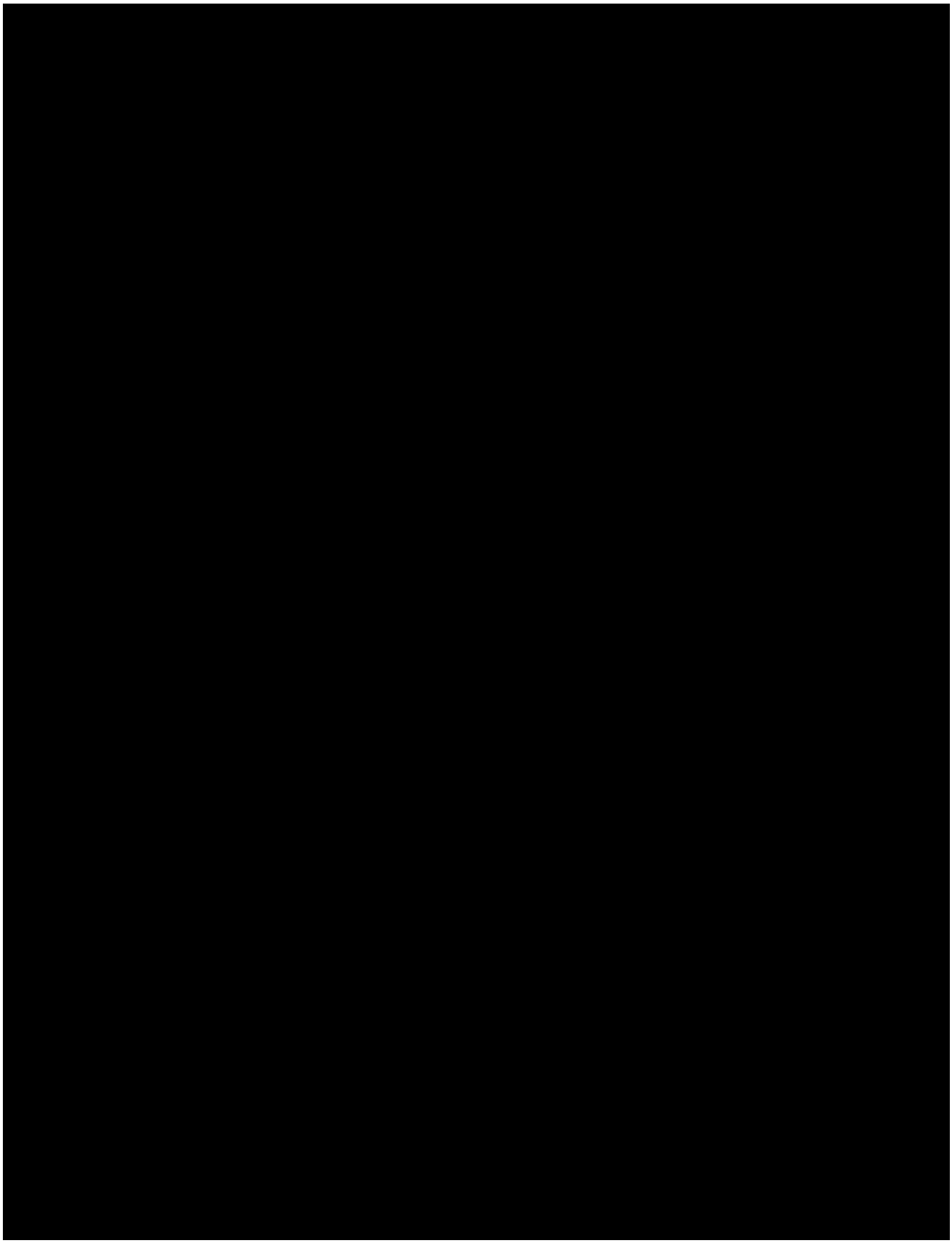

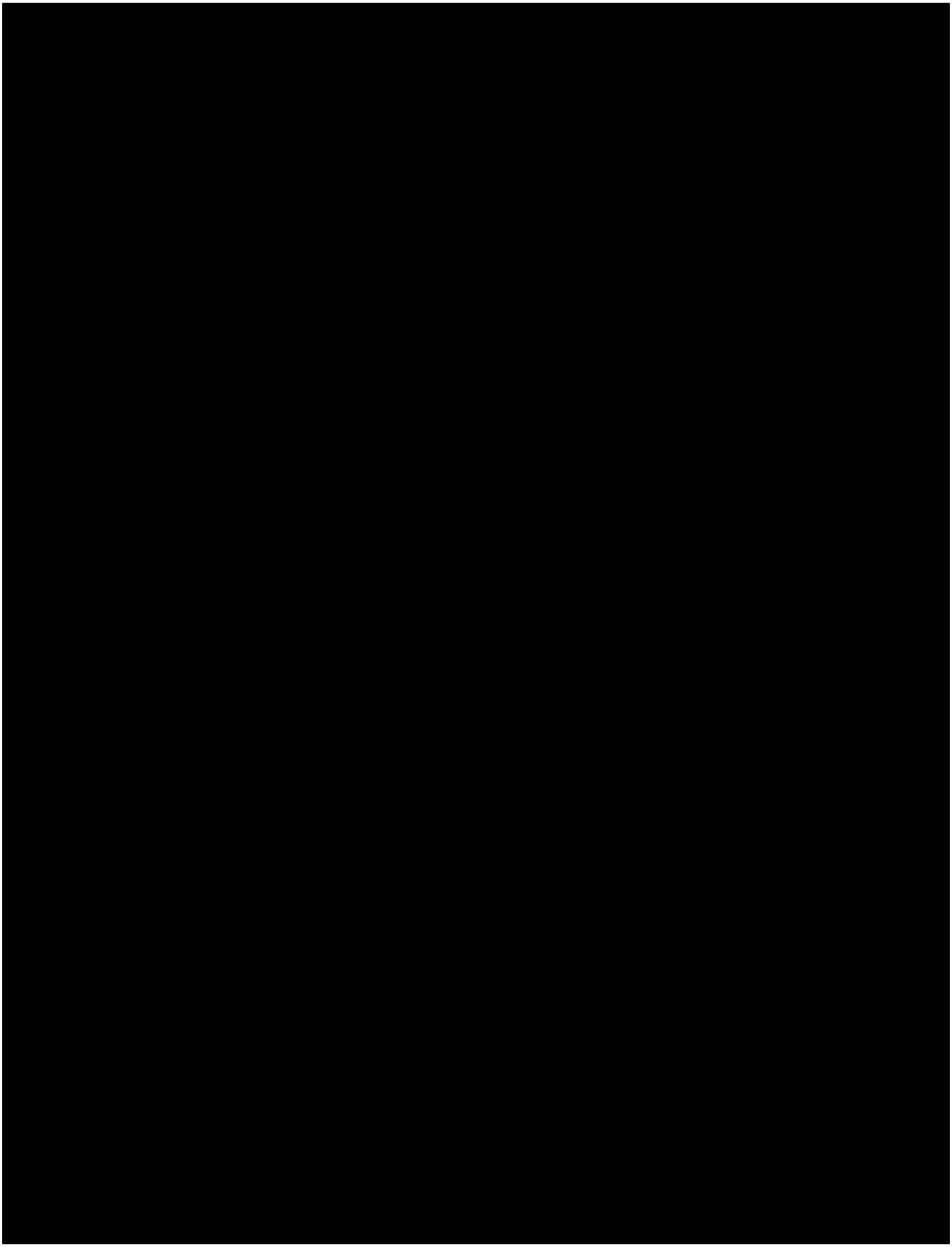

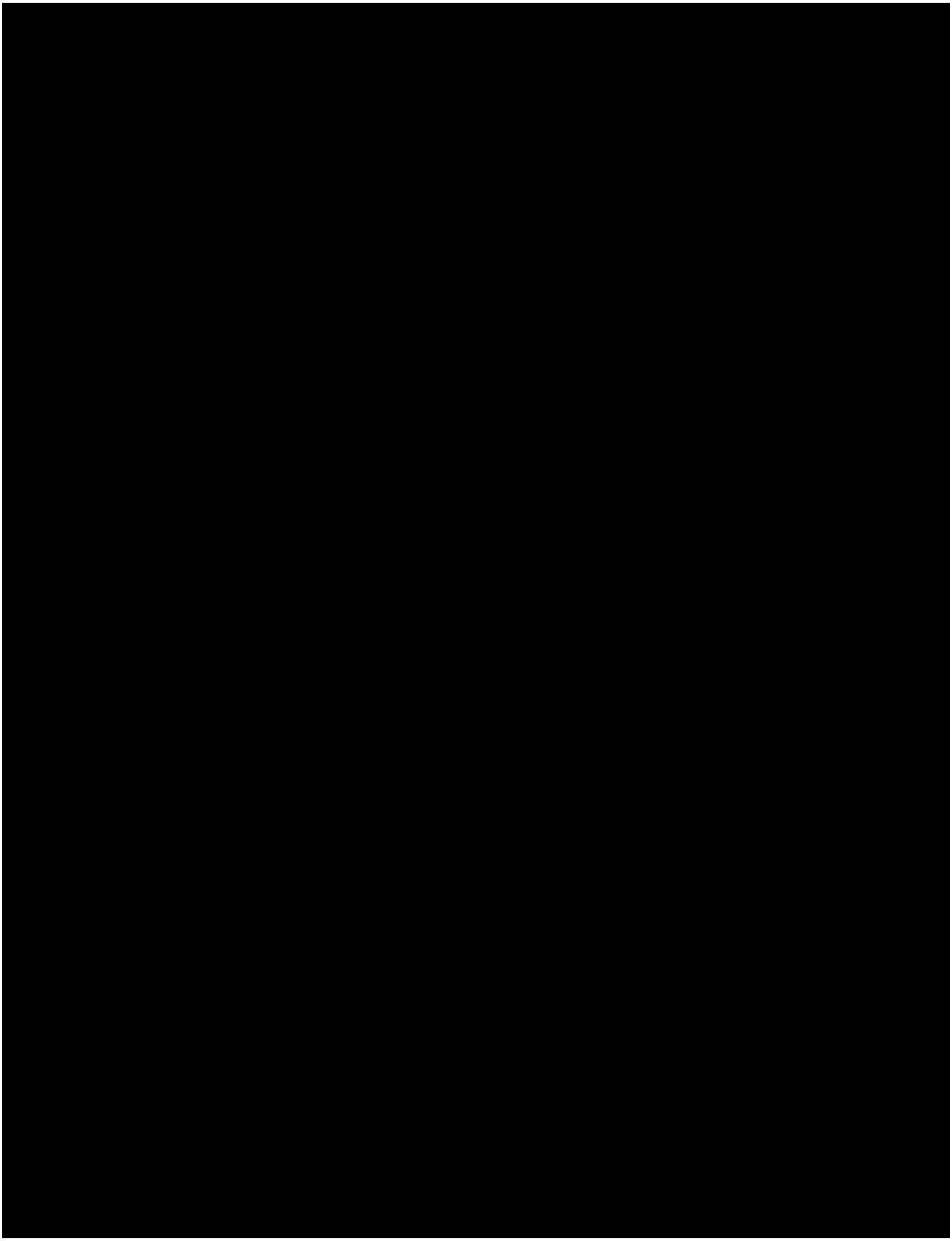

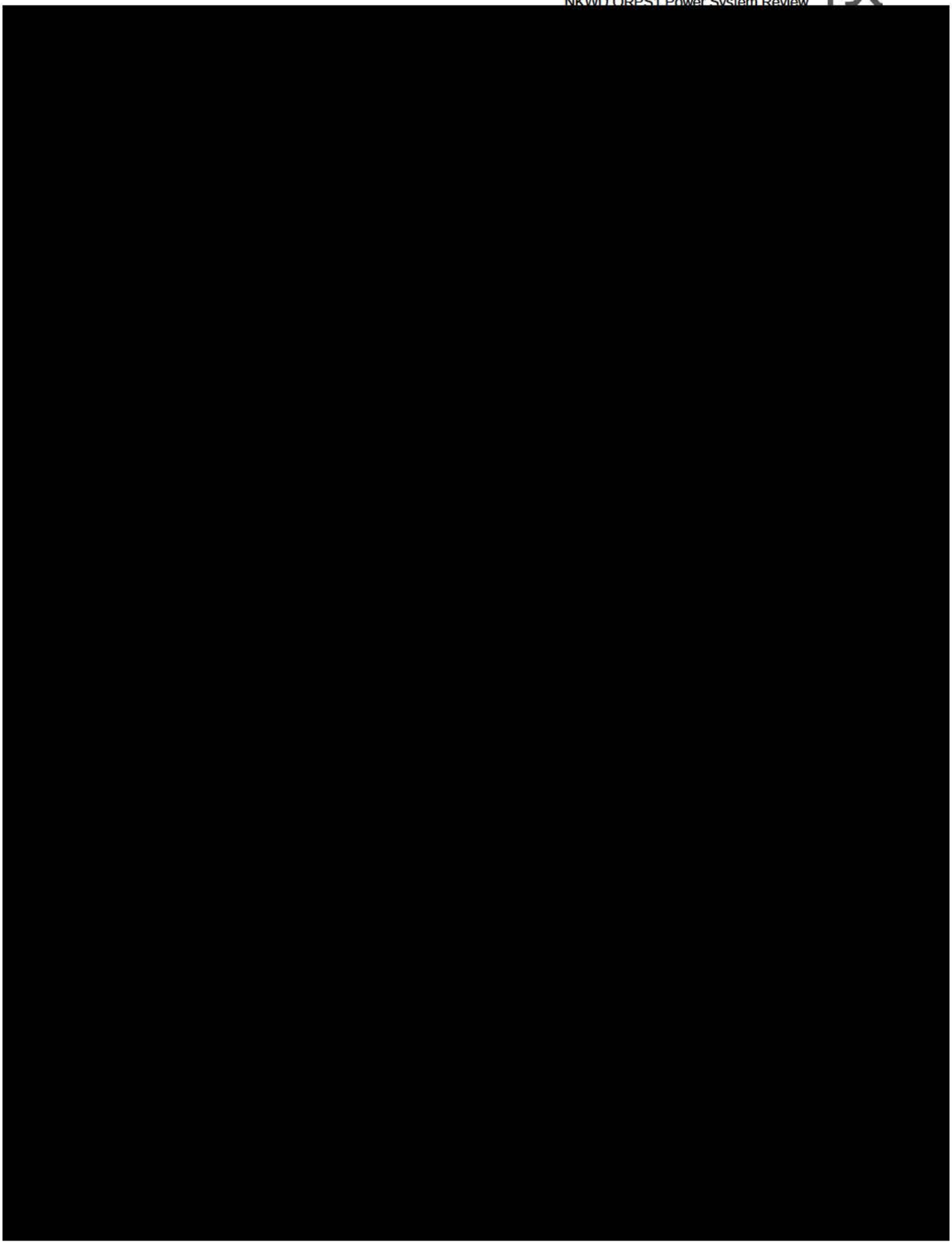

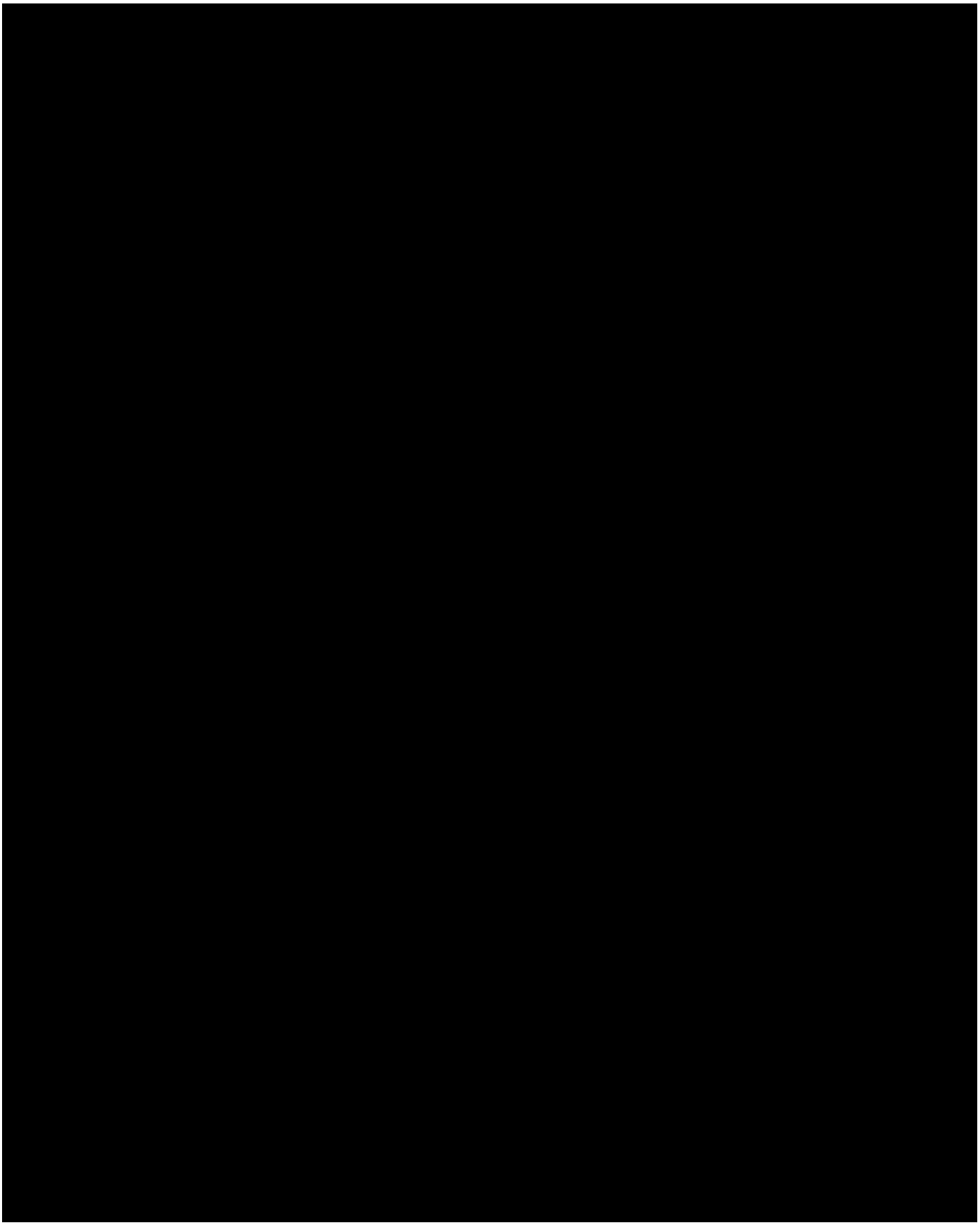

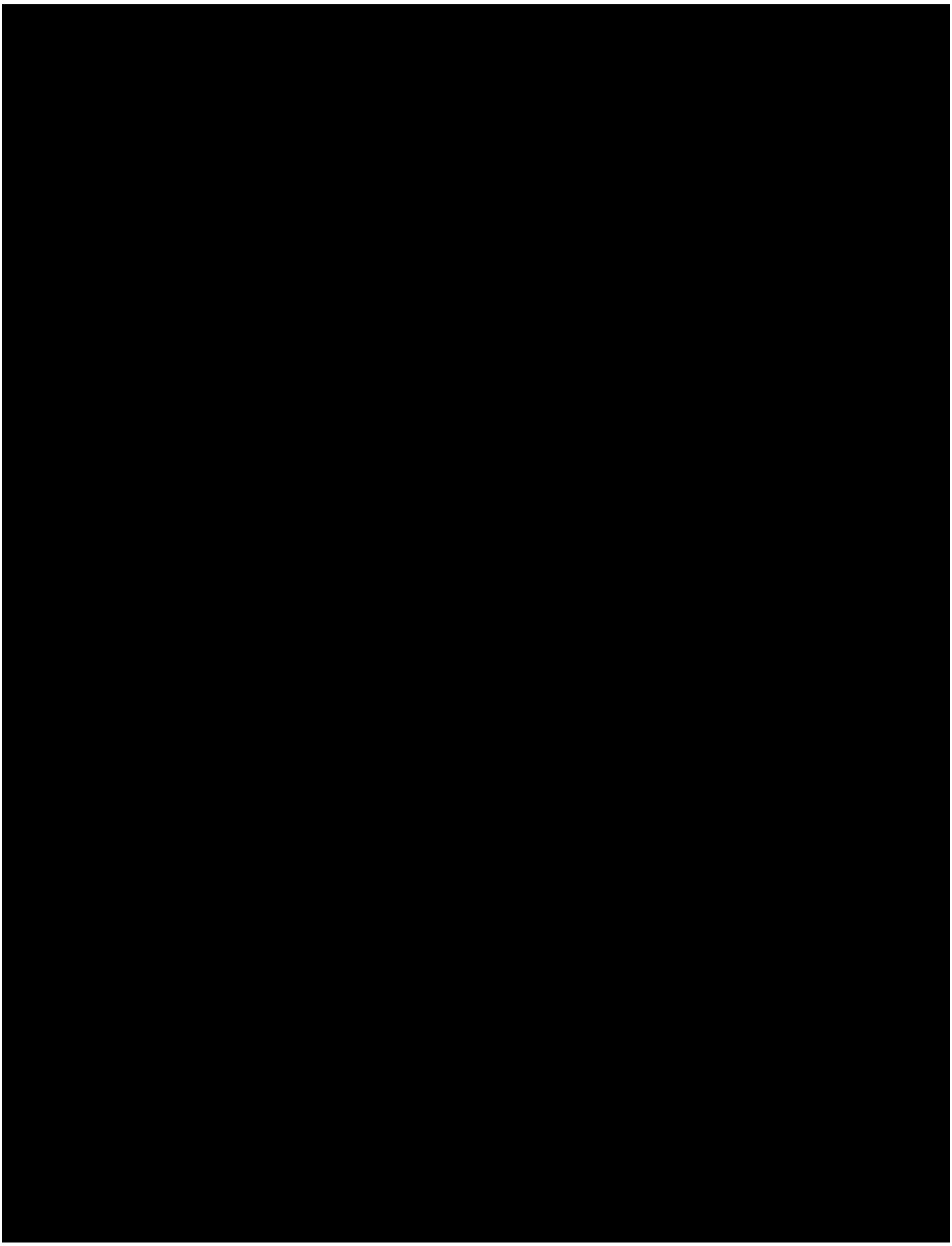

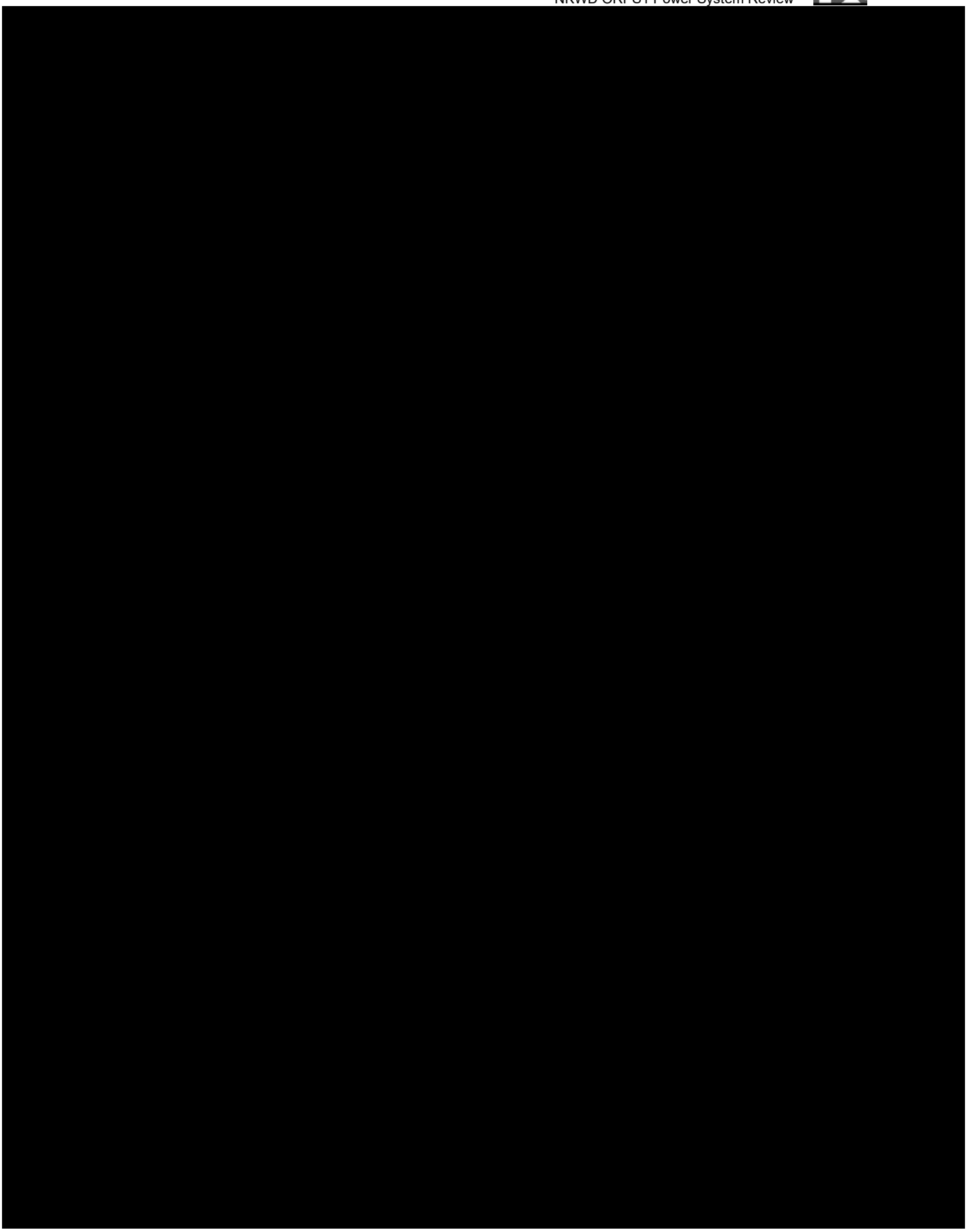

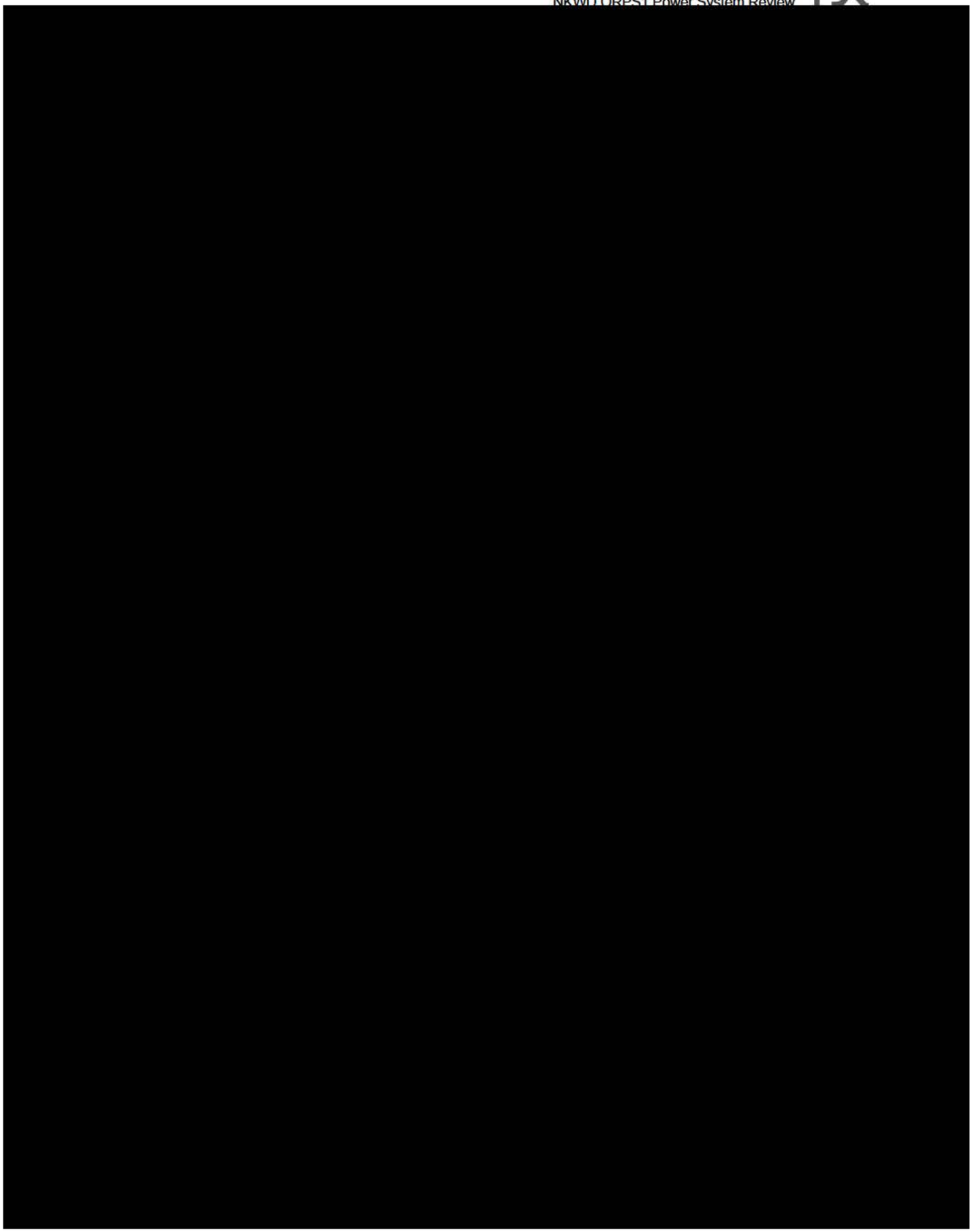

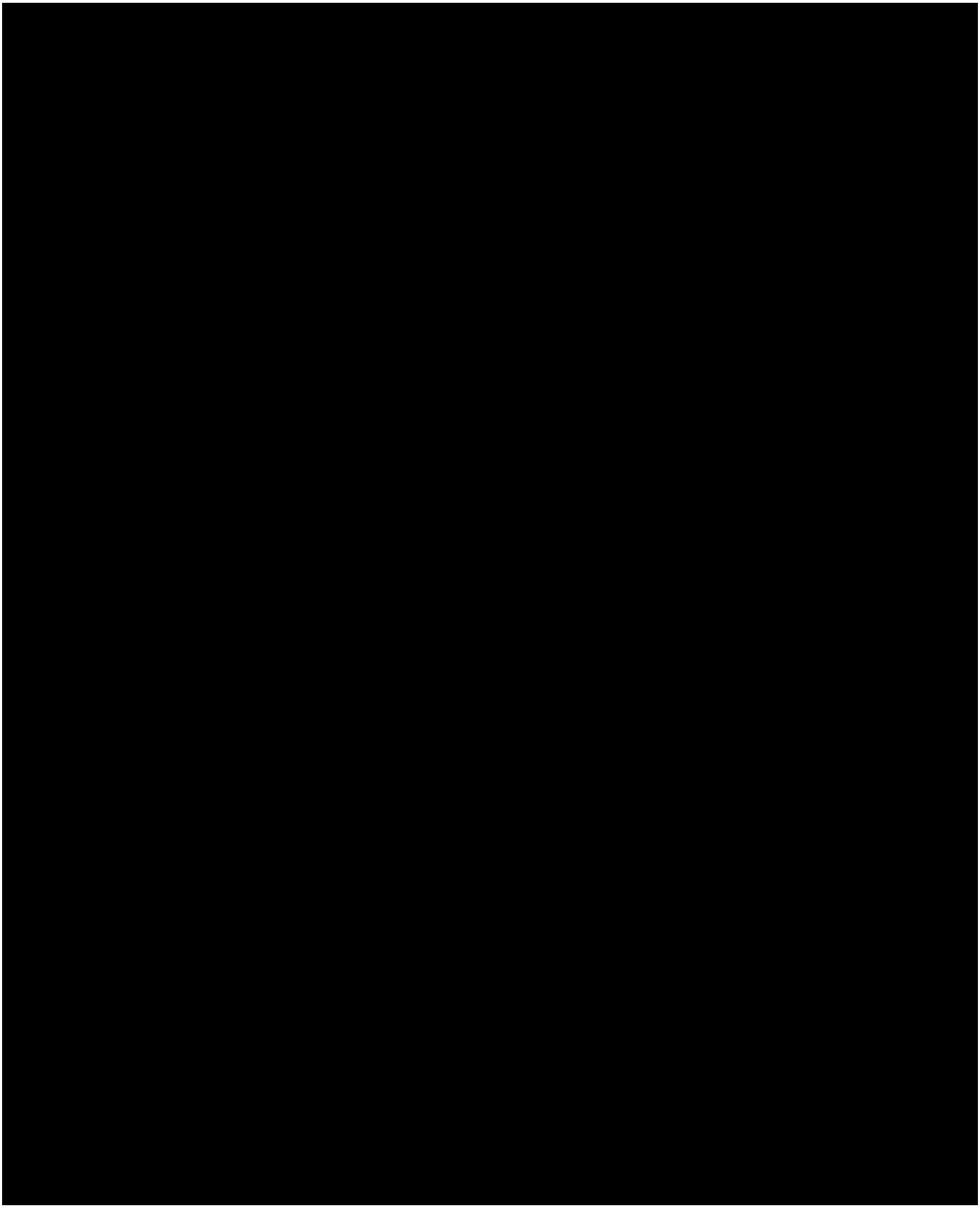

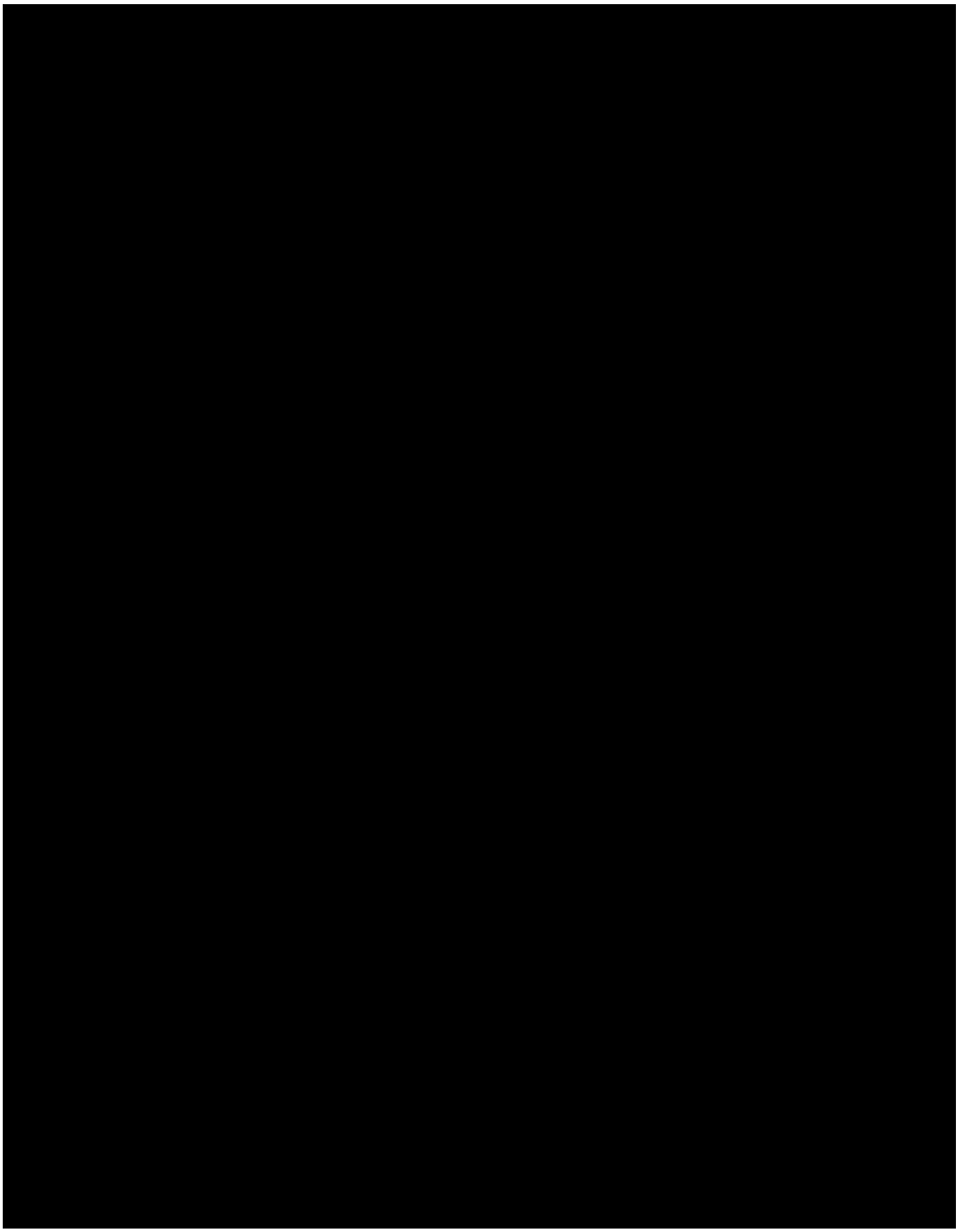

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ORPS1 ONE-LINE DIAGRAMS

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PSC APPLICATION

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COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

Duke Energy Kentucky, Inc.'s Application for Approval of a Special Contract and for Waiver of 807 KAR 5:041, Section 6(2)(c)	)))	Case No. 2021-00192

DUKE ENERGY KENTUCKY, INC.'S APPLICATION FOR APPROVAL OF A SPECIAL CONTRACT AND FOR WAIVER OF 807 KAR 5:041, SECTION 6(2)(c)

Now comes Duke Energy Kentucky, Inc. (Duke Energy Kentucky or Company), pursuant to 807 KAR 5:011, Section 13, 5:006, Section 28, and 5:041, Section 6(6) and hereby respectfully requests the Kentucky Public Service Commission (Commission) approve the attached special contract and to grant a waiver from 807 KAR 5:041, Section 6(2)(c) to the extent necessary.

In support of this Application, Duke Energy Kentucky respectfully states:

1. Duke Energy Kentucky is a Kentucky corporation with its principal office and principal place of business at 139 East Fourth Street Cincinnati, Ohio 45202. The Company's local office in Kentucky is Duke Energy Operations Center, 1262 Cox Road, Erlanger, Kentucky 41018.

2. Copies of all orders, pleadings and other communications related to this proceeding should be sent to:

Rocco O. D'Ascenzo
Deputy General Counsel
Duke Energy Kentucky, Inc.
139 E. 4th St., Cincinnati, OH 45202
Rocco.D'Ascenzo@duke-energy.com
KYfilings@duke-energy.com

3. Duke Energy Kentucky is a utility engaged in the gas and electric business. Duke Energy Kentucky purchases, sells, stores and transports natural gas in Boone, Bracken, Campbell, Gallatin, Grant, Kenton and Pendleton Counties, Kentucky. Duke Energy Kentucky also generates electricity, which it distributes and sells in Boone, Campbell, Grant, Kenton and Pendleton Counties.

4. Pursuant to 807 KAR 5:001, Section 14(2), Duke Energy Kentucky states that it was originally incorporated in the Commonwealth of Kentucky on March 20, 1901, and attests that it is currently in good standing in said Commonwealth.

5. Duke Energy Kentucky customer, Northern Kentucky Water District (NKWD) operates the Ohio River Pumping Station 1, also known as the Mary Ingles Pumping Station, located on Mary Ingles Highway, Ft. Thomas, Kentucky (the Pumping Station) where a total of six 1,250 HP pumps are installed.

6. Duke Energy serves the Pumping Station from its 12.47 kV electric distribution circuit, Wilder 46, which also serves other businesses and residences.

7. NKWD currently takes service at the Pumping Station in accordance with Duke Energy Kentucky's approved Time-Of-Day Rate For Service At Distribution Voltage, Rate DT, KY.P.S.C Electric No. 2, Eleventh Revised Sheet No. 41. See Attachment 1. Rate DT offers lower rates on electric demand and energy consumed during off-peak hours. The off-peak hours are as follows:

a. Summer: 8:00 pm – 11:00 am

b. Winter: 9:00 pm – 9:00 am; 2:00 pm – 5:00 pm

8. NKWD, in order to manage its energy costs, operates its pumps primarily during off-peak hours. This results in NKWD having to run more pumps, and start them more

frequently, than if they were able to operate their pumps continuously, 24 hours a day. Multiple pump starts also causes wear and tear on the pumps.

9. When the pumps start, they draw a large amount of power until they can reach normal operating levels. This power draw periodically results in a momentary voltage drop on Wilder 46 that can be more than 4%.

10. The Company and NKWD have been actively engaged in finding a solution to voltage drop issue that balances the interests of the two companies and their respective customers, who would ultimately pay for any incremental facility upgrades to mitigate voltage drops (e.g., motor controls for NKWD or additional electric service substations for the Company). Together, the companies have developed a solution through a reasonable special contract structure that will enable NKWD to have greater control over running their Pumping Station 1 without an adverse impact on their electric costs paid to Duke Energy Kentucky, or necessitating significant capital investments or upgrades to the Pumping Station or Duke Energy's distribution system.

11. On March 19, 2021, Duke Energy Kentucky and NKWD entered into a Rates and Scheduling Agreement (Agreement), subject to approval by the Commission. See Attachment 2.

12. The intent of this Agreement is to provide NKWD greater operational flexibility for its pumping stations in a manner that does not adversely impact its costs of electric service. The Agreement is structured such that NKWD is agreeing to a revised operating schedule in which it may start its pumps between the hours of midnight and 4:00 am (with an exception for emergency conditions) and run the pumps 24 hours per day. This revised operating schedule will see fewer pump starts and fewer pumps running at any given time under normal conditions. Hence, the revised operating schedule will result in fewer instances of voltage drop on Wilder

46, and the voltage drops will occur during a period of the night less likely to impact other customers on the circuit. In return, Duke Energy Kentucky is agreeing to adjust how it charges NKWD for power at the Ohio River Pumping Station 1. Duke Energy will charge NKWD a fixed demand charge of $3.38 per kW and fixed energy charge of $0.038016 per kWh for all power consumed at 3,000 kW and below and will charge NKWD the normal Rate DT charges for all power consumed greater than 3,000 kW. All other riders associated with Rate DT will be charged per their terms. Further, the fixed rates charged for power below 3,000 kW will be commensurately adjusted with any Commission-approved adjustment to Rate DT. This structure is intended to make Duke Energy Kentucky whole from an electricity sold perspective, and not to penalize NKWD for implementing the revised operating schedule.

13. Prior to the Agreement becoming effective, Commission approval is required along with an approved waiver from 807 KAR 5:041, Section 6 and any other laws, rules, or regulations that pertain to the potential voltage drops caused by the operation of the pumps.

14. The companies believe the Agreement will mitigate the periodic adverse impacts on the Company's distribution circuit when NKWD starts its pumps. The Agreement will allow NKWD to run their pumps on a more continuous basis, manage their electric demand, and reduce the number of pump starts, thereby reducing their operating costs and mitigating the associated periodic voltage drops impacting Duke Energy Kentucky's distribution system.

15. 807 KAR 5:041, Section 6(2)(c), provides in relevant part: "Where utility distribution facilities supplying customers are reasonably adequate and of sufficient capacity to carry actual loads normally imposed, the utility may require that starting and operating characteristics of equipment on customer premises shall not cause an instantaneous voltage drop of more than four (4) percent of standard voltage nor cause objectionable flicker in other

customer's lights."

16. Duke Energy Kentucky respectfully submits that the potential for voltage variation as a result of NKWD's pump operation is consistent with 807 KAR 5:041, Section 6 (6), as being in a limited area in and where the business done by NKWD, namely providing adequate water service to the citizens of Northern Kentucky does not justify close voltage administrative regulation. Nonetheless, the companies have worked diligently to find ways to minimize the voltage deviations caused by NKWD's pumping stations and impacts to our common customers. The companies recognize that this contract will likely not eliminate all future voltage impacts on the circuit, particularly in emergency or maintenance situations where NKWD will need to operate additional pumps. Nonetheless, in order to implement this arrangement, and not find itself in a willful violation of the Commission's regulations, the Company requests a waiver, to the extent necessary, for such voltage deviations, in excess of 807 KAR 5:041 during the hours of midnight to 4:00 am and due to the emergency or maintenance operation of NKWD's pumps within the confines of the Agreement. This waiver will allow NKWD to take necessary actions in maintaining their facilities and respond to emergency situations without resulting in Duke Energy Kentucky to suddenly be in violation.

17. Duke Energy Kentucky will provide any additional information that may be required to support this application.

WHEREFORE, for the reasons stated herein, Duke Energy Kentucky respectfully requests the Commission approve the Agreement and grant a waiver of 807 KAR 5:041, Section 6(2)(c) as described herein.

Respectfully submitted,

/s/Rocco D'Ascenzo

Rocco D'Ascenzo (92796)
Deputy General Counsel
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Email: rocco.d'ascenzo@duke-energy.com
Counsel for Duke Energy Kentucky, Inc.

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 May 5, 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.[1]

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

[1] *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).

KY.P.S.C. Electric No. 2
Eleventh Revised Sheet No. 41
Cancels and Supersedes
Tenth Revised Sheet No. 41
Page 1 of 4

Duke Energy Kentucky, Inc.
1262 Cox Road
Erlanger, Kentucky 41018

RATE DT

TIME-OF-DAY RATE FOR SERVICE AT DISTRIBUTION VOLTAGE

APPLICABILITY

Applicable to electric service for customers with an average monthly demand of 500 kilowatts or greater where the Company specifies service at a nominal distribution system voltage of 34,500 volts or lower, and the Company determines that facilities of adequate capacity are available and adjacent to the premises to be served. Electric service must be supplied at one point of delivery and is not applicable for resale service.

TYPE OF SERVICE

Alternating current 60 Hz, single phase or three phase at Company's standard distribution voltage of 34,500 volts or lower.

NET MONTHLY BILL

Computed in accordance with the following charges (kilowatt of demand abbreviated as kW and kilowatt-hours are abbreviated as kWh):

1. Base Rate

(a) Customer Charge

Single Phase	$ 63.50	per month
Three Phase	$127.00	per month
Primary Voltage Service	$138.00	per month

(b) Demand Charge

Summer

On Peak kW	$ 14.85	per kW	(I)
Off Peak kW	$ 1.34	per kW	(I)

Winter

On Peak kW	$ 14.05	per kW	(I)
Off Peak kW	$ 1.34	per kW	(I)

(c) Energy Charge

Summer On Peak kWh	$0.046825	per kWh (I)
Winter On Peak kWh	$0.044698	per kWh (I)
Off Peak kWh	$0.038345	per kWh (I)

Issued by authority of an Order of the Kentucky Public Service Commission dated October 16, 2020 in Case No. 2019-00271.

Issued: October 29, 2020
Effective: October 29, 2020
Issued by Amy B. Spiller, President /s/ Amy B. Spiller

Duke Energy Kentucky, Inc.
1262 Cox Road
Erlanger, Kentucky 41018

NET MONTHLY BILL (Contd.)

2. Applicable Riders

The following riders are applicable pursuant to the specific terms contained within each rider:
Sheet No. 76, Rider ESM, Environmental Surcharge Mechanism Rider
Sheet No. 78, Rider DSMR, Demand Side Management Rider
Sheet No. 80, Rider FAC, Fuel Adjustment Clause
Sheet No. 82, Rider PSM, Profit Sharing Mechanism

The minimum charge shall be the Customer Charge, as stated above.

When both single and three phase secondary voltage services are required by a customer, the monthly kilowatt-hour usage and kilowatt demands shall be the respective arithmetical sums of both services.

For purposes of administration of the above Base Rate charges, the summer period is defined as that period represented by the Company's billing for the four (4) revenue months of June through September. The winter period is defined as that period represented by the Company's billing for the eight (8) revenue months of January through May and October through December.

RATING PERIODS

The rating periods applicable to the demand charge shall be as follows:

a) On Peak Period
Summer - 11 a.m. to 8 p.m. Monday through Friday, excluding holidays.
Winter - 9 a.m. to 2 p.m. and 5 p.m. to 9 p.m., Monday through Friday, excluding holidays.

b) Off Peak Period - All hours Monday through Friday not included above plus all day Saturday and Sunday, as well as New Year's Day, President's Day, Good Friday, Memorial Day, Independence Day, Labor Day, Columbus Day, Veterans Day, Thanksgiving Day and Christmas Day on the day nationally designated to be celebrated as such.

METERING

The company may meter at secondary or primary voltage as circumstances warrant. If the Company elects to meter at primary voltage, kilowatt hours registered on the Company's meter will be reduced one and one-half percent (1.5%) for billing purposes.

If the customer furnishes primary voltage transformers and appurtenances, in accordance with the Company's specified design and maintenance criteria, the Demand Charge, as stated above, shall be reduced as follows:

First 1,000 kW of On Peak billing demand at $0.75 per kW.
Additional kW of On Peak billing demand at $0.58 per kW.

Issued by authority of an Order of the Kentucky Public Service Commission dated October 16, 2020 in Case No. 2019-00271.

Issued: October 29, 2020
Effective: October 29, 2020
Issued by Amy B. Spiller, President /s/ Amy B. Spiller

Duke Energy Kentucky, Inc.
1262 Cox Road
Erlanger, Kentucky 41018

KY.P.S.C. Electric No. 2
Eleventh Revised Sheet No. 41
Cancels and Supersedes
Tenth Revised Sheet No. 41
Page 3 of 4

DEMAND

The On Peak billing demand shall be the kilowatts derived from the Company's demand meter for the fifteen minute period of greatest use in the on peak rating period adjusted for power factor as provided herein. The Off Peak billing demand shall be the kilowatts derived from the Company's demand meter for the fifteen minute period of greatest use in the off peak rating period adjusted for power factor minus the On Peak billing demand. In no case shall the Off Peak billing demand be less than zero.

POWER FACTOR ADJUSTMENT

The power factor to be maintained shall be not less than 90% lagging. If the Company determines the customer's power factor to be less than 90%, the on peak and off peak billing demands will be the number of kilowatts equal to the respective on peak and off peak kilovolt amperes multiplied by 0.90.

The power factor, as determined by continuous measurement, will be derived from the intervals in which the maximum on peak and off peak kW demands are established.

LATE PAYMENT CHARGE

Payment of the Net Monthly Bill must be received in the Company's office within twenty-one (21) days from the date the bill is mailed by the Company. When not so paid, the Gross Monthly Bill, which is the Net Monthly Bill plus 5%, is due and payable.

TERMS AND CONDITIONS

The initial term of contract shall be for a period of three (3) years for secondary voltage service and five (5) years for primary voltage service terminable thereafter by a minimum notice of either the customer or the Company as follows:

(1) For secondary voltage service customers, as prescribed by the Company's Service Regulations.

(2) For primary voltage service customers with a most recent twelve month average demand of less than 10,000 kVA or greater than 10,000 kVA, written notice of thirty (30) days or twelve (12) months respectively, after receipt of the written notice.

The Company is not obligated to extend, expand or rearrange its transmission system if it determines that existing distribution and/or transmission facilities are of adequate capacity to serve the customer's load.

If the Company offers to provide the necessary facilities for transmission service, in accordance with its Service Regulations, an annual facilities charge, applicable to such additional facilities, is established at twenty (20) percent of actual cost. The annual facilities charge shall be billed in twelve monthly installments to be added to the demand charge.

Issued by authority of an Order of the Kentucky Public Service Commission dated October 16, 2020 in Case No. 2019-00271.
Issued: October 29, 2020
Effective: October 29, 2020
Issued by Amy B. Spiller, President /s/ Amy B. Spiller

Duke Energy Kentucky, Inc.
1262 Cox Road
Erlanger, Kentucky 41018

KY.P.S.C. Electric No. 2
Eleventh Revised Sheet No. 41
Cancels and Supersedes
Tenth Revised Sheet No. 41
Page 4 of 4

TERMS AND CONDITIONS (Contd.)

For purposes of the administration of this rate, the Company will determine the customer's average monthly demand based upon the twelve months ending December of each year after the applicable term of service has been fulfilled by the customer. If the customer's demand is less than 500 kilowatts and the Company expects the customer's demand to remain below 500 kilowatts, then the Company will notify the customer prior to May of the succeeding year that the provisions of Rate DS, Service at Secondary Distribution Voltage or Rate DP, Service at Primary Distribution Voltage shall be applicable initiating with the June revenue month billing and shall continue until the term of service of that rate is fulfilled. In the case where a customer's average demand is estimated by the Company to be significantly greater than 500 kilowatts, the Company may, at its discretion, waive the twelve month demand history requirement in the determination of the applicability of this rate.

The supplying of, and billing for, service and all conditions applying thereto, are subject to the jurisdiction of the Kentucky Public Service Commission, and to Company's Service Regulations currently in effect, as filed with the Kentucky Public Service Commission, as provided by law.

Issued by authority of an Order of the Kentucky Public Service Commission dated October 16, 2020 in Case No. 2019-00271.

Issued: October 29, 2020
Effective: October 29, 2020
Issued by Amy B. Spiller, President /s/ Amy B. Spiller

RATES AND SCHEDULING AGREEMENT

This RATES AND SCHEDULING AGREEMENT (hereinafter referred to as "**Agreement**") is entered into as of the 19th day of March, 2021 (the "**Effective Date**"), by and between Duke Energy Kentucky, Inc. a Kentucky corporation ("**Duke Energy**") and Northern Kentucky Water District, a public water district established pursuant to KRS Chapter 74 (the "**NKWD**"). Duke Energy and the NKWD may be hereinafter referred to individually as a "**Party**" and collectively as the "**Parties**."

RECITALS

A. NKWD operates the Ohio River Pumping Station 1 (ORPS 1), also known as the Mary Ingalls Pumping Station, located on Mary Ingalls Highway, Ft. Thomas Kentucky (the "**Pumping Station**") where a total of six 1,250 HP pumps are installed, all 6 of which are currently in service, at the Pumping Station (collectively, the "**Pumps**").

B. The current practice of NKWD is to operate the Pumps during off-peak hours to take advantage of Duke Energy's time of use distribution rate, Rate DT ("**Normal Operating Schedule**").

C. The current operating practice of NKWD results in the Pumps being cycled on and off at least once per day, which due to the frequent on-off cycling, reduces the life of the pumps. In addition, when the Pumps are turned on there is a significant drop in voltage on Duke Energy's circuit serving the Pumping Station which has resulted in complaints from other Duke Energy customers on the circuit.

D. Based on the foregoing, Duke Energy and NKWD desire to enter into this Agreement to implement a special contract rate and scheduling arrangement for the operation of the Pumps, which the Parties intend to be cost and revenue neutral to both Parties and which will allow NKWD to run their Pumps on a more continuous basis and reduce the number of pump starts and associated voltage drops, all in accordance with the terms of this Agreement (**"Stated Purpose"**).

NOW, THEREFORE, in consideration of the recitals, the mutual promises in the Agreement and other good and valuable consideration, the receipt and sufficiency of which the Parties acknowledge, the Parties agree as follows:

1. Special Contract Rate. A special contract rate as detailed in Exhibit A attached hereto (the "**Contract Rate**") shall be applicable to the Pumping Station subject to the terms and conditions of this Agreement. The rate design assumes a monthly average of 2,566 kW. The maximum peak demand for the special contract rate will be 3,000 kW (the "**Demand Limit**") which is based on the estimated energy usage over 15 minutes of 3 Pumps operating at any one time. All electricity used at the Pumping Station in excess of the Demand Limit shall be considered excess demand ("**Excess Demand**") and shall not qualify for the Contract Rate. All Excess Demand used in any billing period shall be billed at Duke Energy's then current Rate DT. The Contract Rate shall be applicable only to the Pumping Station as defined in Recital A of this Agreement and shall in no way limit or affect any other service provided or

offered by Duke Energy to NKWD or any other customer whatsoever. During the Term of this Agreement, each time a change in Duke Energy's base rates is approved by the Kentucky Public Service Commission (the "**Commission**"), the Contract Rate shall be adjusted by Duke Energy accordingly. If NKWD does not agree with the adjusted rate and the Parties are unable to resolve their differences with respect to the adjusted rate, then either Party may terminate this Agreement by providing 30 days written notice to the other Party.

2. New Operating Schedule. NKWD anticipates that, under normal operating conditions, the Pumping Station will run two Pumps at a time, however, additional Pumps may need to be operated in the event of an Emergency Condition (as defined below) and in addition, the remaining unused Pumps will need to be cycled periodically as part of their routine maintenance. Therefore, subject to Section 3 below, under normal operating conditions, NKWD hereby agrees to comply with the following operating schedule (the "**New Operating Schedule**"):

    a. no more than 2 Pumps shall be started per day,
    b. no more than 50 Pump starts shall occur in any calendar month,
    c. all Pump starts shall take place between 12:00 am and 4:00 am.

3. Emergency Conditions. The Parties hereby acknowledge and agree that under Emergency Conditions, the above stated Operating Schedule may need to be temporarily suspended. As used herein the term "**Emergency Condition**" shall mean a condition or an activity affecting or relating to the Pumping Station that, in the commercially reasonable opinion of NKWD, requires immediate attention to: (i) mitigate or prevent imminent damage or injury to the health or safety of any person; (ii) restore necessary lost utility service; (iii) prevent the imminent loss of utility service; or (iv) protect persons, property, or the environment from imminent and substantial harm. In the event of an Emergency Condition NKWD shall promptly notify Duke Energy and shall provide reasonably available details of the event causing the Emergency Condition as soon as reasonably practicable after becoming aware of the occurrence of the event, but in no event later than 5 business days after the initial occurrence of the Emergency Condition. For so long as the Emergency Condition is continuing, the Operating Schedule may be temporarily suspended to the extent and for the duration made necessary by the Emergency Condition only. NKWD shall act in a commercially reasonable manner to remedy the Emergency Condition as soon as practicable and shall keep Duke Energy advised as to the continuance of the Emergency Condition. Notwithstanding the foregoing, during the suspension of the Operating Schedule all other provisions of this Agreement shall remain in full force and effect, including without limitation the provisions of paragraph 1, Special Contract Rate.

4. Disclosure of Pump Operation Data. If requested by Duke Energy, NKWD shall promptly provide the actual Pump operating data for the Pumping Station, as may be reasonably necessary for Duke Energy to determine NKWD's compliance with this Agreement.

5. Termination Due to Suspension of Operating Schedule. If the Operating Schedule has been suspended for any reason for an aggregate of thirty (30) days or more in any year during the Term, Duke Energy shall have the right in its sole discretion to terminate this Agreement by

providing NKWD not less than thirty (30) days written notice.

6. Term. The initial term of this Agreement shall commence on the Effective Date and shall continue for a term of five (5) years unless earlier terminated in accordance with the terms of this Agreement. Upon expiration of the initial term, this Agreement shall continue on a month to month basis until terminated by either Party by providing not less than thirty (30) days written notice to the other Party. The Initial term and any renewal term may be referred to individually or collectively as the "**Term**."

7. Evaluation Period. Approximately 180 days after the Effective Date, the Parties shall meet in good faith to assess the impact of this Agreement on either or both Parties. If, based on the above assessment, it is reasonably determined by either Party that the Agreement has failed to achieve the Stated Purpose the Parties will attempt to negotiate one or more modifications to the Agreement to achieve the Stated Purpose. If the Parties cannot agree on the modifications within sixty (60) days (or such additional time that the Parties may mutually agree), then either Party may terminate the Agreement by providing not less than sixty (60) days written notice to the other Party.

8. Commission Approval. NKWD hereby acknowledges that Duke Energy must file the Agreement (and any necessary additional documentation or information that may be required by the Commission from time to time) with the Commission and shall have received approval from the Commission ("Commission Approval") prior to the Agreement becoming effective. After execution of this Agreement by both parties Duke Energy will submit the Agreement for filing with the Commission for consideration and approval. Duke Energy shall have sole discretion over all aspects of such submittal, including without limitation, the form and substance of the submittal, confidentiality, procedure, responding to any data requests, and providing any information to the Commission. If the Commission issues an order or any other directive to modify or condition any aspect of this Agreement as a condition to the Commission's approval that negatively impacts either Party as determined in such Party's reasonable discretion, then this Agreement may be terminated by the negatively affected Party by providing not less than 10 business day's written notice to the other Party, and upon any such termination neither Party shall have any obligation, duty, or liability to the other Party under this Agreement.

9. Grant of Waiver. After the execution of this Agreement by both Parties, Duke Energy shall request that the Commission grant a waiver to Duke Energy from 807 KAR 5:041 Section 6 and any other laws, rules or regulations that pertain to the voltage drop on Duke Energy's circuit serving the Pumping Station caused by operation of the Pumps (the "**Waiver**"). NKWD shall support this request. Duke Energy may, in its sole discretion, immediately terminate this Agreement by providing written notice to NKWD under either of the following conditions: (i) if the Commission denies the Waiver request; or (ii) if within one year after the initial filing date of any action with the Commission to approve this Agreement, the Commission fails to grant the Waiver to the satisfaction of Duke Energy as determined in its sole discretion. Upon any such termination under this Section 9, neither Party shall have any further obligation, duty, or liability to the other Party under this Agreement except for those obligations which expressly survive termination hereof.

10. No Liability by Duke Energy. In no event shall Duke Energy be liable for any interruption or damages attributed to NKWD's failure to conform to the requirements of the terms of this Agreement.

11. Non-Compliance and Early Termination. Non-Compliance and Early Termination. In the event either Party (the "Claiming Party") reasonably determines that the other Party (the "Responding Party") is not in compliance with the terms of this Agreement, the Claiming Party will provide the Responding Party with written notice of such non-compliance (the "**Notice of Non-Compliance**"). Within thirty (30) days after its receipt of the Notice of Non-Compliance, the Responding Party will respond to the Claiming Party's assertions of non-compliance. If the Responding Party fails to cure the non-compliance or if the Parties are unable to resolve their differences with respect to the matters addressed in the Notice of Non-Compliance within sixty (60) days after the date of the Notice of Non-Compliance, or such other timeframe agreed upon by both Parties, then either Party may terminate this Agreement by providing not less than ten (10) business days written notice to the other Party.

12. Effect of Expiration or Early Termination. Upon the expiration or early termination of the Agreement, NKWD shall return to Duke Energy's then current Rate DT in effect at the time of the termination or expiration. Upon termination of this Agreement for any reason, the Parties will promptly schedule a joint meeting to discuss potential remedies and allocation of associated costs and next steps, which may include requesting a meeting within 30 days of termination to jointly approach the Commission to discuss responsibility for implementing such solution(s) and allocation of the associated costs. This Section 12 shall survive termination of this Agreement.

13. No Guaranty. The parties hereby acknowledged and agree that NKWD is solely responsible for the operation of its business including the scheduling and operation of the Pumps and the Pumping Station. Duke Energy makes no representations or warranties under this Agreement whatsoever, including any guaranty of uninterrupted service, or that the arrangements agreed to under this Agreement will result in any efficiencies or extended life of the Pumps.

14. Disclaimer of Warranties. DUKE ENERGY MAKES NO WARRANTIES OR GUARANTEES UNDER THIS AGREEMENT OF ANY KIND WHATSOEVER, WHETHER EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE AND ALL SUCH EXPRESS OR IMPLIED WARRANTIES ARE HEREBY WAIVED.

15. No Consequential Damages. In no event shall either Party or their subcontractors or agents be liable under this Agreement, in contract, tort (including negligence), warranty, strict liability or any other legal theory to the other Party for any loss of anticipated profits, or any special, incidental, punitive, exemplary or consequential damages. Notwithstanding the foregoing, nothing precludes either Party from seeking remedies or filing claims with the Commission.

16. Notices. All notices permitted or required under the Agreement shall be deemed given if hand delivered, sent by certified mail, return receipt requested, sent by Federal Express or another

recognized overnight delivery service, or sent by email and confirmed (by physical delivery) to the addresses listed below or the subsequent addresses of which the Parties give each other notice:

To Duke Energy: Duke Energy Kentucky, Inc.
Attn: VP Zone Operations
Chris Lange
1262 Cox Avenue
Erlanger, KY 41018
Email: Chris.Lange@duke-energy.com

To NKWD: Northern Kentucky Water District
Attn: VP of Engineering, Production & Distribution
2835 Crescent Springs Rd., PO Box 18640
Erlanger, KY 41018
Email: akramer@nkywater.org

17. Assignment. NKWD may not assign, or otherwise transfer this Agreement or any of its rights under this Agreement to any third party, other than an affiliate of NKWD that has agreed to assume the obligations hereunder, without the prior written consent of Duke Energy which consent shall not be unreasonably withheld.

18. Service Regulations. Except as modified by this Agreement, retail electric service for the Pumping Station shall be subject to: (a) Duke Energy's Service Regulations contained in Duke Energy's Retail Electric Tariff, including all applicable tariffs, rates and rules as may be revised from time to time with the approval of the Commission; (b) all rules and regulations of the Commission, as such rules and regulations may be revised from time to time by the Commission; and (c) all other applicable local, state, and federal codes and laws, as the same may be in effect from time to time.

19. Governing Law; Venue. This Agreement shall be governed by and construed in accordance with the laws of the Commonwealth of Kentucky without regard to its conflicts of laws principles to the extent such principles would require or permit the application of the laws of another jurisdiction. The Parties agree that any suit, action or other legal proceeding by or against any Party with respect to or arising out of this Agreement shall be brought in the federal or state court of competent jurisdiction located in the Commonwealth of Kentucky.

20. No Joint Venture. Nothing in this Agreement is intended to create an association, partnership, joint venture or other joint enterprise between the Parties and/or any other person.

21. Entire Agreement. The Agreement contains the entire agreement of the Parties relating to the subject matter hereof and supersedes all prior and contemporaneous agreements, understandings, usages of trade and courses of dealing, whether written or oral.

IN WITNESS WHEREOF, the Parties have caused the Agreement to be executed by their duly authorized representatives as of the date first above written.

DUKE ENERGY KENTUCKY, INC.

By: _____
Name: Chris Lange
Title: Vice President Zone Operations
Date: 3/12/21

NORTHERN KENTUCKY WATER DISTRICT

By: Amy Kramer
Name: Amy Kramer
Title: V.P Engineering, Production & Distribution
Date: 3/19/21

Exhibit A
Contract Rate

The Contract Rate shall be as follows: Customer Charge: $138 per month; Demand Charge (maximum monthly kW): $3.38 per kW; and Energy Charge (all kWh): $0.038016 per kWh; and, as such quantities are measured and calculated in accordance with the Schedule of Rates, Classifications, Rules and Regulations for Electric Service of Duke Energy Kentucky, Inc. as approved by the Commission and as may be amended from time to time.

The Contract Rates specified above shall replace the Demand Charge and the Energy Charge provided in Rate DT, Time-of-Day Rate for Service at Distribution Voltage (Rate DT). All other provisions of Rate DT, including all riders thereto, shall continue to apply.

Notwithstanding anything to the contrary herein the Contract Rate shall not apply to Excess Demand.

C

STAFF RESPONSES NO. 1 TO PSC PETITION

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COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

Duke Energy Kentucky, Inc.'s Application for Approval of a Special Contract and for Waiver of 807 KAR 5:041, Section 6(2)(c)	)))	Case No. 2021-00192

PETITION OF DUKE ENERGY KENTUCKY, INC. FOR CONFIDENTIAL TREATMENT OF INFORMATION CONTAINED IN ITS RESPONSES TO COMMISSION STAFF'S FIRST REQUEST FOR INFORMATION ISSUED ON AUGUST 13, 2021

Duke Energy Kentucky, Inc. (Duke Energy Kentucky or Company), pursuant to 807 KAR 5:001, Section 13 and other law, respectfully requests the Commission to classify and protect as confidential certain information provided by Duke Energy Kentucky in its response to Data Request No. 1, as requested by Commission Staff (Staff) in this case on August 13, 2021. The information that Staff seeks through discovery and for which Duke Energy Kentucky now seeks confidential treatment (Confidential Information) includes

In support of this Petition, Duke Energy Kentucky states:

1. The Kentucky Open Records Act exempts from disclosure certain commercial information. KRS 61.878(1)(c). To qualify for this exemption and, therefore, maintain the confidentiality of the information, a party must establish that disclosure of the commercial information would permit an unfair advantage to competitors of that party. Public disclosure of the information identified herein would, in fact, prompt such a result for the reasons set forth below.

2. The Confidential Information contained in response to Data Request No. 1 contains specific customer account information, including the names, addresses, and service data of

customers of Duke Energy Kentucky. This information is generally recognized as confidential in the energy industry. To protect the customers identified in this report, the Company recommends this information be considered confidential.

3. The Confidential Information is distributed within Duke Energy Kentucky, only to those who must have access for business reasons and is generally recognized as confidential and proprietary in the energy industry.

4. The Confidential Information for which Duke Energy Kentucky is seeking confidential treatment is not known outside of Duke Energy Corporation. Publicly disclosing this information could give customers' competitors a distinct advantage, to the detriment of Duke Energy Kentucky and its customers.

5. Duke Energy Kentucky does not object to limited disclosure of the Confidential Information described herein, pursuant to an acceptable protective agreement, with the Attorney General or other intervenors with a legitimate interest in reviewing the same for the purpose of participating in this case.

6. This information was, and remains, integral to Duke Energy Kentucky's effective execution of business decisions and safety of its systems. And such information is generally regarded as confidential or proprietary. Indeed, as the Kentucky Supreme Court has found, "information concerning the inner workings of a corporation is 'generally accepted as confidential or proprietary.'" *Hoy v. Kentucky Industrial Revitalization Authority*, 904 S.W.2d 766, 768 (Ky. 1995).

7. In accordance with the provisions of 807 KAR 5:001, Section 13(3), the Company is filing one copy of the Confidential Information separately under seal, and one copy without the confidential information included.

8. Duke Energy Kentucky respectfully requests that the Confidential Information be withheld from public disclosure indefinitely to preserve the confidential personal identification information for customers. Information such as account numbers, names, and addresses, may remain unchanged as long as the individual is a customer of the Company. Therefore, an indefinite preservation of confidential information for this personal identification information is reasonable.

9. To the extent the Confidential Information becomes generally available to the public, whether through filings required by other agencies or otherwise, Duke Energy Kentucky will notify the Commission and have its confidential status removed, pursuant to 807 KAR 5:001 Section 13(10)(a).

WHEREFORE, Duke Energy Kentucky, Inc., respectfully requests that the Commission classify and protect as confidential the specific information described herein.

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 45201-0960
Phone: (513) 287-4320
Fax: (513) 287-4385
E-mail: rocco.d'ascenzo@duke-energy.com

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 August 27, 2021; and that there are currently no parties that the Commission has excused from participation by electronic means in this proceeding.

/s/Rocco D'Ascenzo
Rocco D'Ascenzo

KyPSC Case No. 2021-00192
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VERIFICATION

STATE OF OHIO)
) SS:
COUNTY OF HAMILTON)

The undersigned, Marc A. Bell, Lead Engineer, being duly sworn, deposes and says that he has personal knowledge of the matters set forth in the foregoing data requests, and that the answers contained therein are true and correct to the best of his knowledge, information and belief.

Marc A. Bell Affiant

Subscribed and sworn to before me by Marc A. Bell on this 23rd day of August, 2021.

NOTARY PUBLIC

My Commission Expires: July 8, 2022

NOTARY PUBLIC STATE OF OHIO

E. MINNA ROLFES-ADKINS
Notary Public, State of Ohio
My Commission Expires
July 8, 2022

VERIFICATION

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

The undersigned, Mike Simms, Manager Grid Management, being duly sworn, deposes and says that he has personal knowledge of the matters set forth in the foregoing data requests, and that the answers contained therein are true and correct to the best of his knowledge, information and belief.

Mike Simms
Mike Simms Affiant

Subscribed and sworn to before me by Mike Simms on this 27 day of AUGUST, 2021.

E. Minna Rolfes-Adkins
NOTARY PUBLIC

My Commission Expires: July 8, 2022

NOTARY PUBLIC STATE OF OHIO
E. MINNA ROLFES-ADKINS
Notary Public, State of Ohio
My Commission Expires
July 8, 2022

Duke Energy Kentucky
Case No. 2021-00192
STAFF First Set Data Requests
Date Received: August 13, 2021

PUBLIC STAFF-DR-01-001
(As to Attachment only)

REQUEST:

Refer to the Application, paragraph 9.

a. Provide the amount of time it takes for the pumps to reach normal operating levels.

b. Under normal circumstances, explain whether pump start-ups can be staggered to avoid voltage drops in excess of 4 percent on Wilder 46.

c. Since taking service with Duke Kentucky, provide the time and date of any instance where the startup of Northern Kentucky Water District's (NKWD) pumps have caused a voltage drop in excess of 4 percent on Wilder 46 in violation of 807 KAR 5:041, Section 6(2)(c).

RESPONSE:

CONFIDENTIAL PROPRIETARY TRADE SECRET (As to Attachment only)

a. Duke Energy Kentucky does not have access to the operating parameters of NKWD's pumps. According to NKWD, normal operating water flow is achieved within 90-120 seconds after pump start. According to Duke Energy Kentucky's previous monitoring, the circuit's voltage drop lasts approximately two (2) seconds with pump start up.

b. Duke Energy Kentucky's understanding is that Northern Kentucky Water typically staggers pump starts; however, each pump start draws enough power to cause a voltage drop.

c. Although Duke Energy Kentucky does not continuously monitor the voltage on each distribution circuit, it is our belief that each pump start causes a voltage drop in excess of 4 percent on Wilder 46. The Company has discussed this issue with NKWD in an effort to find solutions to eliminate or mitigate the effects of the voltage drops for customers in accordance with 807 KAR 5:041, Section 6(2)(c). The Company has periodically monitored the Wilder 46 circuit and has documented the voltage drop occurring in conjunction with NKWD's pump starts. Please see STAFF-DR-01-001 Confidential Attachment for an example of a coordinated monitoring event that occurred in conjunction with NKWD in 2017. While a voltage drop was observed, flickers at that particular premises were not observed during this event.

Northern Kentucky Water typically follows Duke Energy Kentucky's off-peak schedule, so typically starts pumps as follows:

i. Summer – after 8:00 pm

ii. Winter – after 2:00 pm, after 9:00 pm

PERSON RESPONSIBLE: Marc A. Bell

CONFIDENTIAL PROPRIETARY TRADE SECRET

STAFF-DR-01-001 CONFIDENTIAL ATTACHMENT pdf

FILED UNDER SEAL

Duke Energy Kentucky
Case No. 2021-00192
STAFF First Set Data Requests
Date Received: August 13, 2021

STAFF-DR-01-002

REQUEST:

Refer to the Application, paragraphs 10-12.

a. Describe all of the alternatives Duke Kentucky evaluated to alleviate the voltage drops on Wilder 46 caused by the initiation of NKWD's water pumps.

b. State whether those alternatives included modifications to Duke Kentucky's infrastructure, such as placing NKWD on a separate circuit or substation.

c. Provide any supporting cost projections or estimates associated with any alternatives that Duke Kentucky considered other than the special contract that is the subject of this matter.

RESPONSE:

a. Duke Energy has not explored options for alleviating the voltage drops on Wilder 46 caused by Northern Kentucky Water's pump starts on NKWD's equipment because it is the customer's responsibility to address this matter, in accordance with 807 KAR 5:041, and Duke Energy's filed electric tariff. That said, the Company has considered potential modifications to its equipment including potentially building a new substation and reconductoring. The reconductoring was determined as not a viable solution as it would not correct the issue, which is the start-up of NKWD's pumps causing the voltage to drop. The Company did examine the possibility of a new substation, however, the lack of available land in proximity to NKWD, likelihood that the new capacity and substation would still not solve this

voltage drop 100 percent of the time, and the costs were all factors that made a new substation not a viable solution.

b. Please see response to part (a).

c. The Company analyzed the substation solution in 2017 with two scenarios. 1) a smaller substation with a single transformer that would be solely for NKWD load and which would be owned and operated by them. The estimated costs to NKWD at the time were between $4-6 million, excluding land acquisition; and 2) a joint use where a larger substation were constructed with part of it to serve NKWD and part to serve other load on the circuit. The estimated cost of this substation was between $6-8 MM, exclusive of land acquisition. As stated above, the availability of suitable land in proximity to NKWD, and the potential that even with a new substation, voltage drops could still occur by NKWD pump starts, the substation solution #2 was not pursued by Duke Energy Kentucky. It is likely the costs of these solutions have substantially increased since the time the analysis was previously performed.

PERSON RESPONSIBLE: Marc A. Bell

Duke Energy Kentucky
Case No. 2021-00192
STAFF First Set Data Requests
Date Received: August 13, 2021

STAFF-DR-01-003

REQUEST:

Explain and quantify to what extent the special contract is expected to reduce voltage drops in excess of 4 percent on Wilder 46.

RESPONSE:

The new operating schedule adopted by Northern Kentucky Water will reduce the number of voltage drops each day. Currently, Northern Kentucky Water sees approximately 5 – 6 pump starts each day in the summer, and approximately 10 – 12 pump starts each day in the winter, as they follow the off-peak pricing schedule. Because under the contract, Northern Kentucky Water is expecting to run pumps 24x7, it will incur fewer pump starts, perhaps 2 – 3 per day. In addition, these pump starts will occur, absent an emergency, only between the hours of midnight and 4:00 am. It is expected that any voltage drop occurring between these hours will have minimal effect on other customers served on the Wilder 46 distribution circuit.

PERSON RESPONSIBLE: Marc A. Bell

Duke Energy Kentucky
Case No. 2021-00192
STAFF First Set Data Requests
Date Received: August 13, 2021

STAFF-DR-01-004

REQUEST:

Refer to the Application in general. If Duke Kentucky and NKWD were to coordinate pump start-up times, explain whether the voltage on Wilder 46 can be temporarily increased to offset the effects of voltage drop from pump start-ups.

RESPONSE:

No. The 4% change in voltage during the motor start causes voltage flicker which is seen by Duke Energy customers. Raising the voltage would not affect the amount of voltage drop nor the customer impact. In the Company's opinion, motor soft start controls or voltage compensation mitigation would be necessary to offset the impacts of the voltage drop due to pump start-up.

PERSON RESPONSIBLE: Mike Simms

D

STAFF RESPONSES NO. 2 TO PSC PETITION

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VERIFICATION

STATE OF OHIO)
) SS:
COUNTY OF HAMILTON)

The undersigned, Marc A. Bell, Lead Engineer, being duly sworn, deposes and says that he has personal knowledge of the matters set forth in the foregoing data requests, and that the answers contained therein are true and correct to the best of his knowledge, information and belief.

Marc A. Bell Affiant

Subscribed and sworn to before me by Marc A. Bell on this 10th day of January, 2022.

NOTARY PUBLIC

MERON BELAI BEYENE
Notary Public, State of Ohio
My Commission Expires
December 11, 2024

My Commission Expires: 12-11-2024

VERIFICATION

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

The undersigned, Michael J. Pahutski, Regional Director, Ohio-Kentucky Large Account Management, being duly sworn, deposes and says that he has personal knowledge of the matters set forth in the foregoing data requests, and that the answers contained therein are true and correct to the best of his knowledge, information and belief.

Michael J. Pahutski, Affiant

Subscribed and sworn to before me by Michael J. Pahutski, on this 5 day of Jan, 2022.

NOTARY PUBLIC

My Commission Expires:

NOTARIAL SEAL STATE OF OHIO

NICHOLAS SPRAGUE
Notary Public, State of Ohio
My Commission Expires 06-24-2023

VERIFICATION

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

The undersigned, Michelle Basch, Manager Consumer Affairs, being duly sworn, deposes and says that she has personal knowledge of the matters set forth in the foregoing data requests, and that the answers contained therein are true and correct to the best of her knowledge, information and belief.

Michelle Basch

Michelle Basch, Affiant

Subscribed and sworn to before me by Michelle Basch, on this 13 day of January, 2022.

NOTARY PUBLIC

My Commission Expires:

NOTARIAL SEAL
STATE OF OHIO

ROCCO O. D'ASCENZO
ATTORNEY AT LAW
Notary Public, State of Ohio
My Commission Has No Expiration
Section 147.03 R.C.

VERIFICATION

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

The undersigned, Mike Simms, Manager Grid Management, being duly sworn, deposes and says that he has personal knowledge of the matters set forth in the foregoing data requests, and that the answers contained therein are true and correct to the best of his knowledge, information and belief.

Mike Simms

Mike Simms Affiant

Subscribed and sworn to before me by Mike Simms on this 13 day of JANUARY, 2022.

NOTARY PUBLIC

My Commission Expires:

NOTARIAL SEAL STATE OF OHIO

ROCCO O. D'ASCENZO
ATTORNEY AT LAW
Notary Public, State of Ohio
My Commission Has No Expiration
Section 147.03 R.C.

KyPSC Case No. 2021-00192
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Duke Energy Kentucky
Case No. 2021-00192
STAFF Second Set Data Requests
Date Received: December 27, 2021

STAFF-DR-02-001

REQUEST:

Refer to Duke Kentucky's responses to Staff's First Request for Information (Staff's First Request), Items 1c and 2c.

a. If Duke Kentucky and Northern Kentucky Water District (NKWD) have known about the voltage drop since 2017, explain why the Commission was not made aware until Duke Kentucky's application on May 6, 2021.

b. Explain each basis for Duke Kentucky's belief that each pump start causes a voltage drop in excess of 4 percent on Wilder 46.

c. Explain in detail how voltage variations are currently monitored on Wilder 46 on an ongoing basis.

d. Explain how Duke Kentucky monitored voltage variations on Wilder 46 when it determined that the voltage drops were caused by NKWD starting its pumps.

RESPONSE:

a. Duke Energy Kentucky and NKWD were cooperatively attempting to develop amicable solutions to alleviate the voltage drop in a fair and equitable way for our respective customers. Duke Energy Kentucky and NKWD were working in good faith in trying to identify, confirm, and attempt to resolve the issue. See Response to Staff DR-02-003. A capital-based solution is complex and expensive for the Company, and would not likely fix the problem entirely. Any solution necessarily required cooperation, time to evaluate, and the parties were committed to working

together to bring a solution to the Commisison once determined. Duke Energy Kentucky utilized a Ranger 7000T and Eagle 330 high resolution recorders at various locations, and documented the voltage drops coordinated with pump starts using arranged coordinated testing with NKWD.

b. Duke Energy Kentucky has standard voltage monitoring on the bus of the substation and at a few electronic devices on the line itself. Standard monitoring is not always fast enough to accurately record events, such as flicker caused by a motor start. When there is an indication of an issue, a Company technician places a portable recording meter that has higher recording resolution.

c. Duke Energy Kentucky utilizes a portable recorder with high recording resolution, at strategic locations to capture the data accurately. Multiple times we have completed this in coordination with NKWD to coordinate the timing with their motor starts using the Eagle 330.

PERSON RESPONSIBLE: Marc Bell

Duke Energy Kentucky
Case No. 2021-00192
STAFF Second Set Data Requests
Date Received: December 27, 2021

STAFF-DR-02-002

REQUEST:

Refer to Duke Kentucky's responses to Staff's First Request, Item 2a. Describe all of the alternatives NKWD has evaluated or proposed to Duke Kentucky to alleviate the voltage drops on Wilder 46 caused by the initiation of NKWD's water pumps.

RESPONSE:

Duke Energy Kentucky is not aware of the alternatives NKWD may have evaluated.

Upon inquiry to NKWD, NKWD states as follows:

NKWD staggers pump starts at the Ohio River Pumping Station 1. Since 2017, the NKWD has made a concerted effort to also stagger pump starts with its smaller Ohio River Pumping Station 2, located less than a mile from Ohio River Pump Station 1 on the same circuit, so that only one pump starts at a time from either station. The NKWD installed motor soft starters on 2 of its 6 motors in 2019 at a total project cost of $494,167. The NKWD conducted a test in 2020 to measure the voltage on pump starts. The report summaries are attached as STAFF-DR-02-002 Attachments (a) through (g). The NKWD has budgeted $1,036,000 in its 5-year capital improvement budget to replace the other 4 existing motors starters with soft starters.

PERSON RESPONSIBLE: Mike Simms

Electrical Certification Incorporated
*P.O. Box 53368 * Cincinnati, Ohio 45253*
*Office: (513) 662-7500 * Fax: (513) 662-6610*
*Cell: (513) 604-2431 * Email: ECInc@cinci.rr.com*

Report Summary 2020-400
Date: July 21, 2020

Bill Speier
Northern Kentucky Water Sewer District

Re: Northern Kentucky Water Sewer District – KCWW Ohio River Station
Subject: Record Motor Starting Parameters

Mr. Speier,

On July 5, 2020, Electrical Certification Incorporated installed load monitoring equipment to monitor the load being supplied by the local utility. Continuous monitoring of the load was performed utilizing a Fluke 435II Energy Analyzer.

All data was recorded and is enclosed for your review and records. The following is a discussion of our observations and comments.

Equipment List

4200V Rail Side
4200V River Side

Summary

Both T1 & T2 Transformers were connected to the same utility source for this testing.

River Side Substation:

Test #1:
No pumps running – start pump #4 (soft starter) – delay (10) mins. – start pump #6 (RVS auto transformer start). Only (1) transient event occurred.

07:42:15 Voltage dip on soft starter to 3726V
- Amp on soft starter 540. Approximately 3.75 seconds acceleration

07:53:01 Voltage dip on RVS to 3648V
- Amp on RVS 640. Approximately 2.5 seconds acceleration

Test #2:
No pumps running – start pump #6 (RVS auto transformer) – delay (10) mins. – start pump #5 (soft starter). (2) swells and (1) transient event occurred.

08:23:27 Voltage dip on RVS to 3715V
- Amp on RVS 570. Approximately 2.5 seconds acceleration

08:39:00 Voltage dip on soft starter 3671V
- Amp on soft starter 640. Approximately 3.75 seconds acceleration

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Report Summary #2020-400
Page #2

Electrical Certification Incorporated appreciates the opportunity to have provided this service. If you have any questions concerning this report, or have additional testing needs please call any time for prompt professional service.

Sincerely,

Jeffrey Jones
General Manager

FLUKE®

Filename	Report Date/Time	
MEAS 9 -- SD Card	7/15/2020 11:33:44 AM	Page 1

Instrument Information

Model Number	435-II
Serial Number	28453110
Firmware Revision	V04.01

Software Information

Power Log Version	5.4
FLUKE 430-II DLL Version	1.2.0.13

General Information

Recording location	KCWW OHIO RIVER STA
Client	SAME
Notes	4200V RAILSIDE (3) RVS RUNNING

FLUKE®

Filename	Report Date/Time	
MEAS 9 -- SD Card	7/15/2020 11:33:44 AM	Page 2

Measurement Summary

Measurement topology	3-element delta mode
Application mode	Volts/Amps/Hertz
First recording	7/15/2020 6:52:22 AM 533msec
Last recording	7/15/2020 7:31:02 AM 533msec
Recording interval	0h 0m 10s 0msec
Nominal Voltage	173 V
Nominal Current	30 A
Nominal Frequency	60 Hz
File start time	7/15/2020 6:52:12 AM 533msec
File end time	7/15/2020 7:31:02 AM 533msec
Duration	0d 0h 38m 50s 0msec
Number of events	Normal: 0 Detailed: 0
Events downloaded	No
Number of screens	0
Screens downloaded	Yes
Power measurement method	Unified
Cable type	Copper
Harmonic scale	%H1
THD mode	THD 40
CosPhi / DPF mode	DPF

Scaling

Phase:	
Current Clamp type	i430Flex
Clamp range	N/A
Nominal range	30 A
Sensitivity	x1
Current ratio	1000:5
Voltage ratio	35:1
Neutral:	
Current Clamp type	i430TF
Clamp range	N/A
Nominal range	300 A
Sensitivity	x10 AC only
Current ratio	1:1
Voltage ratio	1:1

Recording Summary

RMS recordings	233
DC recordings	0
Frequency recordings	233
Unbalance recordings	0
Harmonic recordings	0
Power harmonic recordings	0
Power recordings	0
Power unbalance recordings	0
Energy recordings	0
Energy losses recordings	0
Flicker recordings	0
Mains signaling recordings	0

FLUKE®

Filename	Report Date/Time	
MEAS 9 -- SD Card	7/15/2020 11:33:44 AM	Page 3

Events Summary

Dips	0
Swells	0
Transients	0
Interruptions	0
Voltage profiles	0
Rapid voltage changes	0
Screens	0
Waveforms	0
Intervals without measurements	0
Inrush current graphics	0
Wave events	0
RMS events	0

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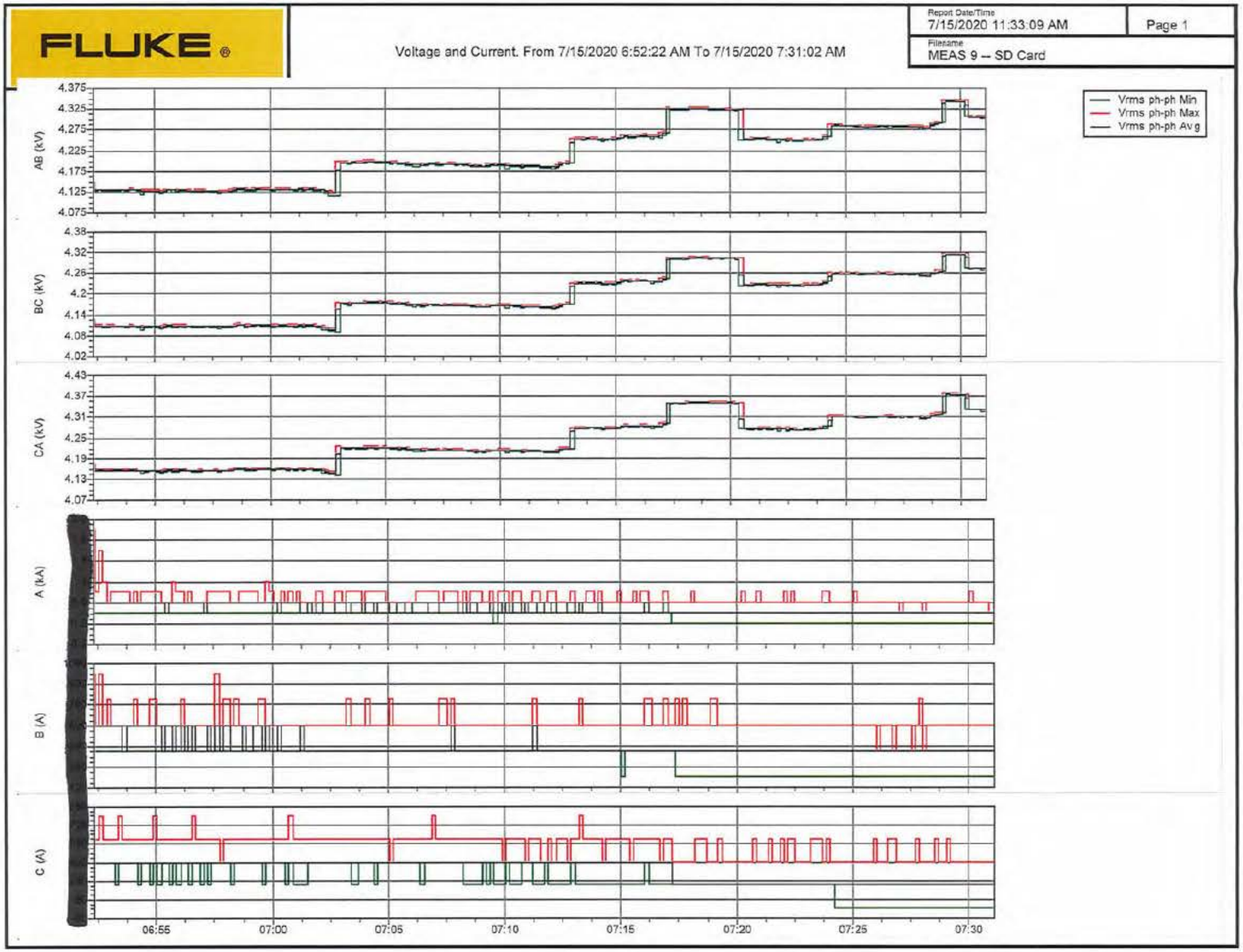

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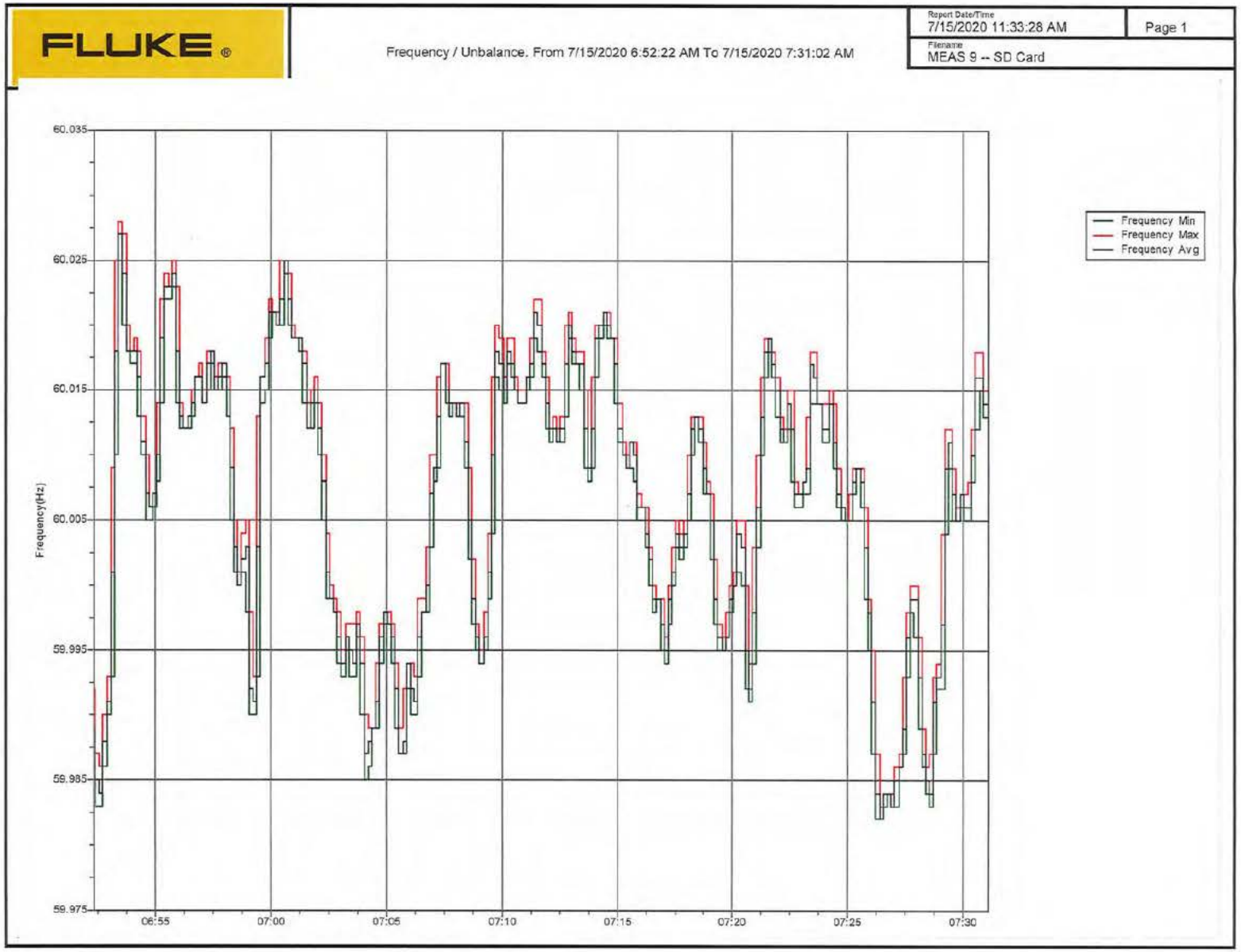

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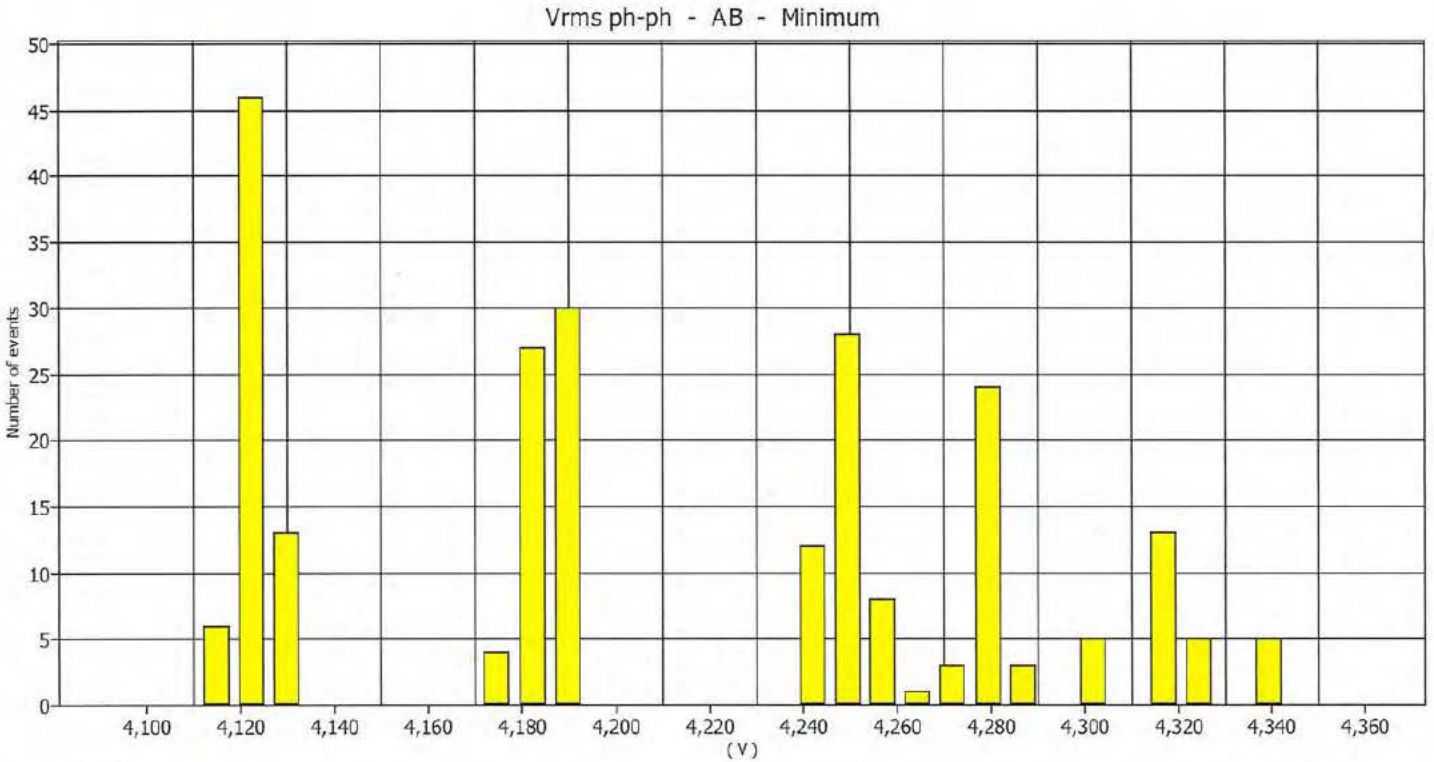
FLUKE®

Statistics. From 7/15/2020 6:52:22 AM To 7/15/2020 7:31:02 AM

Report Date/Time: 7/15/2020 11:46:16 AM | Page 1

Filename: MEAS 9 -- SD Card



Summary

From	7/15/2020 6:52:22 AM	5% percentile	4125 V
To	7/15/2020 7:31:02 AM	95% percentile	4324 V
Maximum value	4343.15 V	% [85% - 110%]	0%
At	7/15/2020 7:29:32 AM	% [90% - 110%]	0 %
Minimum value	4114.95 V		
At	7/15/2020 7:03:02 AM		
μ (Avg)	4213.38 V		
s	68.4327 V		

Upper extreme values

Date / Time	Value
7/15/2020 7:29:32 AM	4343.1499
7/15/2020 7:30:12 AM	4342.4502
7/15/2020 7:29:52 AM	4342.4502
7/15/2020 7:29:42 AM	4342.4502
7/15/2020 7:30:02 AM	4342.1001

Lower extreme values

Date / Time	Value
7/15/2020 7:03:02 AM	4114.9502
7/15/2020 7:02:42 AM	4116.3501
7/15/2020 7:02:52 AM	4117.0498
7/15/2020 6:54:32 AM	4119.8501
7/15/2020 6:55:22 AM	4121.6001

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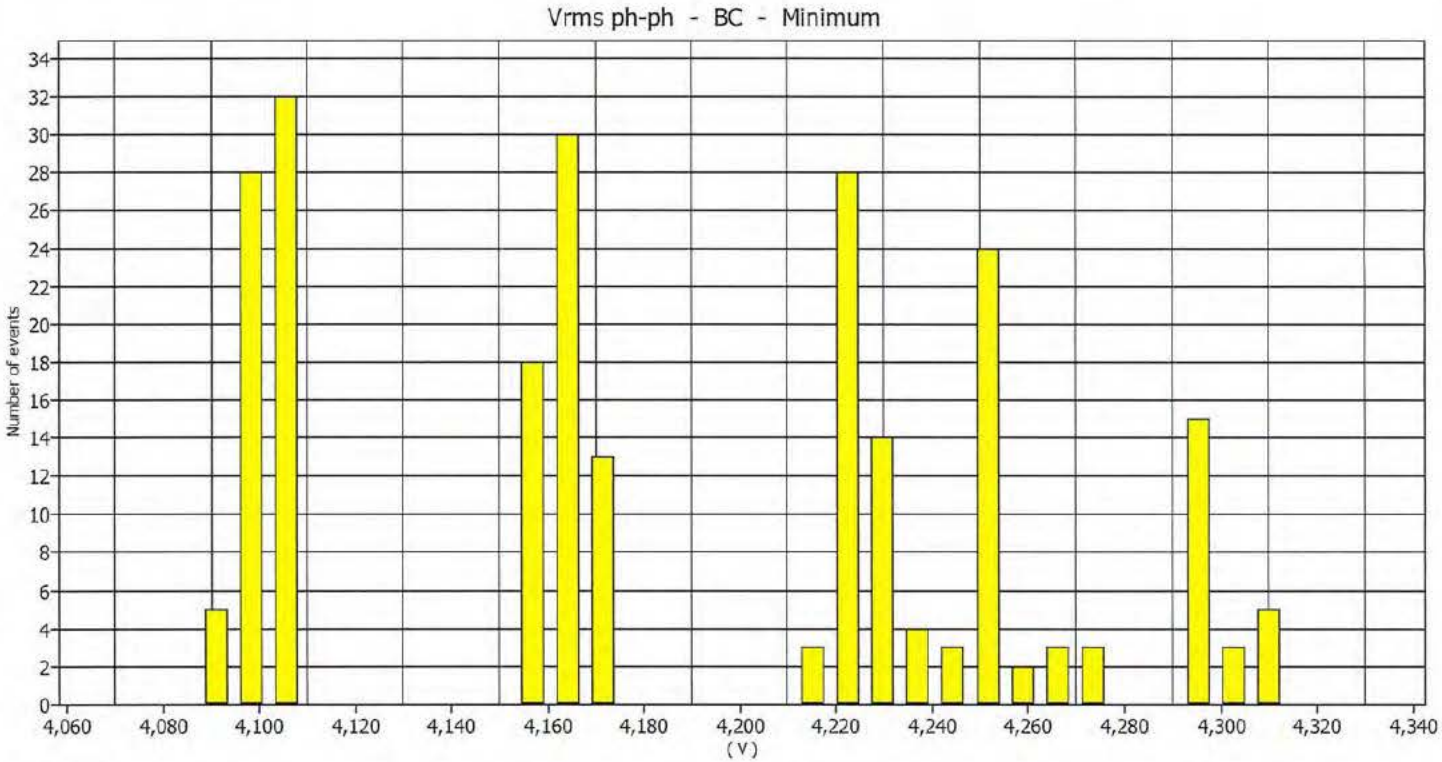
FLUKE®

Statistics. From 7/15/2020 6:52:22 AM To 7/15/2020 7:31:02 AM

Report Date/Time: 7/15/2020 11:46:32 AM | Page 1

Filename: MEAS 9 – SD Card



Summary

From	7/15/2020 6:52:22 AM	5% percentile	4103 V
To	7/15/2020 7:31:02 AM	95% percentile	4302 V
Maximum value	4313.75 V	% [85% - 110%]	0%
At	7/15/2020 7:29:52 AM	% [90% - 110%]	0 %
Minimum value	4091.15 V		
At	7/15/2020 7:03:02 AM		
μ (Avg)	4189.97 V		
s	67.0431 V		

Upper extreme values

Date / Time	Value
7/15/2020 7:29:52 AM	4313.75
7/15/2020 7:29:32 AM	4313.0498
7/15/2020 7:30:12 AM	4312.7002
7/15/2020 7:30:02 AM	4312.7002
7/15/2020 7:29:42 AM	4312.7002

Lower extreme values

Date / Time	Value
7/15/2020 7:03:02 AM	4091.1501
7/15/2020 7:02:42 AM	4092.9001
7/15/2020 7:02:52 AM	4093.25
7/15/2020 6:54:32 AM	4097.7998
7/15/2020 7:02:32 AM	4098.1499

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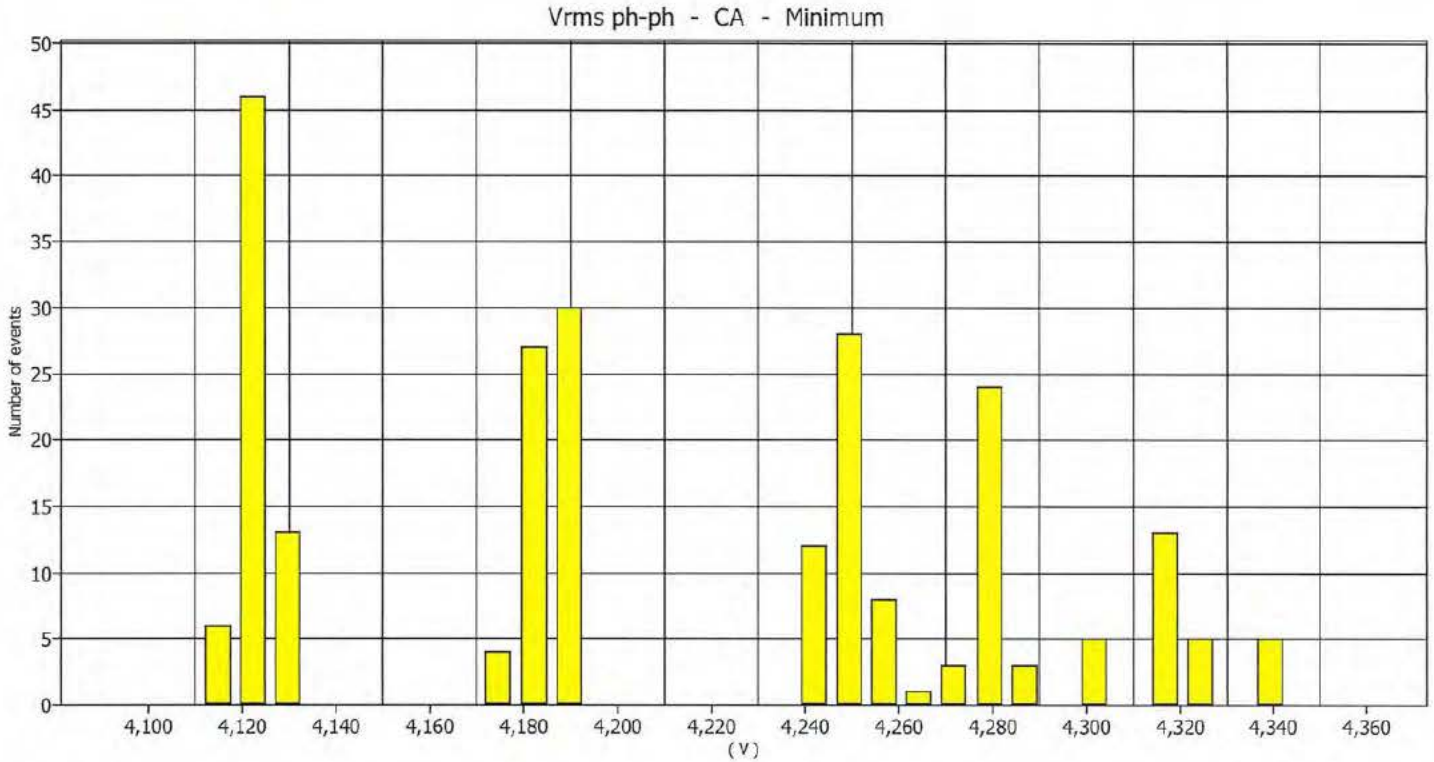
FLUKE®

Statistics. From 7/15/2020 6:52:22 AM To 7/15/2020 7:31:02 AM

Report Date/Time: 7/15/2020 11:46:46 AM | Page 1

Filename: MEAS 9 -- SD Card



Summary

From	7/15/2020 6:52:22 AM	5% percentile	4125 V
To	7/15/2020 7:31:02 AM	95% percentile	4324 V
Maximum value	4343.15 V	% [85% - 110%]	0%
At	7/15/2020 7:29:32 AM	% [90% - 110%]	0 %
Minimum value	4114.95 V		
At	7/15/2020 7:03:02 AM		
μ (Avg)	4213.38 V		
s	68.4327 V		

Upper extreme values

Date / Time	Value
7/15/2020 7:29:32 AM	4343.1499
7/15/2020 7:30:12 AM	4342.4502
7/15/2020 7:29:52 AM	4342.4502
7/15/2020 7:29:42 AM	4342.4502
7/15/2020 7:30:02 AM	4342.1001

Lower extreme values

Date / Time	Value
7/15/2020 7:03:02 AM	4114.9502
7/15/2020 7:02:42 AM	4116.3501
7/15/2020 7:02:52 AM	4117.0498
7/15/2020 6:54:32 AM	4119.8501
7/15/2020 6:55:22 AM	4121.6001

FLUKE®

Filename	Report Date/Time	
MEAS 11 -- SD Card	7/15/2020 11:56:49 AM	Page 1

Instrument Information

Model Number	435-II
Serial Number	28453110
Firmware Revision	V04.01

Software Information

Power Log Version	5.4
FLUKE 430-II DLL Version	1.2.0.13

Test 2

General Information

Recording location	KCWW OHIO RIVER STA
Client	SAME
Notes	4200V RAIL SIDE NO PUMPS RUNNING

FLUKE®

Filename	Report Date/Time	
MEAS 11 -- SD Card	7/15/2020 11:56:49 AM	Page 2

Measurement Summary

Measurement topology	3-element delta mode
Application mode	Logger
First recording	7/15/2020 8:22:08 AM 886msec
Last recording	7/15/2020 8:42:24 AM 386msec
Recording interval	0h 0m 0s 500msec
Nominal Voltage	100 V
Nominal Current	30 A
Nominal Frequency	60 Hz
File start time	7/15/2020 8:22:08 AM 386msec
File end time	7/15/2020 8:42:24 AM 386msec
Duration	0d 0h 20m 16s 0msec
Number of events	Normal: 0 Detailed: 0
Events downloaded	No
Number of screens	0
Screens downloaded	No
Power measurement method	Unified
Cable type	Copper
Harmonic scale	%H1
THD mode	THD 40
CosPhi / DPF mode	DPF

Scaling

Phase:	
Current Clamp type	i430Flex
Clamp range	N/A
Nominal range	30 A
Sensitivity	x1
Current ratio	1000:5
Voltage ratio	35:1
Neutral:	
Current Clamp type	i430TF
Clamp range	N/A
Nominal range	300 A
Sensitivity	x10 AC only
Current ratio	1:1
Voltage ratio	1:1

Recording Summary

RMS recordings	2432
DC recordings	0
Frequency recordings	2432
Unbalance recordings	2432
Harmonic recordings	0
Power harmonic recordings	0
Power recordings	0
Power unbalance recordings	0
Energy recordings	0
Energy losses recordings	0
Flicker recordings	0
Mains signaling recordings	0

FLUKE®

Filename	Report Date/Time	
MEAS 11 -- SD Card	7/15/2020 11:56:49 AM	Page 3

Events Summary

Dips	0
Swells	0
Transients	0
Interruptions	0
Voltage profiles	0
Rapid voltage changes	0
Screens	0
Waveforms	0
Intervals without measurements	0
Inrush current graphics	0
Wave events	0
RMS events	0

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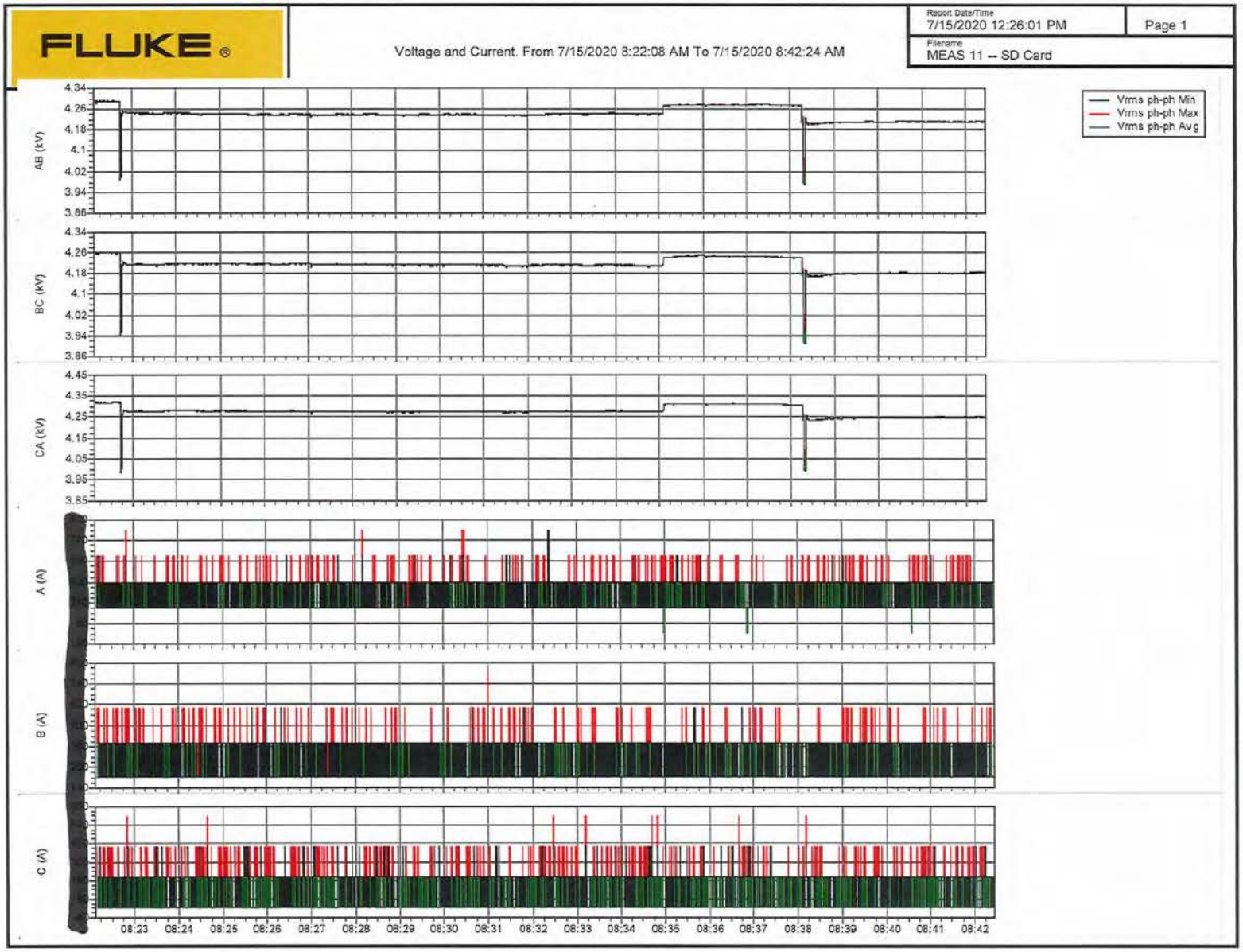

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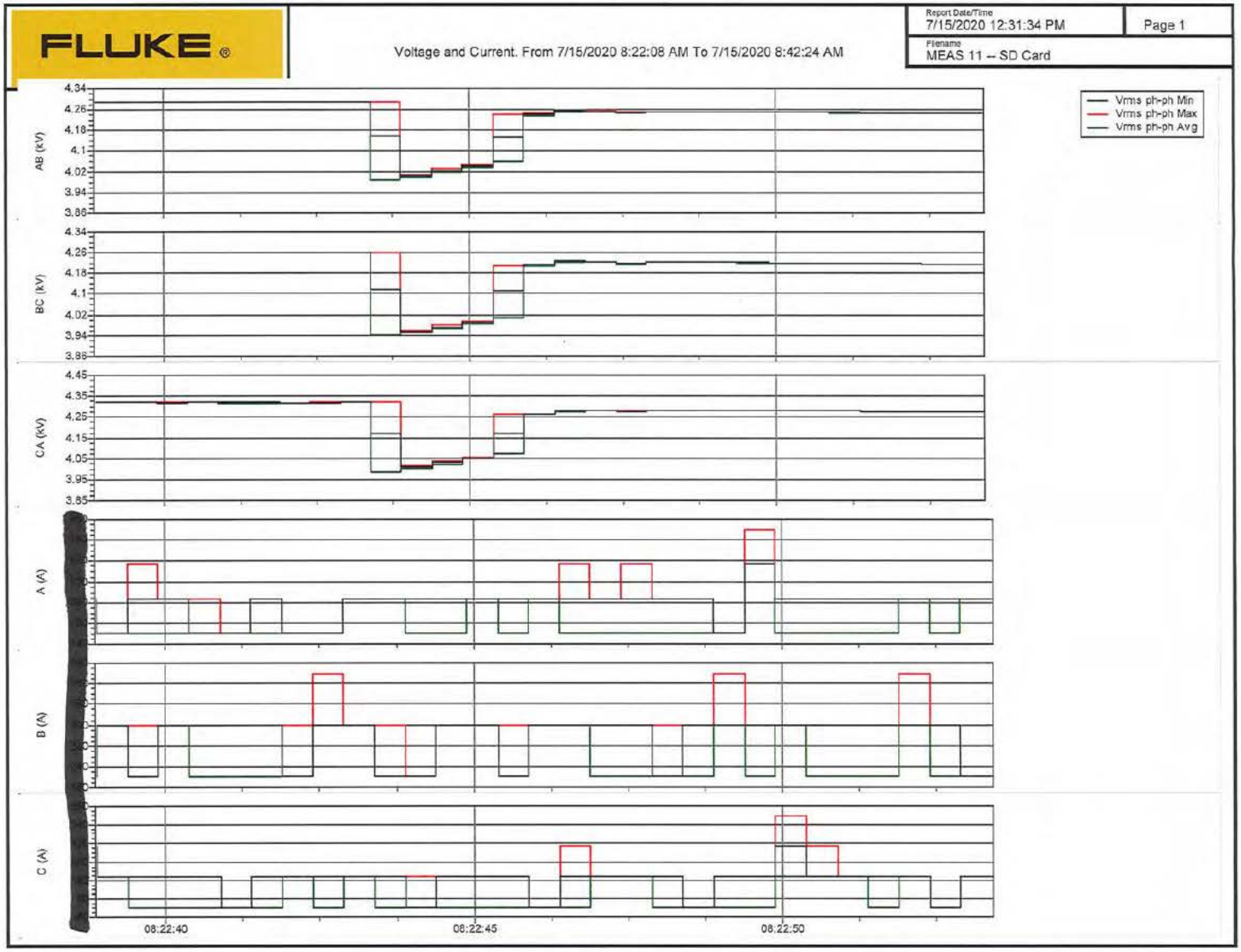

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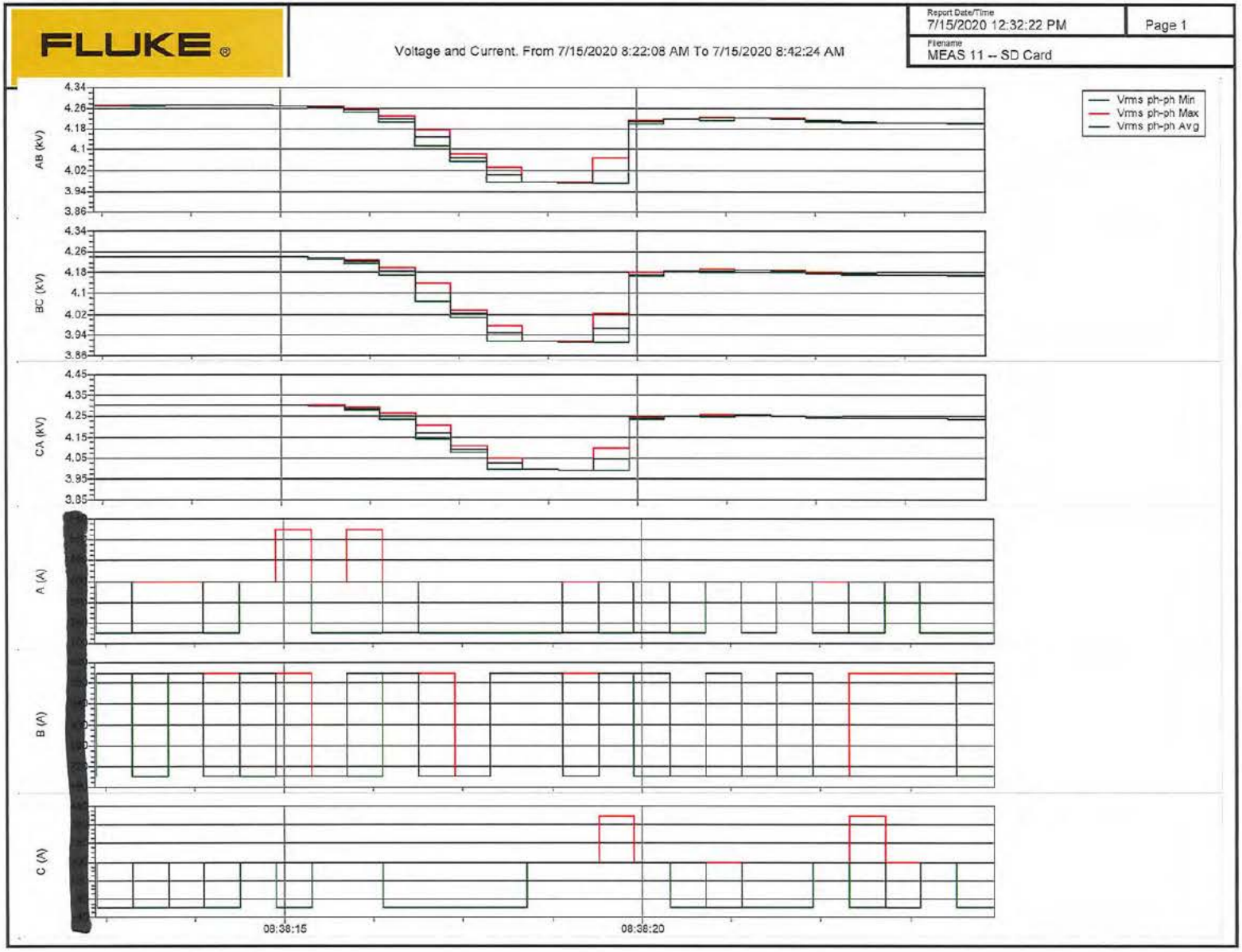

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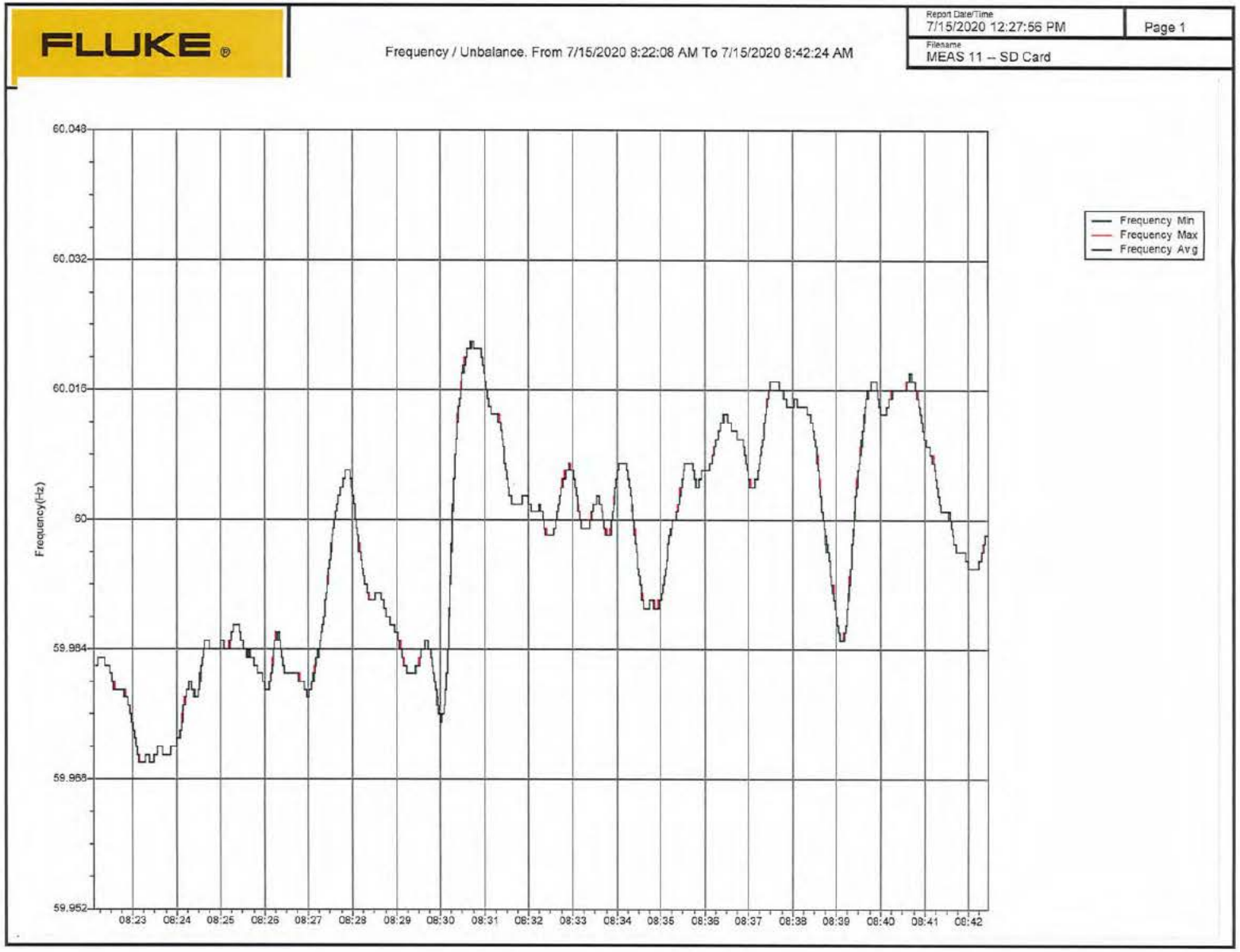

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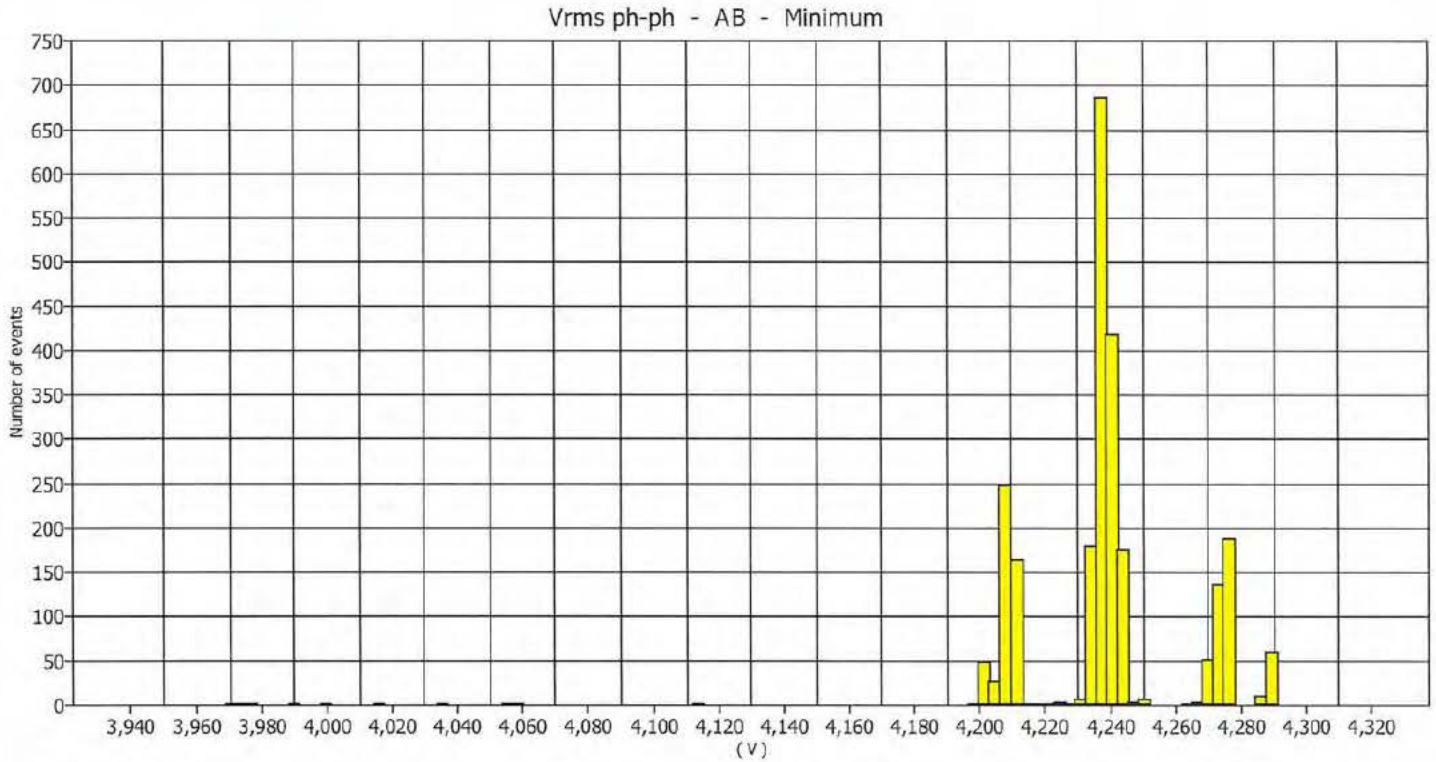
FLUKE®

Statistics. From 7/15/2020 8:22:08 AM To 7/15/2020 8:42:24 AM

Report Date/Time: 7/15/2020 12:26:59 PM | Page 1

Filename: MEAS 11 -- SD Card



Summary

From	7/15/2020 8:22:08 AM	5% percentile	4209 V
To	7/15/2020 8:42:24 AM	95% percentile	4277 V
Maximum value	4291.35 V	% [85% - 110%]	0%
At	7/15/2020 8:22:15 AM	% [90% - 110%]	0 %
Minimum value	3970.4 V		
At	7/15/2020 8:38:19 AM		
μ (Avg)	4240.05 V		
s	26.3379 V		

Upper extreme values

Date / Time	Value
7/15/2020 8:22:35 AM	4291.3501
7/15/2020 8:22:21 AM	4291.3501
7/15/2020 8:22:16 AM	4291.3501
7/15/2020 8:22:15 AM	4291.3501
7/15/2020 8:22:36 AM	4291

Lower extreme values

Date / Time	Value
7/15/2020 8:38:19 AM	3970.3999
7/15/2020 8:38:19 AM	3970.75
7/15/2020 8:38:18 AM	3976
7/15/2020 8:38:18 AM	3977.05
7/15/2020 8:22:43 AM	3991.75

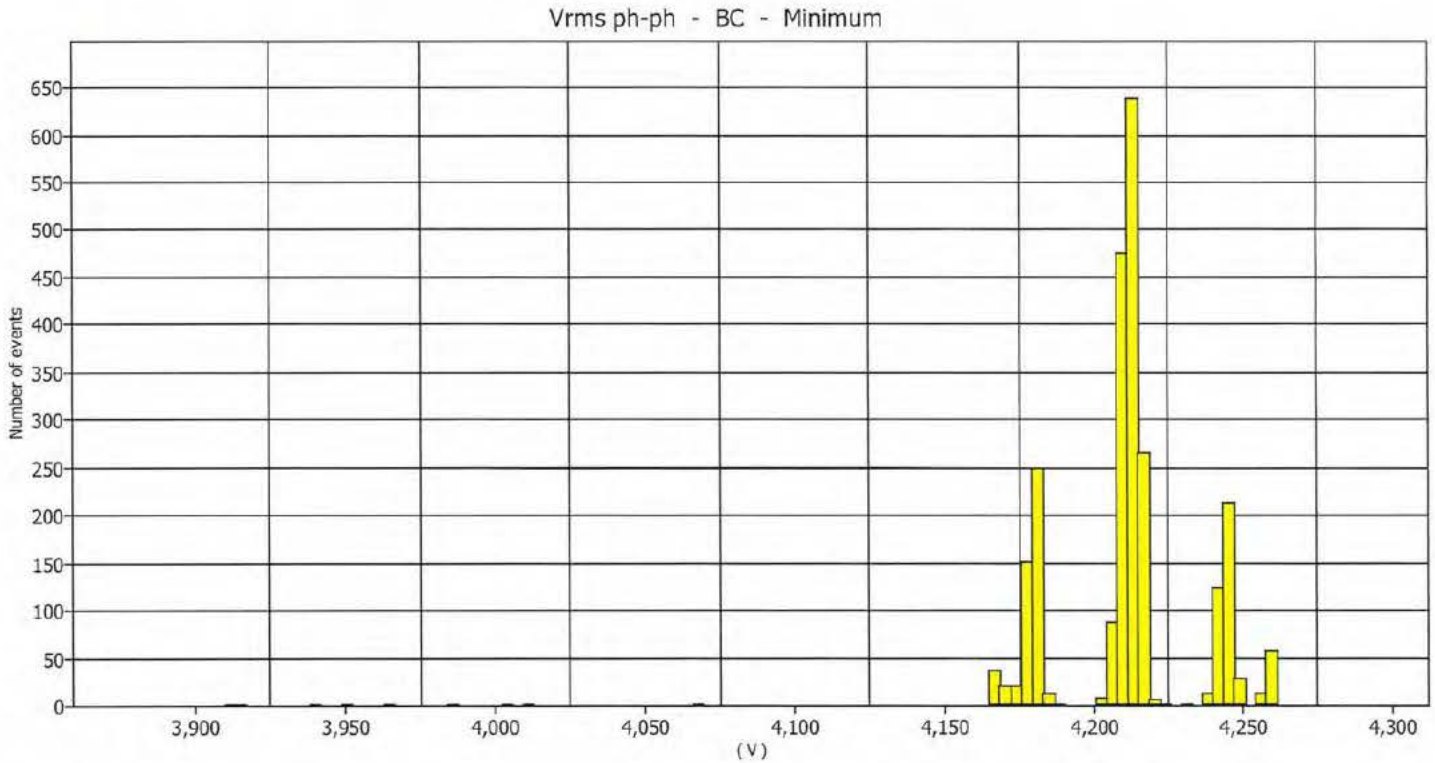
CONFIDENTIAL PROPRIETARY TRADE SECRET

FLUKE®

Statistics. From 7/15/2020 8:22:08 AM To 7/15/2020 8:42:24 AM

Report Date/Time: 7/15/2020 12:27:17 PM | Page 1

Filename: MEAS 11 -- SD Card



Summary

From	7/15/2020 8:22:08 AM	5% percentile	4180 V
To	7/15/2020 8:42:24 AM	95% percentile	4248 V
Maximum value	4261.6 V	% [85% - 110%]	0%
At	7/15/2020 8:22:21 AM	% [90% - 110%]	0 %
Minimum value	3911.6 V		
At	7/15/2020 8:38:19 AM		
μ (Avg)	4212.23 V		
s	27.3827 V		

Upper extreme values

Date / Time	Value
7/15/2020 8:22:35 AM	4261.6001
7/15/2020 8:22:21 AM	4261.6001
7/15/2020 8:22:35 AM	4261.25
7/15/2020 8:22:34 AM	4261.25
7/15/2020 8:22:34 AM	4261.25

Lower extreme values

Date / Time	Value
7/15/2020 8:38:19 AM	3911.6001
7/15/2020 8:38:19 AM	3912.6499
7/15/2020 8:38:18 AM	3916.8501
7/15/2020 8:38:18 AM	3917.8999
7/15/2020 8:22:43 AM	3941.7

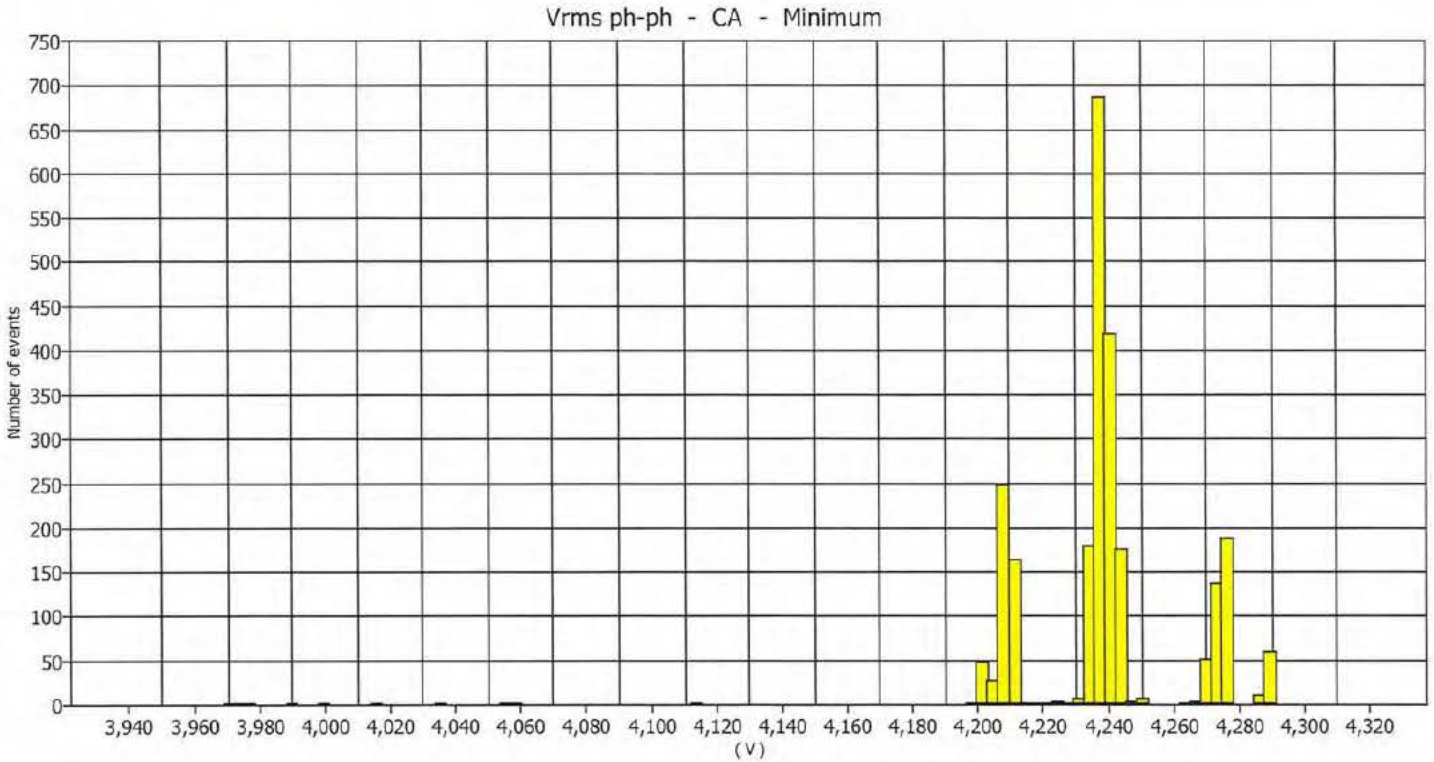
CONFIDENTIAL PROPRIETARY TRADE SECRET

FLUKE®

Statistics. From 7/15/2020 8:22:08 AM To 7/15/2020 8:42:24 AM

Report Date/Time: 7/15/2020 12:27:31 PM | Page 1

Filename: MEAS 11 -- SD Card



Summary

From	7/15/2020 8:22:08 AM	5% percentile	4209 V
To	7/15/2020 8:42:24 AM	95% percentile	4277 V
Maximum value	4291.35 V	% [85% - 110%]	0%
At	7/15/2020 8:22:15 AM	% [90% - 110%]	0 %
Minimum value	3970.4 V		
At	7/15/2020 8:38:19 AM		
μ (Avg)	4240.05 V		
s	26.3379 V		

Upper extreme values

Date / Time	Value
7/15/2020 8:22:35 AM	4291.3501
7/15/2020 8:22:21 AM	4291.3501
7/15/2020 8:22:16 AM	4291.3501
7/15/2020 8:22:15 AM	4291.3501
7/15/2020 8:22:36 AM	4291

Lower extreme values

Date / Time	Value
7/15/2020 8:38:19 AM	3970.3999
7/15/2020 8:38:19 AM	3970.75
7/15/2020 8:38:18 AM	3976
7/15/2020 8:38:18 AM	3977.05
7/15/2020 8:22:43 AM	3991.75

FLUKE®

Filename	Report Date/Time	
MEAS 10 -- SD Card	7/15/2020 11:40:17 AM	Page 1

Instrument Information

Model Number	435-II
Serial Number	28453110
Firmware Revision	V04.01

Software Information

Power Log Version	5.4
FLUKE 430-II DLL Version	1.2.0.13

Test #1

General Information

Recording location	KCWW OHIO RIVER STA
Client	SAME
Notes	4200V RAIL SIDE NO PUMPS RUNNING

FLUKE®

Filename	Report Date/Time	
MEAS 10 -- SD Card	7/15/2020 11:40:17 AM	Page 2

Measurement Summary

Measurement topology	3-element delta mode
Application mode	Logger
First recording	7/15/2020 7:40:32 AM 471msec
Last recording	7/15/2020 8:09:33 AM 971msec
Recording interval	0h 0m 0s 500msec
Nominal Voltage	173 V
Nominal Current	30 A
Nominal Frequency	60 Hz
File start time	7/15/2020 7:40:31 AM 971msec
File end time	7/15/2020 8:09:33 AM 971msec
Duration	0d 0h 29m 2s 0msec
Number of events	Normal: 0 Detailed: 0
Events downloaded	No
Number of screens	0
Screens downloaded	Yes
Power measurement method	Unified
Cable type	Copper
Harmonic scale	%H1
THD mode	THD 40
CosPhi / DPF mode	DPF

Scaling

Phase:	
Current Clamp type	i430Flex
Clamp range	N/A
Nominal range	30 A
Sensitivity	x1
Current ratio	1000:5
Voltage ratio	35:1
Neutral:	
Current Clamp type	i430TF
Clamp range	N/A
Nominal range	300 A
Sensitivity	x10 AC only
Current ratio	1:1
Voltage ratio	1:1

Recording Summary

RMS recordings	3484
DC recordings	0
Frequency recordings	3484
Unbalance recordings	3484
Harmonic recordings	0
Power harmonic recordings	0
Power recordings	0
Power unbalance recordings	0
Energy recordings	0
Energy losses recordings	0
Flicker recordings	0
Mains signaling recordings	0

FLUKE®

Filename	Report Date/Time	
MEAS 10 -- SD Card	7/15/2020 11:40:17 AM	Page 3

Events Summary

Dips	0
Swells	0
Transients	0
Interruptions	0
Voltage profiles	0
Rapid voltage changes	0
Screens	0
Waveforms	0
Intervals without measurements	0
Inrush current graphics	0
Wave events	0
RMS events	0

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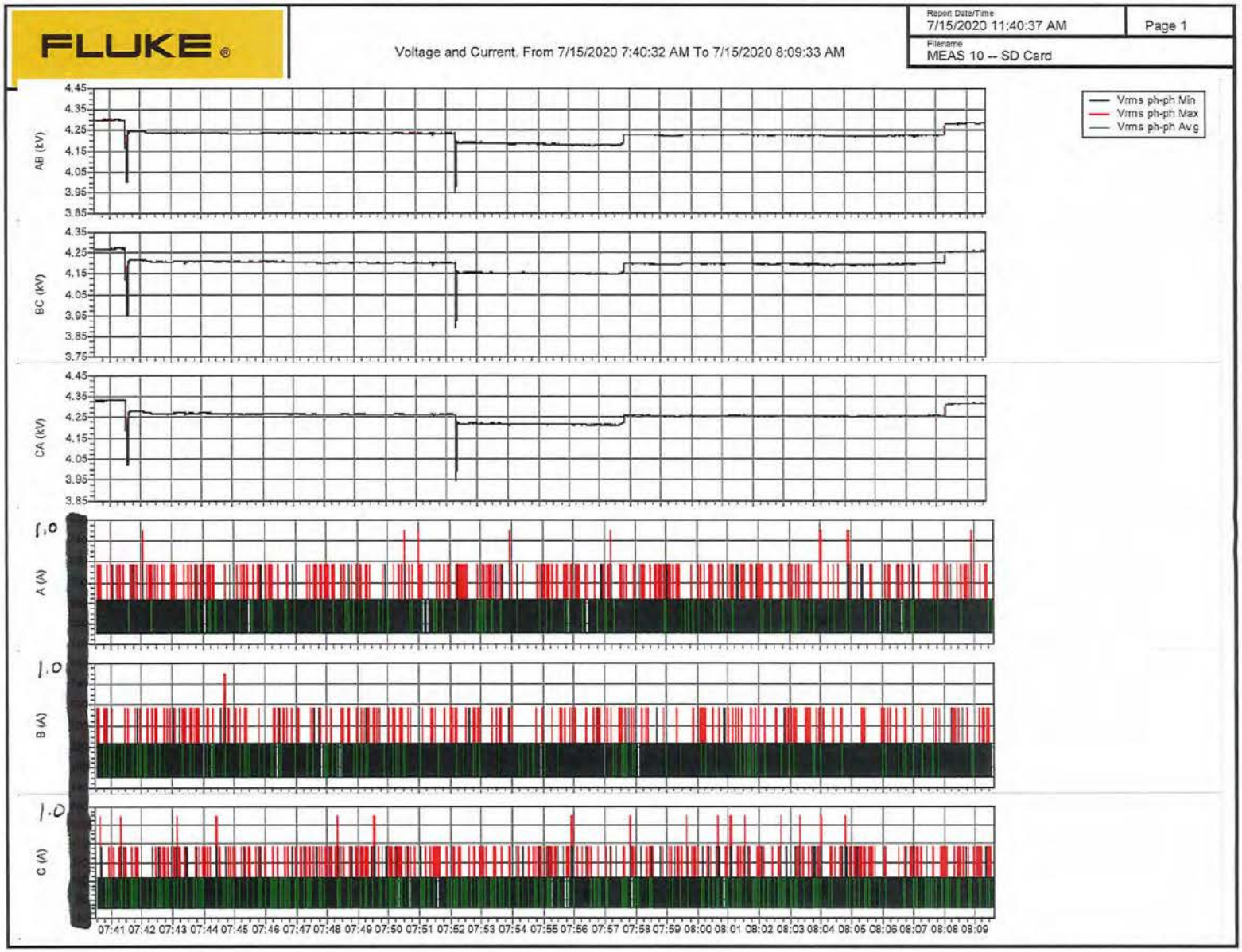

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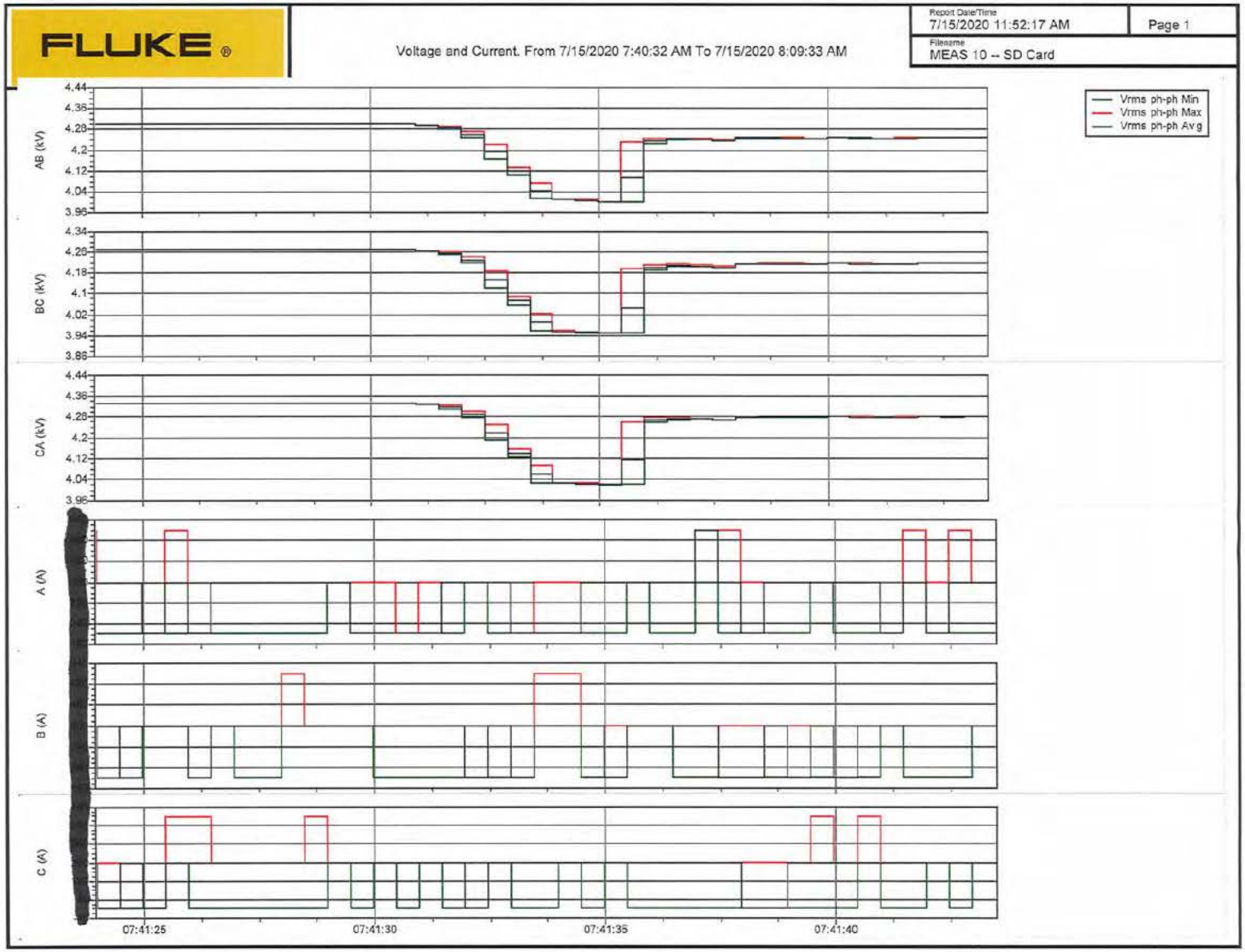

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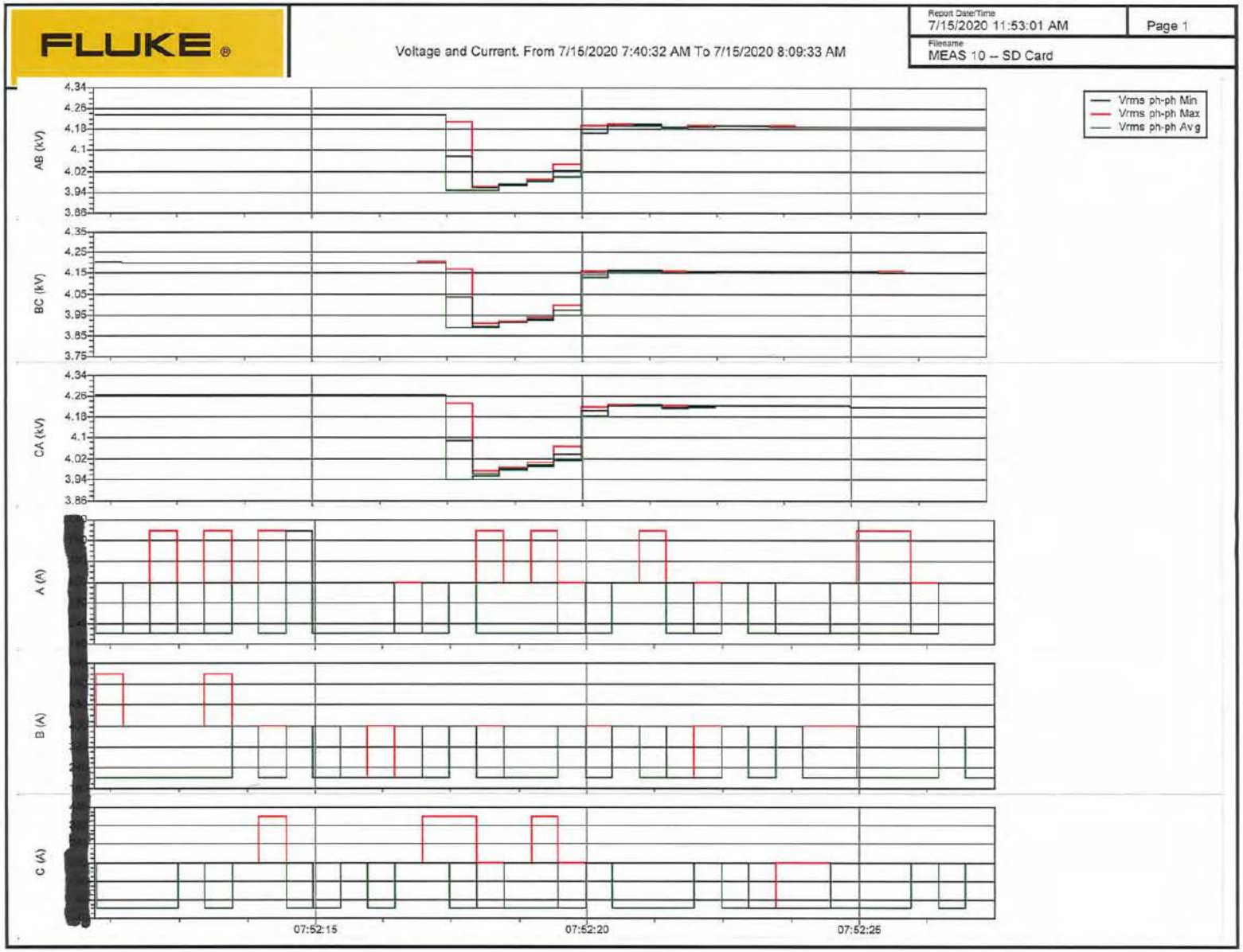

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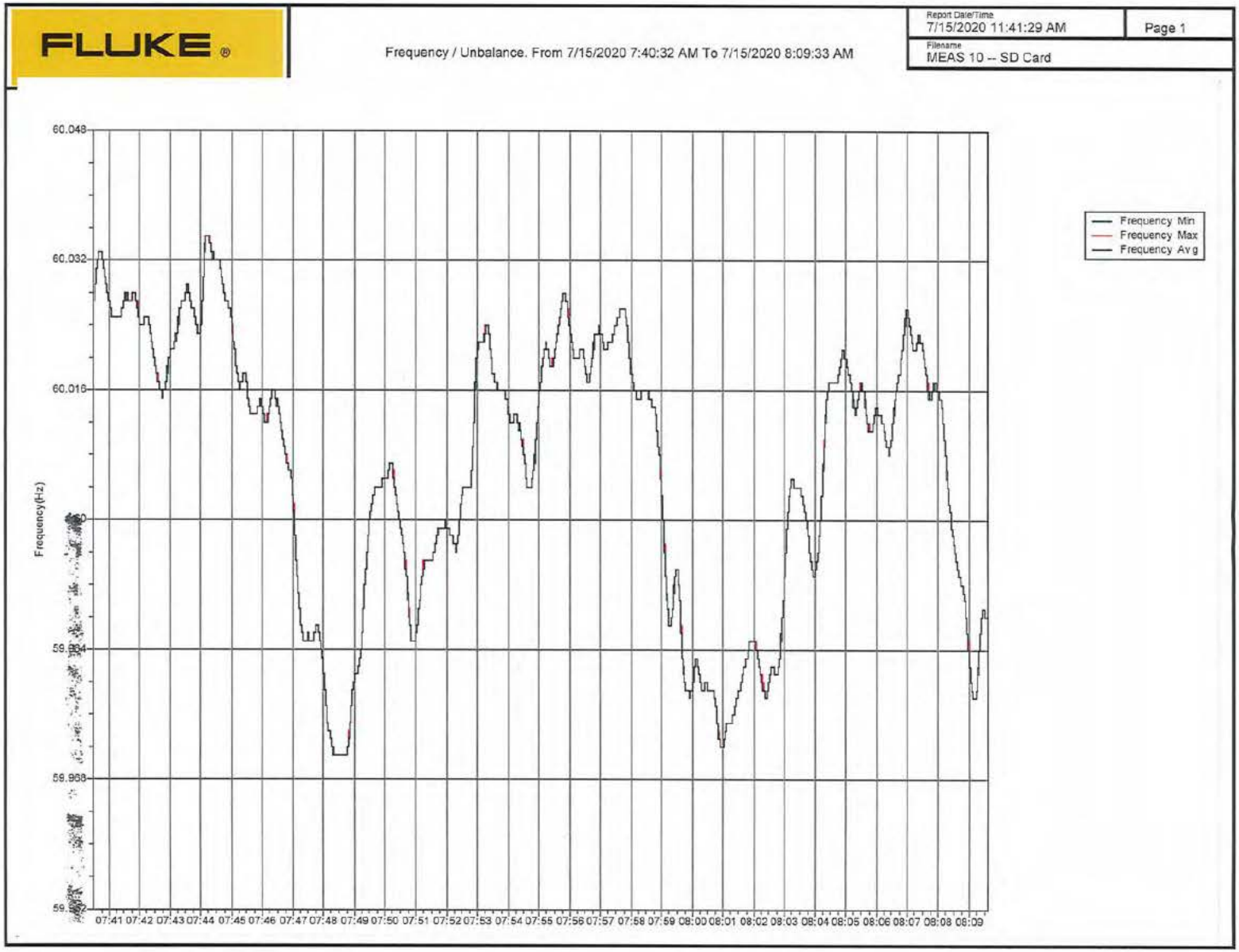

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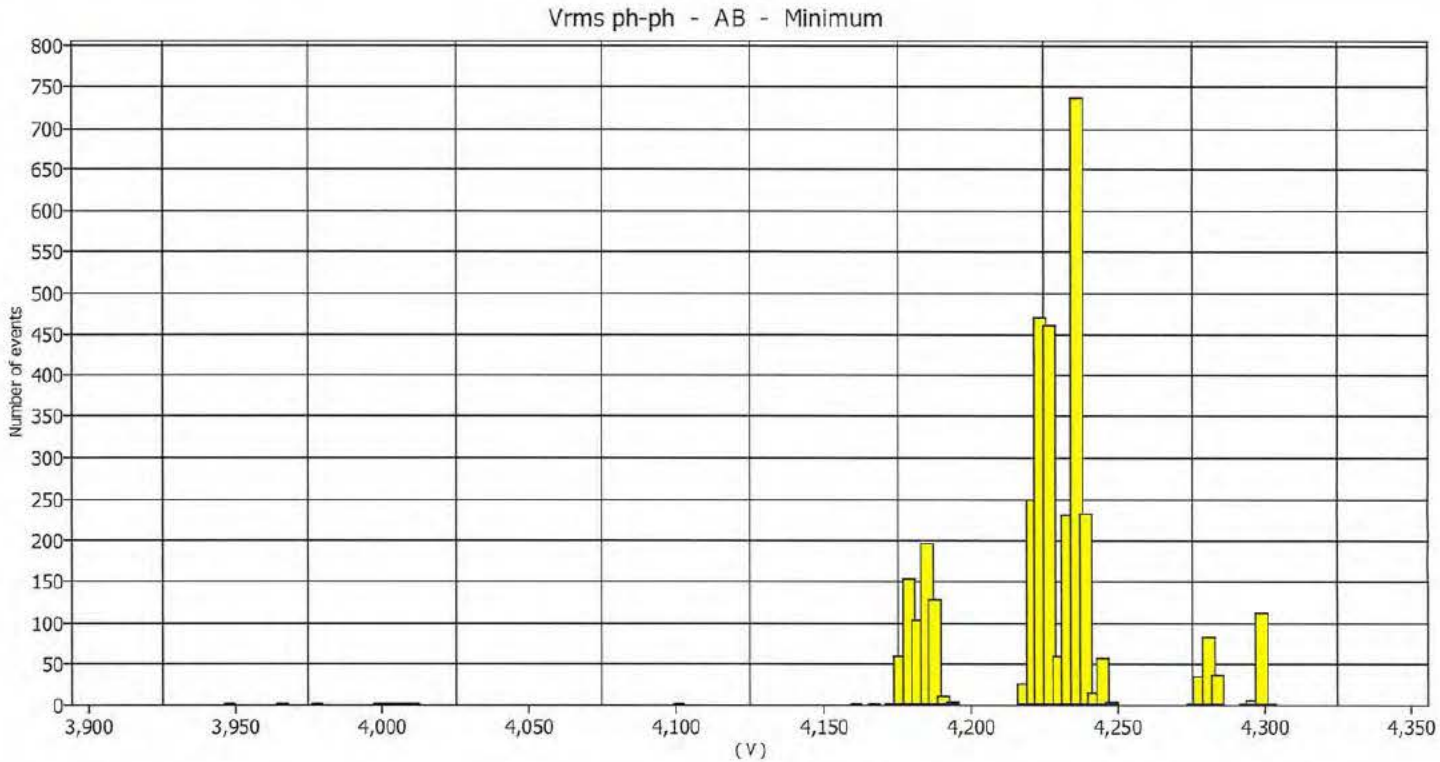
FLUKE®

Statistics. From 7/15/2020 7:40:32 AM To 7/15/2020 8:09:33 AM

Report Date/Time: 7/15/2020 11:43:00 AM | Page 1

Filename: MEAS 10 -- SD Card



Summary

From	7/15/2020 7:40:32 AM	5% percentile	4180 V
To	7/15/2020 8:09:33 AM	95% percentile	4283 V
Maximum value	4302.2 V	% [85% - 110%]	0%
At	7/15/2020 7:41:14 AM	% [90% - 110%]	0 %
Minimum value	3948 V		
At	7/15/2020 7:52:17 AM		
μ (Avg)	4227.01 V		
s	29.6908 V		

Upper extreme values

Date / Time	Value
7/15/2020 7:41:14 AM	4302.2002
7/15/2020 7:41:13 AM	4301.8501
7/15/2020 7:41:13 AM	4301.8501
7/15/2020 7:41:10 AM	4301.8501
7/15/2020 7:41:10 AM	4301.8501

Lower extreme values

Date / Time	Value
7/15/2020 7:52:17 AM	3948
7/15/2020 7:52:18 AM	3950.8
7/15/2020 7:52:18 AM	3968.3
7/15/2020 7:52:19 AM	3979.1501
7/15/2020 7:52:19 AM	3999.45

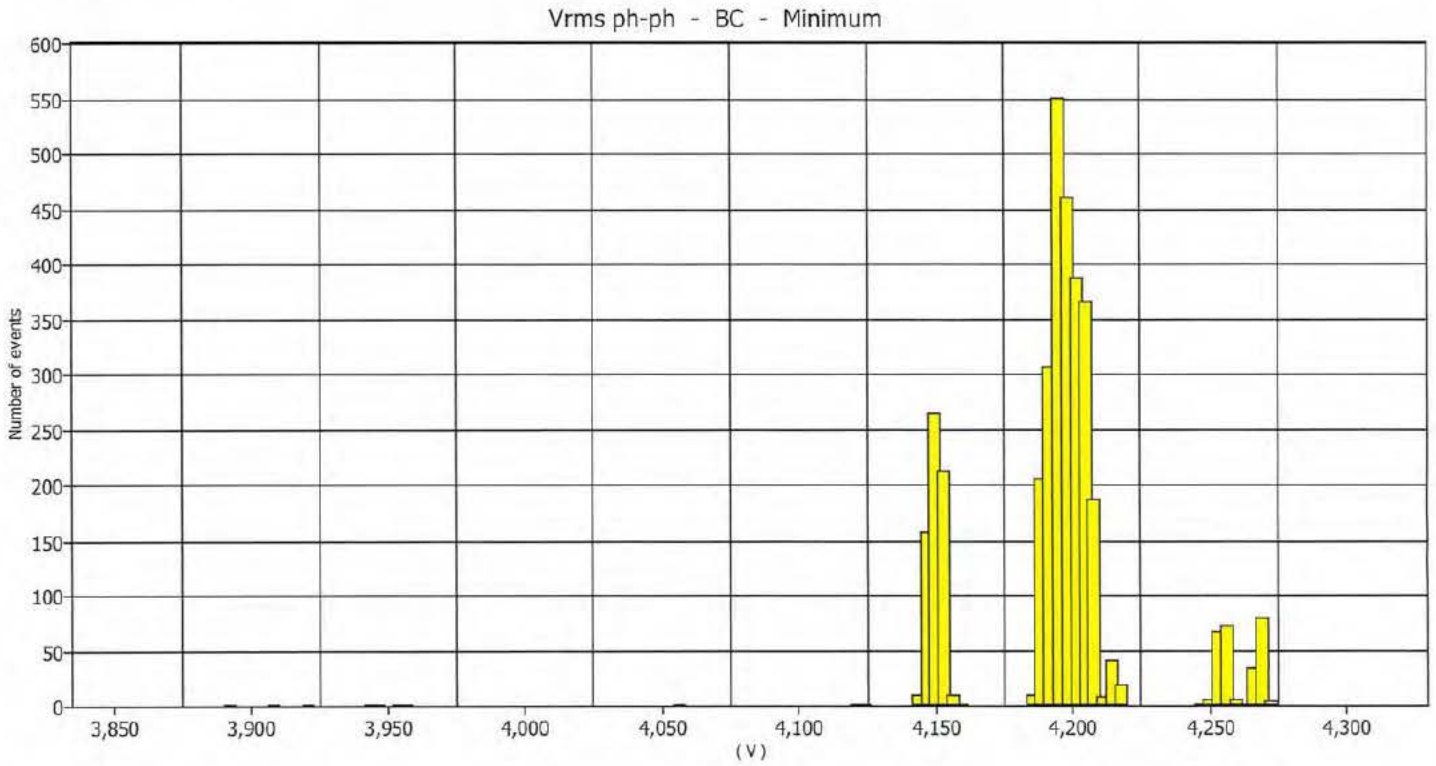
CONFIDENTIAL PROPRIETARY TRADE SECRET

FLUKE®

Statistics. From 7/15/2020 7:40:32 AM To 7/15/2020 8:09:33 AM

Report Date/Time: 7/15/2020 11:43:39 AM | Page 1

Filename: MEAS 10 -- SD Card



Summary

From	7/15/2020 7:40:32 AM	5% percentile	4150 V
To	7/15/2020 8:09:33 AM	95% percentile	4267 V
Maximum value	4272.45 V	% [85% - 110%]	0%
At	7/15/2020 7:41:14 AM	% [90% - 110%]	0 %
Minimum value	3892 V		
At	7/15/2020 7:52:18 AM		
μ (Avg)	4194.99 V		
s	31.0974 V		

Upper extreme values

Date / Time	Value
7/15/2020 7:41:17 AM	4272.4502
7/15/2020 7:41:17 AM	4272.4502
7/15/2020 7:41:14 AM	4272.4502
7/15/2020 7:41:14 AM	4272.4502
7/15/2020 7:41:30 AM	4272.1001

Lower extreme values

Date / Time	Value
7/15/2020 7:52:18 AM	3892
7/15/2020 7:52:17 AM	3892.7
7/15/2020 7:52:18 AM	3910.55
7/15/2020 7:52:19 AM	3922.45
7/15/2020 7:52:19 AM	3945.2

CONFIDENTIAL PROPRIETARY TRADE SECRET

FLUKE®

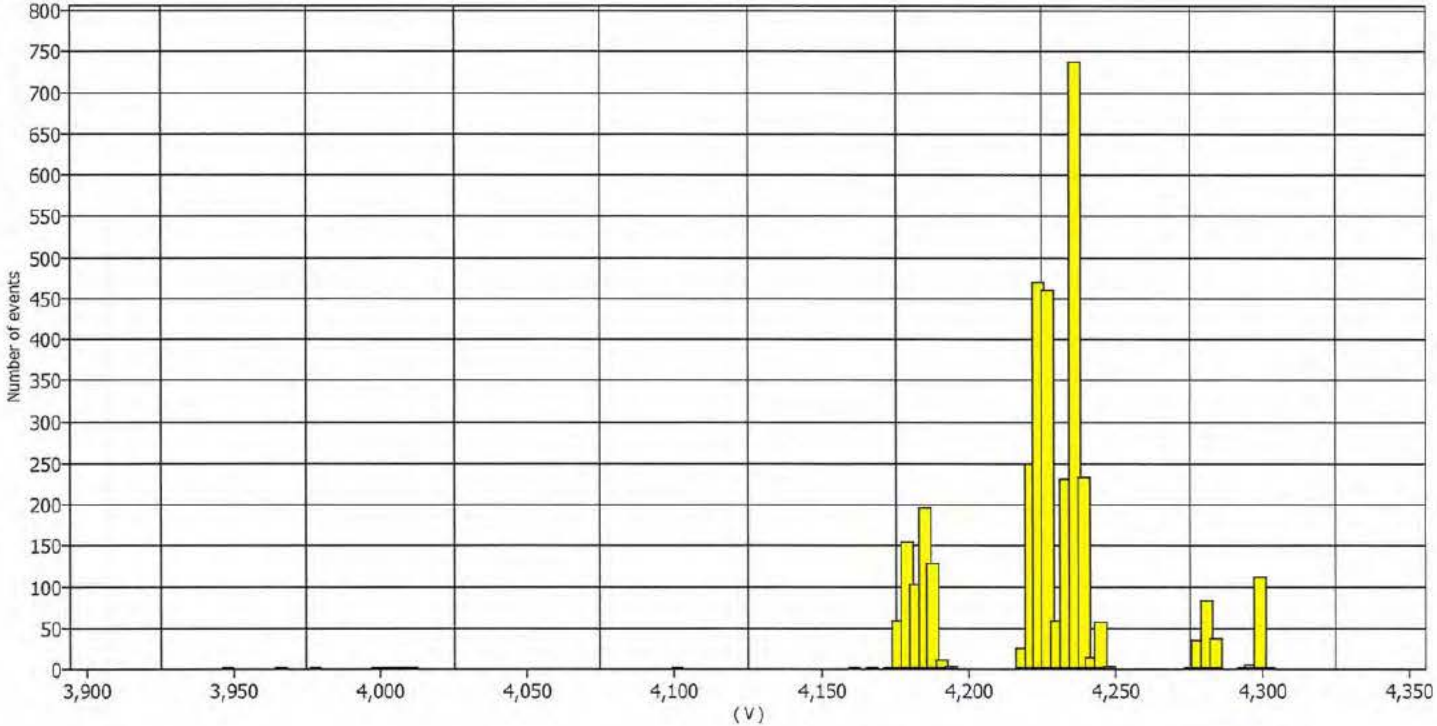
Statistics. From 7/15/2020 7:40:32 AM To 7/15/2020 8:09:33 AM

Report Date/Time
7/15/2020 11:44:08 AM

Page 1

Filename
MEAS 10 -- SD Card

Vrms ph-ph - CA - Minimum



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To	7/15/2020 8:09:33 AM	95% percentile	4283 V
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Minimum value	3948 V		
At	7/15/2020 7:52:17 AM		
μ (Avg)	4227.01 V		
s	29.6908 V		

Upper extreme values

Date / Time	Value
7/15/2020 7:41:14 AM	4302.2002
7/15/2020 7:41:13 AM	4301.8501
7/15/2020 7:41:13 AM	4301.8501
7/15/2020 7:41:10 AM	4301.8501
7/15/2020 7:41:10 AM	4301.8501

Lower extreme values

Date / Time	Value
7/15/2020 7:52:17 AM	3948
7/15/2020 7:52:18 AM	3950.8
7/15/2020 7:52:18 AM	3968.3
7/15/2020 7:52:19 AM	3979.1501
7/15/2020 7:52:19 AM	3999.45

FLUKE®

Filename	Report Date/Time	
MEASUREMENT 16 -- SD Card	7/15/2020 12:58:24 PM	Page 1

Instrument Information

Model Number	Fluke 430xII
Serial Number	N/A
Firmware Revision	N/A

Software Information

Power Log Version	5.4
FLUKE 430-II DLL Version	1.2.0.13

Test #1

General Information

Recording location	KCWW OHIO RIVER STA
Client	SAME
Notes	4200V RIVER SIDE TEST 1 SOFT START PUMP #4 RVS START PUMP #6

FLUKE®

Filename	Report Date/Time	
MEASUREMENT 16 -- SD Card	7/15/2020 12:58:24 PM	Page 2

Measurement Summary

Measurement topology	3-element delta mode
Application mode	Logger
First recording	7/15/2020 7:40:57 AM 500msec
Last recording	7/15/2020 8:09:33 AM 0msec
Recording interval	0h 0m 0s 500msec
Nominal Voltage	173 V
Nominal Current	5 A
Nominal Frequency	60 Hz
File start time	7/15/2020 7:40:57 AM 0msec
File end time	7/15/2020 8:09:33 AM 0msec
Duration	0d 0h 28m 36s 0msec
Number of events	Normal: 1 Detailed: 0
Events downloaded	Yes
Number of screens	0
Screens downloaded	Yes
Power measurement method	Unified
Cable type	Aluminium
Harmonic scale	%H1
THD mode	THD 40
CosPhi / DPF mode	DPF

Scaling

Phase:	
Current Clamp type	i5s
Clamp range	400 mV/A
Nominal range	5 A
Sensitivity	x1
Current ratio	1000:5
Voltage ratio	35:1
Neutral:	
Current Clamp type	i430TF
Clamp range	N/A
Nominal range	300 A
Sensitivity	x10 AC only
Current ratio	1:1
Voltage ratio	1:1

Recording Summary

RMS recordings	3432
DC recordings	0
Frequency recordings	3432
Unbalance recordings	3432
Harmonic recordings	0
Power harmonic recordings	0
Power recordings	0
Power unbalance recordings	0
Energy recordings	0
Energy losses recordings	0
Flicker recordings	0
Mains signaling recordings	0

FLUKE®

Filename	Report Date/Time	
MEASUREMENT 16 -- SD Card	7/15/2020 12:58:24 PM	Page 3

Events Summary

Dips	0
Swells	0
Transients	1
Interruptions	0
Voltage profiles	0
Rapid voltage changes	0
Screens	0
Waveforms	0
Intervals without measurements	0
Inrush current graphics	0
Wave events	1
RMS events	1

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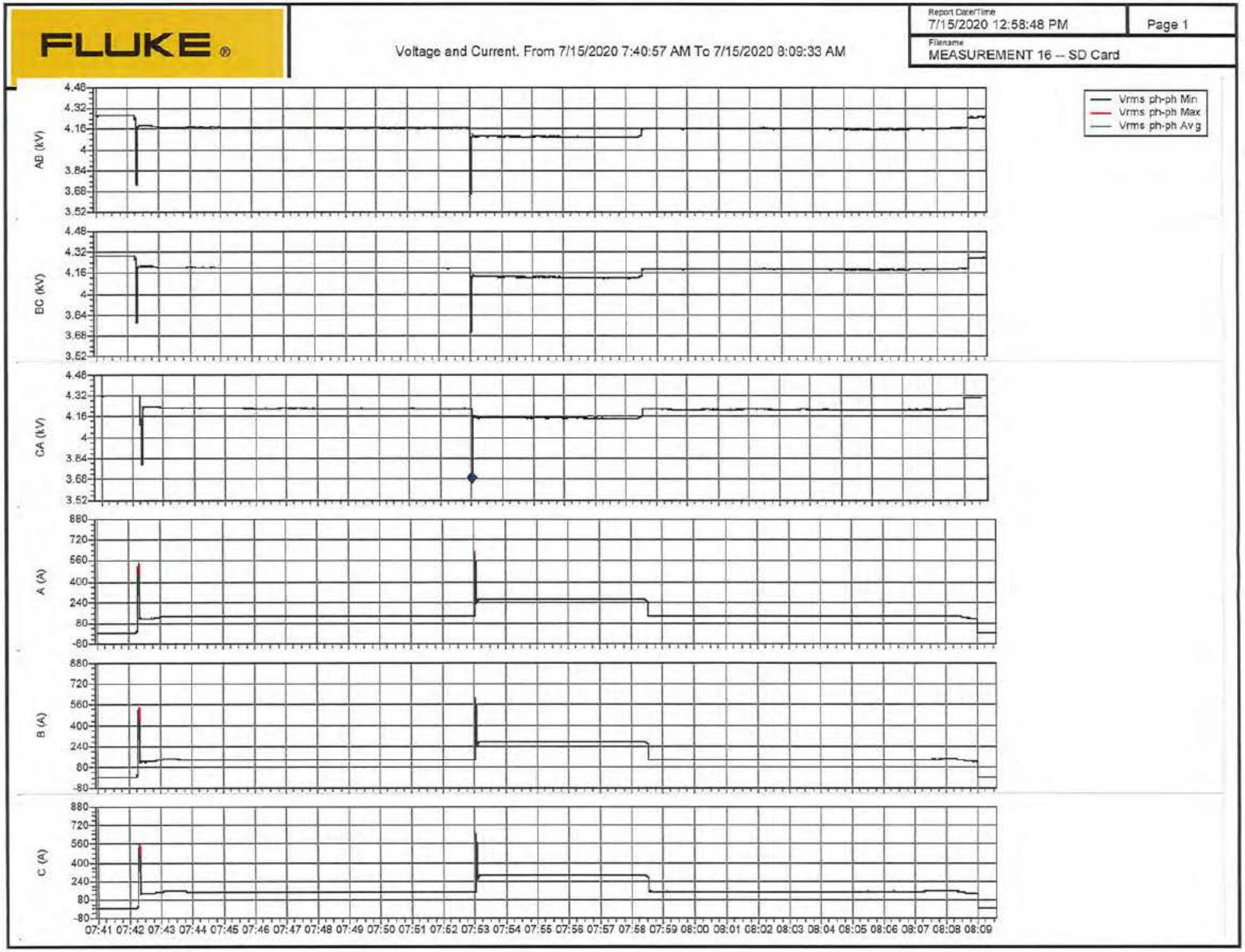
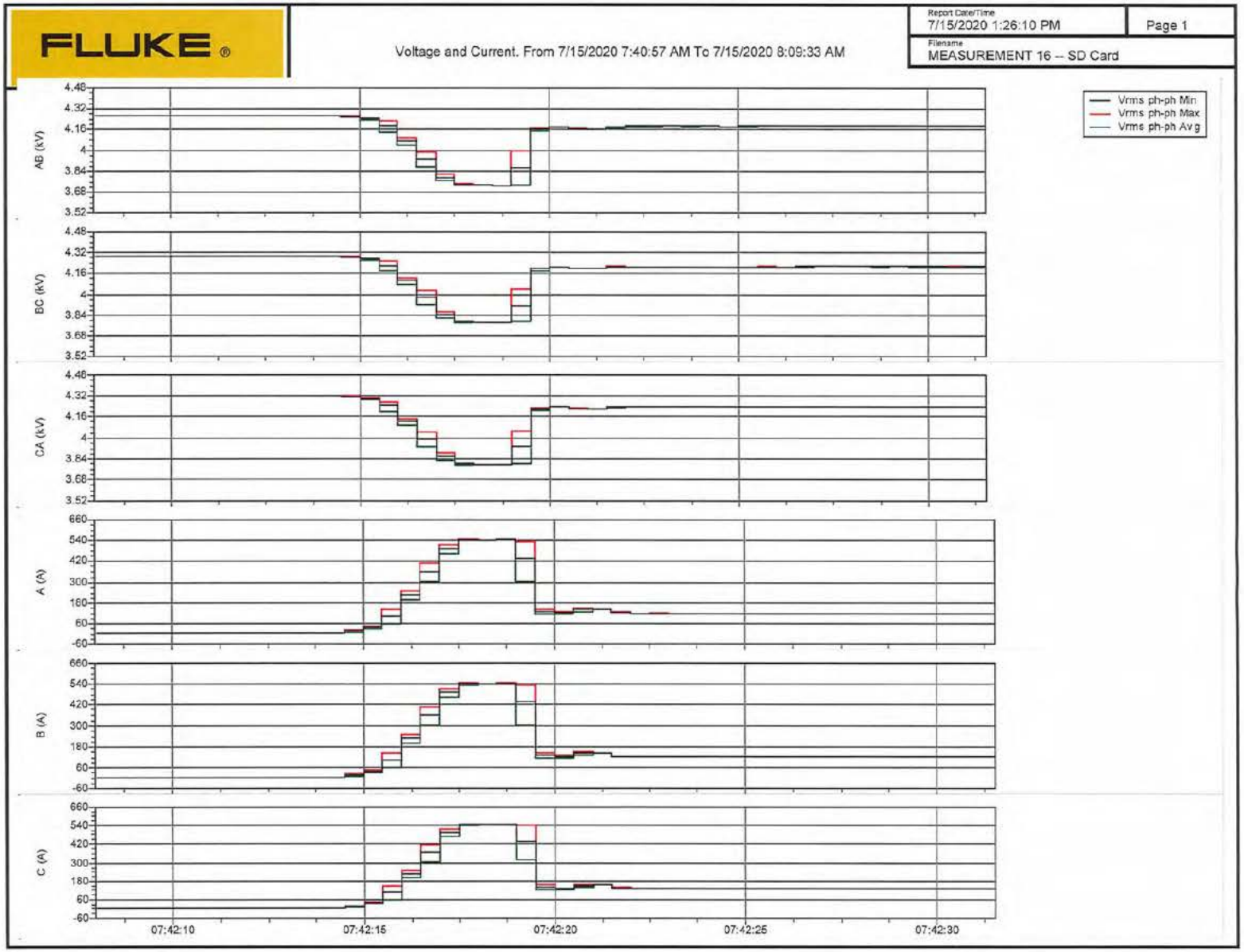
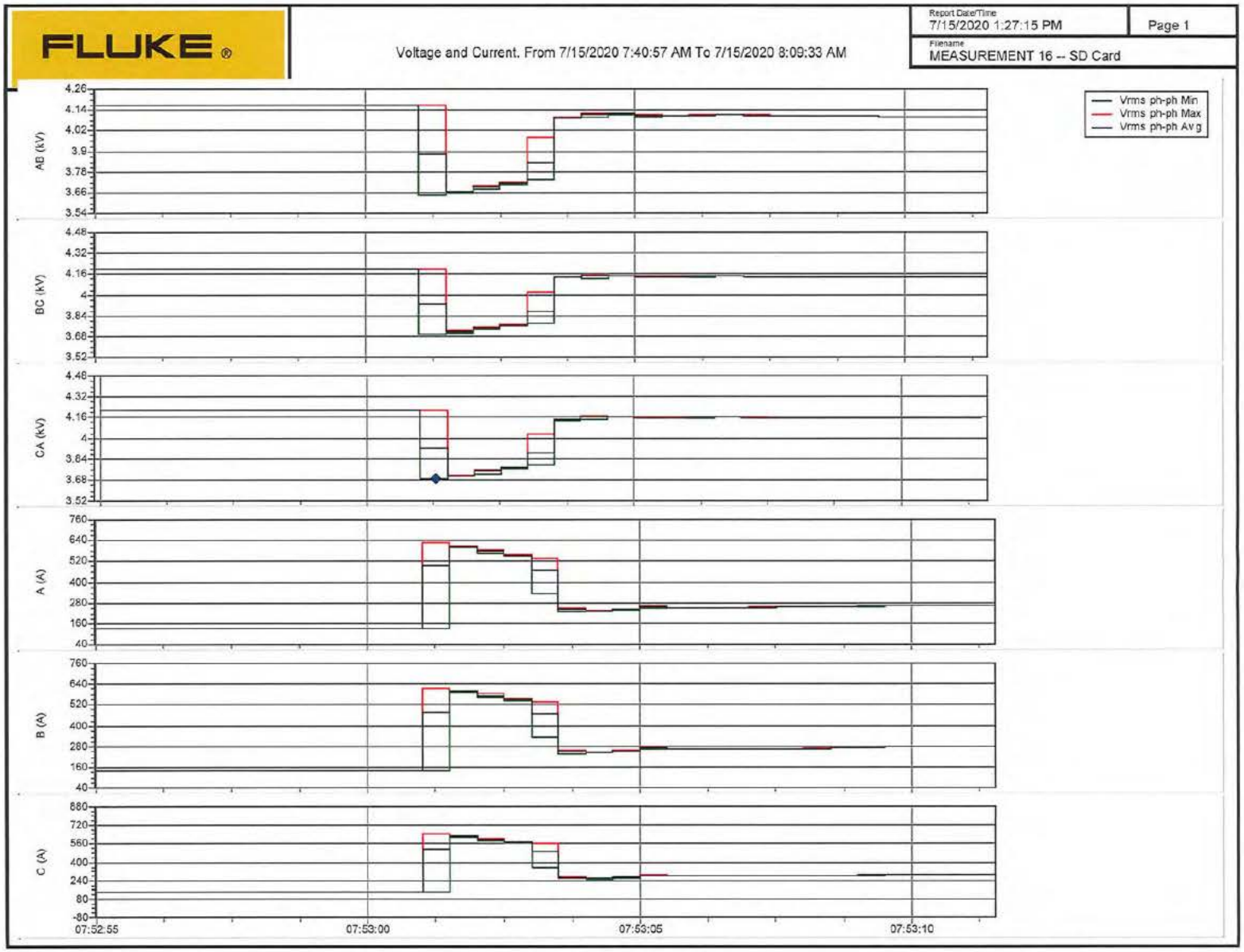


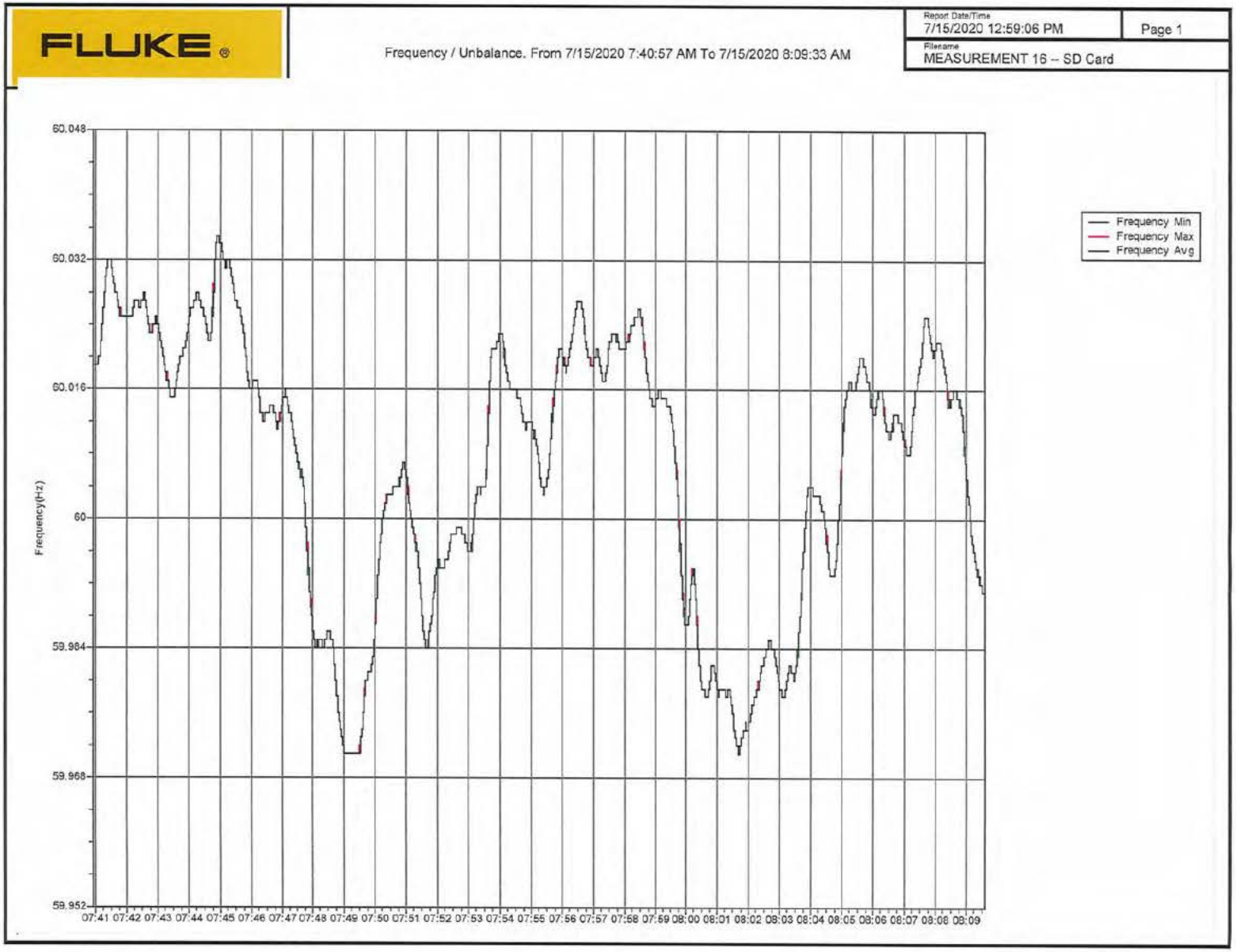
CONFIDENTIAL PROPRIETARY TRADE SECRET



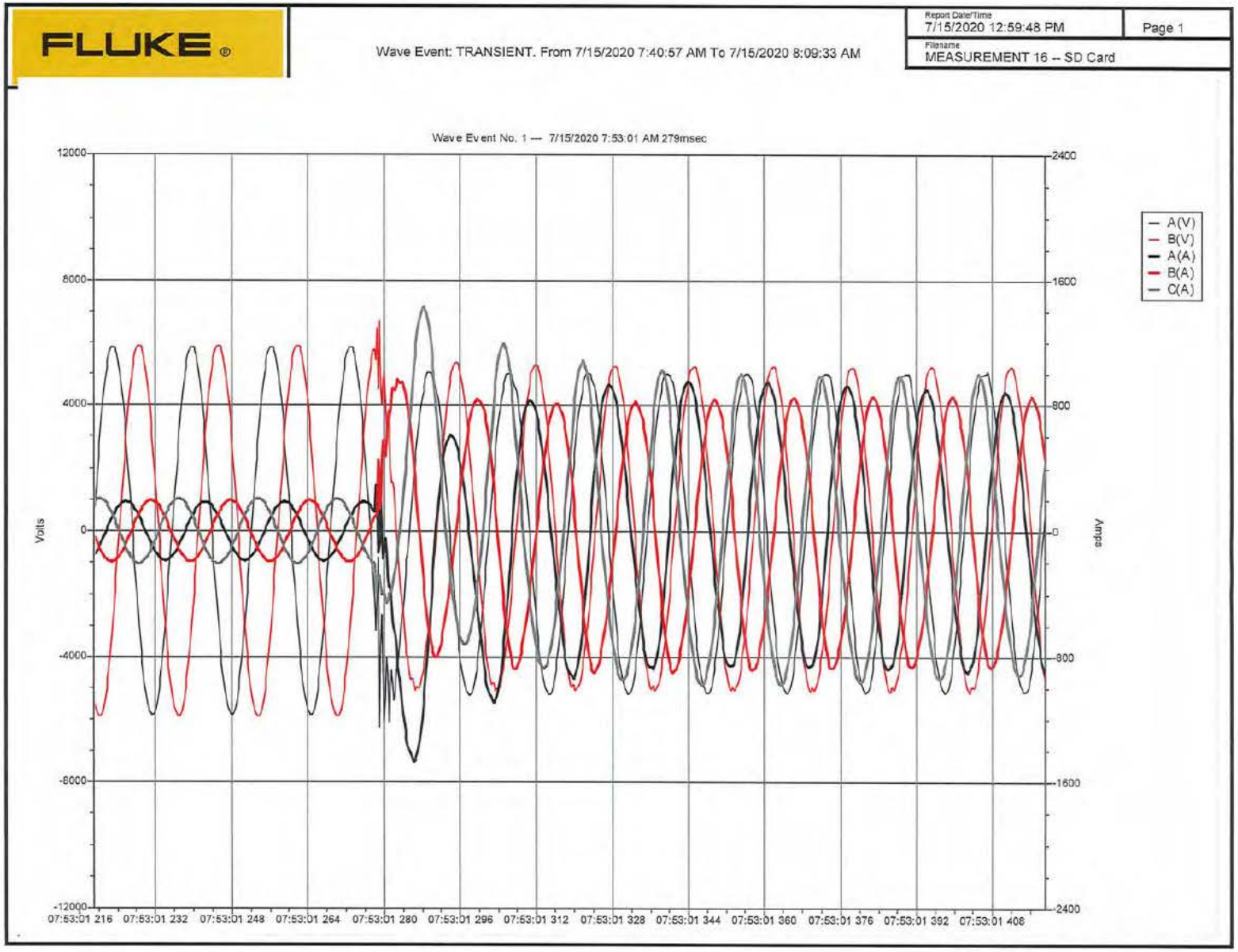
CONFIDENTIAL PROPRIETARY TRADE SECRET



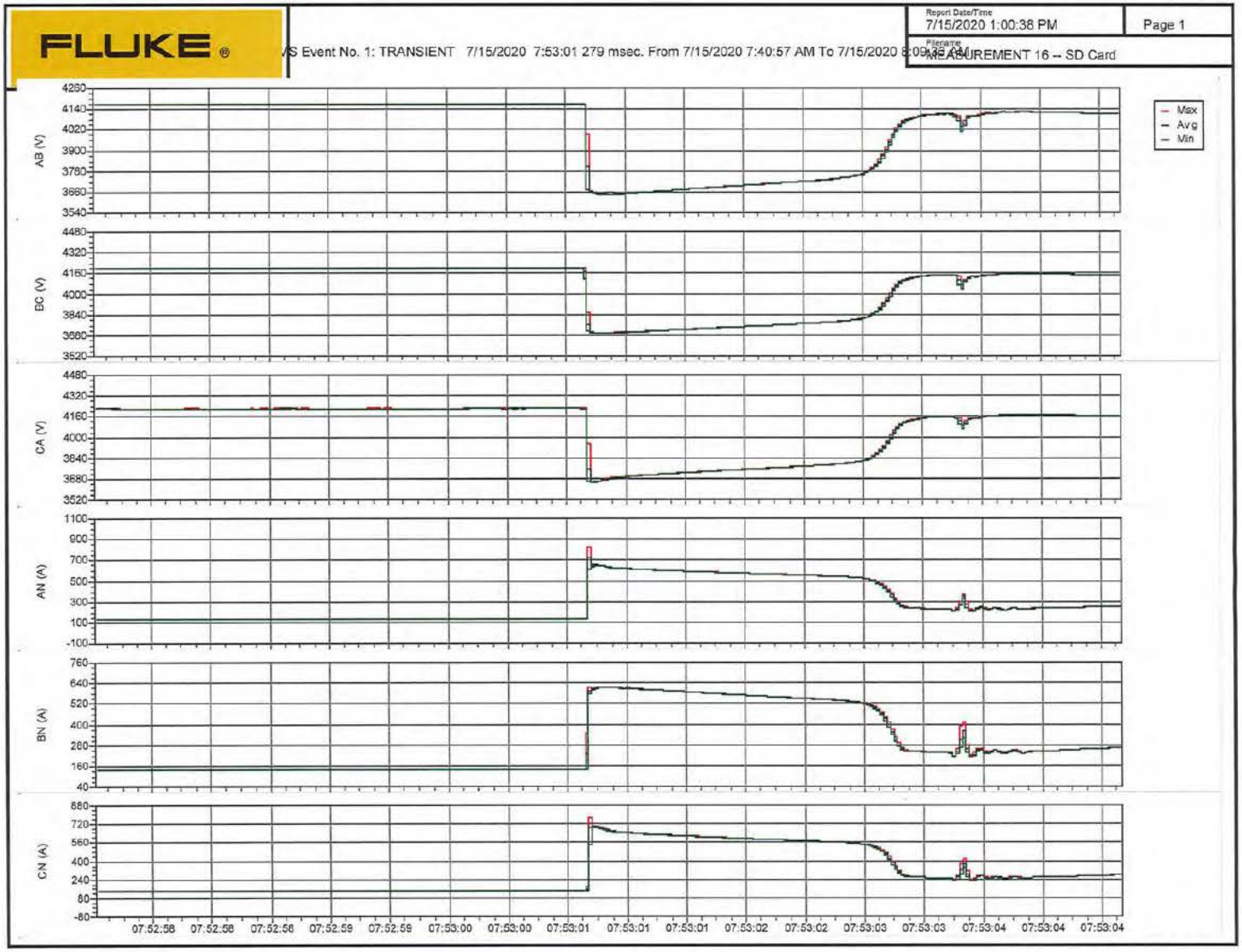
CONFIDENTIAL PROPRIETARY TRADE SECRET



CONFIDENTIAL PROPRIETARY TRADE SECRET



CONFIDENTIAL PROPRIETARY TRADE SECRET



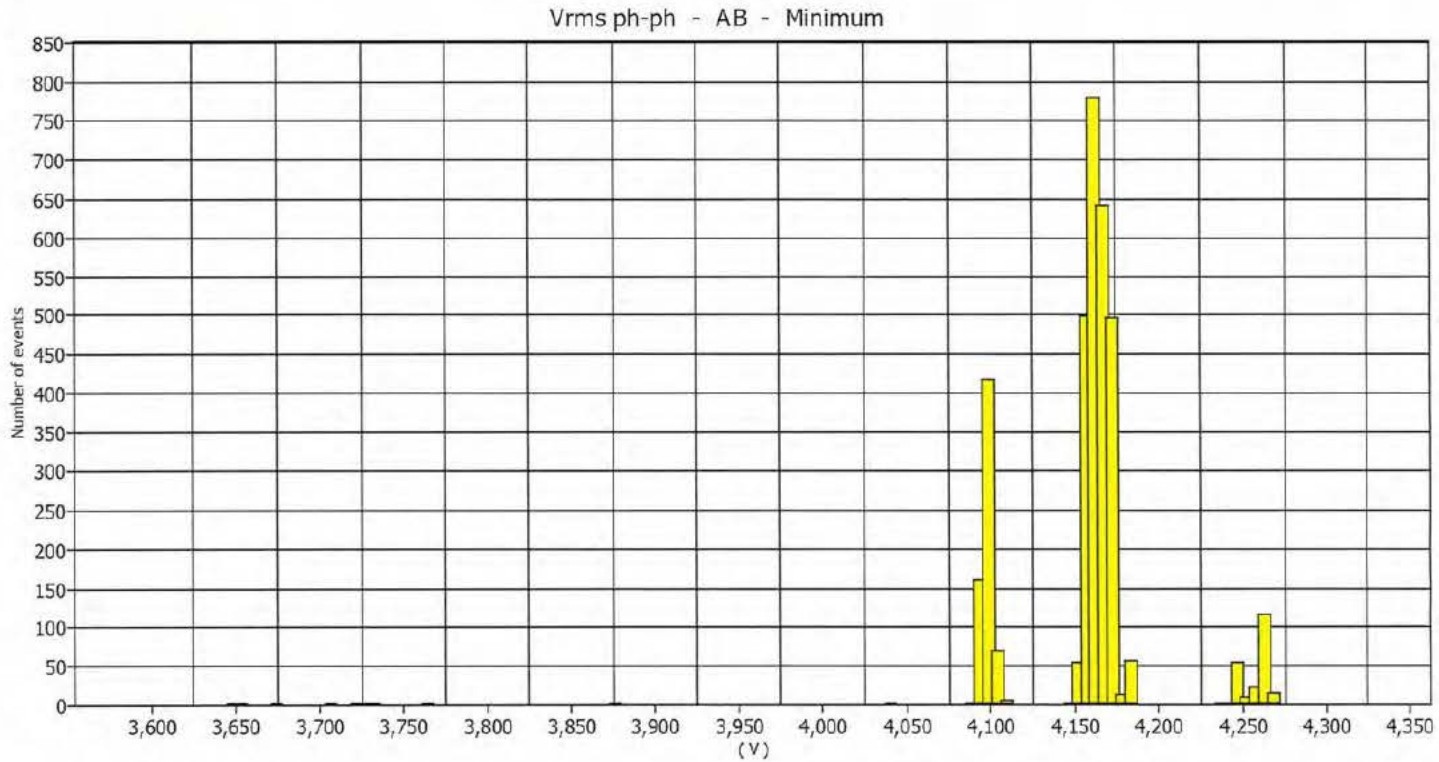
CONFIDENTIAL PROPRIETARY TRADE SECRET

FLUKE®

Statistics. From 7/15/2020 7:40:57 AM To 7/15/2020 8:09:33 AM

Report Date/Time: 7/15/2020 1:03:29 PM | Page 1

Filename: MEASUREMENT 16 -- SD Card



Summary

From	7/15/2020 7:40:57 AM	5% percentile	4099 V
To	7/15/2020 8:09:33 AM	95% percentile	4252 V
Maximum value	4269.3 V	% [85% - 110%]	0%
At	7/15/2020 7:41:58 AM	% [90% - 110%]	0 %
Minimum value	3648.05 V		
At	7/15/2020 7:53:01 AM		
μ (Avg)	4159.37 V		
s	44.9538 V		

Upper extreme values

Date / Time	Value
7/15/2020 7:41:58 AM	4269.2998
7/15/2020 7:42:02 AM	4268.9502
7/15/2020 7:42:01 AM	4268.9502
7/15/2020 7:42:01 AM	4268.9502
7/15/2020 7:42:00 AM	4268.9502

Lower extreme values

Date / Time	Value
7/15/2020 7:53:01 AM	3648.05
7/15/2020 7:53:02 AM	3657.8501
7/15/2020 7:53:02 AM	3679.55
7/15/2020 7:53:03 AM	3711.05
7/15/2020 7:42:19 AM	3726.1001

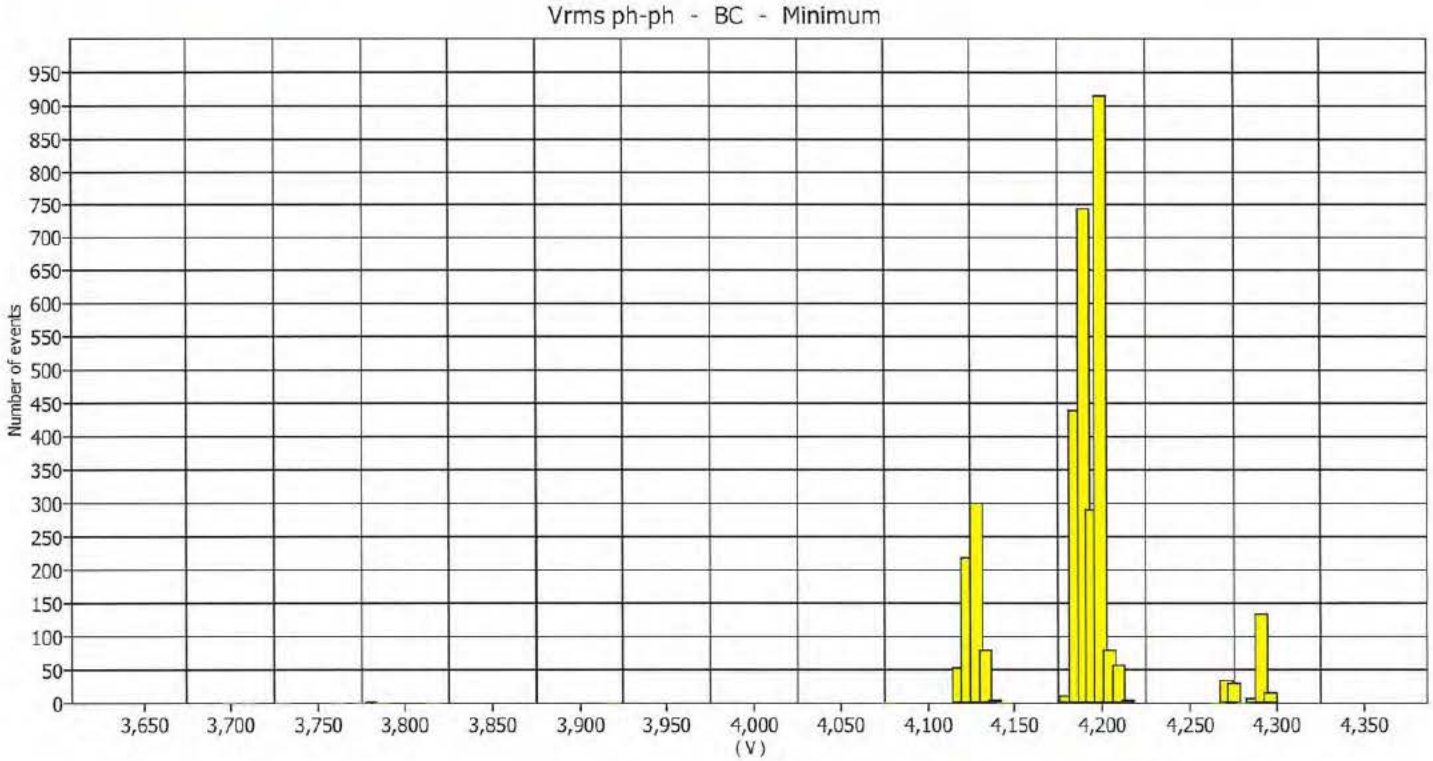
CONFIDENTIAL PROPRIETARY TRADE SECRET

FLUKE®

Statistics. From 7/15/2020 7:40:57 AM To 7/15/2020 8:09:33 AM

Report Date/Time: 7/15/2020 1:03:44 PM | Page 1

Filename: MEASUREMENT 16 -- SD Card



Summary

From	7/15/2020 7:40:57 AM	5% percentile	4124 V
To	7/15/2020 8:09:33 AM	95% percentile	4278 V
Maximum value	4297.3 V	% [85% - 110%]	0%
At	7/15/2020 7:41:57 AM	% [90% - 110%]	0 %
Minimum value	3698.8 V		
At	7/15/2020 7:53:01 AM		
μ (Avg)	4187.7 V		
s	44.511 V		

Upper extreme values

Date / Time	Value
7/15/2020 7:41:58 AM	4297.2998
7/15/2020 7:41:57 AM	4297.2998
7/15/2020 7:41:59 AM	4296.9502
7/15/2020 7:41:58 AM	4296.9502
7/15/2020 7:41:57 AM	4296.9502

Lower extreme values

Date / Time	Value
7/15/2020 7:53:01 AM	3698.8
7/15/2020 7:53:02 AM	3710
7/15/2020 7:53:02 AM	3730.6501
7/15/2020 7:53:03 AM	3760.75
7/15/2020 7:42:19 AM	3777.9001

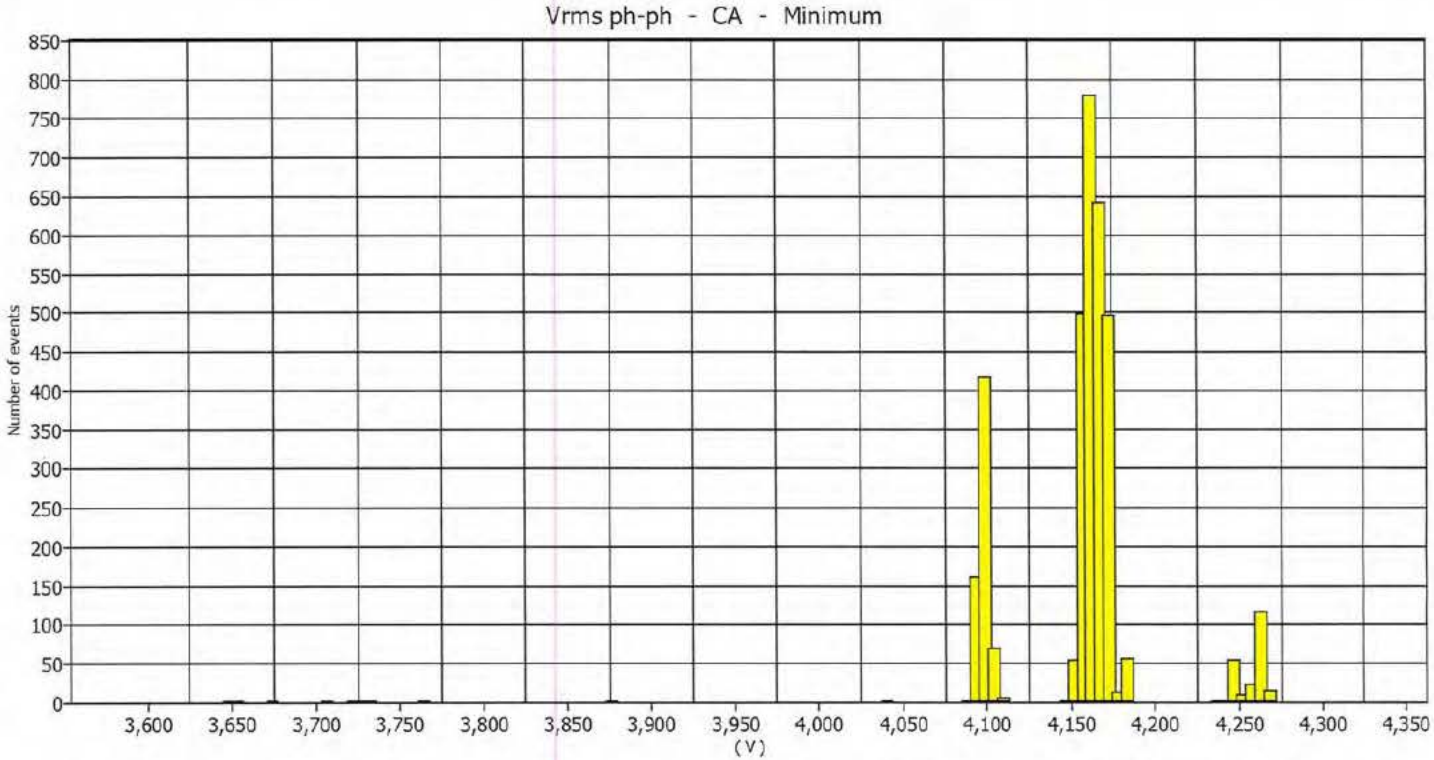
CONFIDENTIAL PROPRIETARY TRADE SECRET

FLUKE®

Statistics. From 7/15/2020 7:40:57 AM To 7/15/2020 8:09:33 AM

Report Date/Time: 7/15/2020 1:03:54 PM | Page 1

Filename: MEASUREMENT 16 -- SD Card



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7/15/2020 7:42:01 AM	4268.9502
7/15/2020 7:42:01 AM	4268.9502
7/15/2020 7:42:00 AM	4268.9502

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7/15/2020 7:53:02 AM	3679.55
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Electrical Certification Incorporated
*P.O. Box 53368 * Cincinnati, Ohio 45253*
*Office: (513) 662-7500 * Fax: (513) 662-6610*
*Cell: (513) 604-2431 * Email: ECInc@cinci.rr.com*

Report Summary 2020-400
Date: July 21, 2020

Bill Speier
Northern Kentucky Water Sewer District

Re: Northern Kentucky Water Sewer District – KCWW Ohio River Station
Subject: Record Motor Starting Parameters

Mr. Speier,

On July 5, 2020, Electrical Certification Incorporated installed load monitoring equipment to monitor the load being supplied by the local utility. Continuous monitoring of the load was performed utilizing a Fluke 435II Energy Analyzer.

All data was recorded and is enclosed for your review and records. The following is a discussion of our observations and comments.

Equipment List

4200V Rail Side
4200V River Side

Summary

Both T1 & T2 Transformers were connected to the same utility source for this testing.

River Side Substation:

Test #1:
No pumps running – start pump #4 (soft starter) – delay (10) mins. – start pump #6 (RVS auto transformer start). Only (1) transient event occurred.

07:42:15 Voltage dip on soft starter to 3726V
- Amp on soft starter 540. Approximately 3.75 seconds acceleration

07:53:01 Voltage dip on RVS to 3648V
- Amp on RVS 640. Approximately 2.5 seconds acceleration

Test #2:
No pumps running – start pump #6 (RVS auto transformer) – delay (10) mins. – start pump #5 (soft starter). (2) swells and (1) transient event occurred.

08:23:27 Voltage dip on RVS to 3715V
- Amp on RVS 570. Approximately 2.5 seconds acceleration

08:39:00 Voltage dip on soft starter 3671V
- Amp on soft starter 640. Approximately 3.75 seconds acceleration

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Report Summary #2020-400
Page #2

Electrical Certification Incorporated appreciates the opportunity to have provided this service. If you have any questions concerning this report, or have additional testing needs please call any time for prompt professional service.

Sincerely,

Jeffrey Jones
General Manager

Electrical Certification Incorporated
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Page #2

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Sincerely,

Jeffrey Jones
General Manager

Duke Energy Kentucky
Case No. 2021-00192
STAFF Second Set Data Requests
Date Received: December 27, 2021

STAFF-DR-02-003

REQUEST:

Refer to Duke Kentucky's responses to Staff's First Request, Item 2c.

a. Provide current cost estimates of the two substation solutions.

b. Explain why the voltage drops would still occur even if Duke Kentucky or NKWD constructed a new substation, and explain the extent to which, if any, Duke Kentucky would expect a new substation to mitigate the voltage drops.

RESPONSE:

a. Based on existing greenfield substation projects, it is estimated that the Substation and Transmission loop cost approximately $10 million. That estimate does NOT include the cost of a useable site to locate the substation, provided one can be located. Additionally, the estimate does not include costs for installation of distribution lines. All-in costs could be $13M- $20M depending on location and land acquisition. The circuit area lies between a hillside and the river where real estate prices are significant.

b. A new substation likely wouldn't shield all of the voltage fluctuation due to the amount of starting current.

PERSON RESPONSIBLE: Marc A. Bell

Duke Energy Kentucky
Case No. 2021-00192
STAFF Second Set Data Requests
Date Received: December 27, 2021

STAFF-DR-02-004

REQUEST:

Refer to Duke Kentucky's responses to Staff's First Request, Item 3.

a. State whether Duke Kentucky or NKWD will continue to tract voltage variations following an approval of the special contract.

b. If so, explain how Duke Kentucky will track voltage variations.

c. If not, explain why Duke Kentucky will not track voltage variations.

RESPONSE:

a. Duke Energy Kentucky will track NKWD's compliance with the terms of the contract to ensure that NKWD starts its pumps only between the hours of midnight and 4:00 am, except for emergency circumstances.

b. The contract Duke Energy Kentucky has initiated allows for the variations during daytime, controlled starts. Therefore, no additional monitoring is planned.

c. N/A

PERSON RESPONSIBLE: Marc Bell

Duke Energy Kentucky
Case No. 2021-00192
STAFF Second Set Data Requests
Date Received: December 27, 2021

STAFF-DR-02-005

REQUEST:

Refer to Duke Kentucky's responses to Staff's First Request, Item 4.

a. Explain in detail what "soft start controls" and "voltage compensation" refer to and how they would be implemented.

b. Provide the cost estimate of soft start controls and voltage compensation mitigation.

c. Confirm that either of these two solutions would completely alleviate the voltage drops of more than 4 percent on Wilder 46, and explain in detail if it cannot be confirmed.

RESPONSE:

a. "Soft start controls" are implemented by using reduced voltage motor starting which allows for the motor to come up to speed gradually resulting in less inrush current and less voltage drop. Reduced voltage motor starting technology must be installed by the customer and would be applied individually to each motor starting control.

Voltage compensation refers to a device that can detect and react to rapid voltage fluctuations and injects reactive power to compensate for excessive voltage drop. Voltage compensation technology must be installed by the customer and would be applied at each motor or on the primary supply to the motors.

b. Cost estimates would require detailed engineering analysis.

c. Reduced voltage motor starting can effective in reducing the motor starting voltage drop but require the motors be capable of starting with this method. Voltage compensation could more effectively reduce the motor starting voltage drop. Confirmation of elimination of voltage drop would be part of the engineering analysis.

PERSON RESPONSIBLE: Mike Simms

Duke Energy Kentucky
Case No. 2021-00192
STAFF Second Set Data Requests
Date Received: December 27, 2021

STAFF-DR-02-006

REQUEST:

Provide the highest voltage drop recorded since 2017 on Wilder 46 when NKWD starts its pumps.

RESPONSE:

Since 2017, the highest voltage drop that has been recorded is 8.8%.

PERSON RESPONSIBLE: Mike Simms

Duke Energy Kentucky
Case No. 2021-00192
STAFF Second Set Data Requests
Date Received: December 27, 2021

STAFF-DR-02-007

REQUEST:

Provide the typical voltage drop recorded on Wilder 46 when NKWD starts its pumps, and explain how Duke Kentucky determined the typical voltage drop.

RESPONSE:

The actual voltage drop associated with NKWD motor starts has been measured and documented to be between 6-8% depending on measurement location.

PERSON RESPONSIBLE: Mike Simms

Duke Energy Kentucky
Case No. 2021-00192
STAFF Second Set Data Requests
Date Received: December 27, 2021

STAFF-DR-02-008

REQUEST:

Provide the standard nominal voltage for Wilder 46.

RESPONSE:

12.47kV

PERSON RESPONSIBLE: Mike Simms

Duke Energy Kentucky
Case No. 2021-00192
STAFF Second Set Data Requests
Date Received: December 27, 2021

STAFF-DR-02-009

REQUEST:

State whether and, if so, how often NKWD's pumps result in variations in voltage that exceed 5 percent of the nominal voltage adopted for Wilder 46 in violation of 807 KAR 5:041, Section 6(2)(a), and explain each basis for Duke Kentucky's response.

RESPONSE:

Every NKWD motor start results in greater than 5% voltage drop from the voltage prior to starting. Each NKWD motor start creates a conflict with 807 KAR 5:041, Section 6(2)(c) exceeding a 4% drop in instantaneous voltage resulting in flickers in customers lighting. Data has been verified with measurements at customer premises.

PERSON RESPONSIBLE: Mike Simms

Duke Energy Kentucky
Case No. 2021-00192
STAFF Second Set Data Requests
Date Received: December 27, 2021

STAFF-DR-02-010

REQUEST:

State whether NKWD's pumps result in total variations of voltage from minimum to maximum that exceed 6 percent of the nominal voltage for Wilder 46 in violation of 807 KAR 5:041, Section 6(2)(a), and explain each basis for Duke Kentucky's response.

RESPONSE:

NKWD's motor starts are in conflict with 807 KAR 5:041, Section6(2)(c). The Company has measured the voltage variance during motor starts. See STAFF-DR-01-001 Confidential Attachment for an example of monitoring results.

PERSON RESPONSIBLE: Mike Simms

Duke Energy Kentucky
Case No. 2021-00192
STAFF Second Set Data Requests
Date Received: December 27, 2021

STAFF-DR-02-011

REQUEST:

State whether Duke Kentucky contends that the requirement in 807 KAR 5:041, Section 6(2)(a) that the total voltage from minimum to maximum shall not exceed 6 percent of the nominal voltage applies at all hours of the day or only between 5 p.m. and 11 p.m., and explain each basis for Duke Kentucky's contention.

RESPONSE:

Duke Kentucky does not make this contention. The Company is seeking necessary waivers as described in its application to enable the parties to operate under this contract. The Contract is consistent with 807 KAR 5:041 Section 6(2)((c), which states "where the utility distribution facilities supplying customers are reasonably adequate and of sufficient capacity to carry actual loads normally imposed, the utility may require that the starting and operating characteristics of equipment on customer premises shall not cause and instantaneous voltage drop of more than four (4) percent of standard voltage nor cause objectionable flicker in other customer's lights. It is the Company's understanding that Section 6(2)(a) applies to steady state supply voltage ranges, whereas the issues here is instantaneous voltage fluctuations that affect customer lighting. The Contract will shift the starts (except for emergency purposes) to hours that should minimally impact other customers, if at all.

PERSON RESPONSIBLE: Mike Simms

Duke Energy Kentucky
Case No. 2021-00192
STAFF Second Set Data Requests
Date Received: December 27, 2021

STAFF-DR-02-012

REQUEST:

State how often, if ever, Duke Kentucky has recorded voltage on Wilder 46 that exceeds the standard nominal voltage for that circuit by 2 percent or more in each year since 2017.

RESPONSE:

Duke Energy Kentucky's normal operating voltage range on Wilder 46 is +5% and -2.5%. The monitoring Duke Energy Kentucky maintains at the substation does not have the resolution to capture instantaneous voltage drops from motor starts. To investigate the light flickers that were occurring on the circuit, the Company installed temporary and specialized monitoring equipment. The last time the Company recorded the instantaneous voltage drops from NKWD motor starting was in 2017 when this more sensitive equipment was used. The Company properly characterized the motor starts and the system impact at that time as well as the customer impact. Each motor start will cause greater than 4% instantaneous voltage drop.

PERSON RESPONSIBLE: Mike Simms

Duke Energy Kentucky
Case No. 2021-00192
STAFF Second Set Data Requests
Date Received: December 27, 2021

STAFF-DR-02-013

REQUEST:

Identify each complaint Duke Kentucky has received since 2017 from any customer served by Wilder 46 other than NKWD regarding voltage variation issues by identifying the type of customer that made the complaint, the date of the complaint, a description of the complaint, and how the complaint was resolved.

RESPONSE:

Since 2017, there have been zero complaints related to voltage variation issues on Wilder 46.

PERSON RESPONSIBLE: Michelle Basch

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PSC ORDER/APPROVAL

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COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

ELECTRONIC APPLICATION OF DUKE ENERGY KENTUCKY, INC. FOR APPROVAL OF A SPECIAL CONTRACT AND FOR WAIVER OF 807 KAR 5:041, SECTION 6(2)(C)	))))	CASE NO. 2021-00192

O R D E R

On May 5, 2021, Duke Energy Kentucky (Duke Kentucky) filed an Application with the Commission for approval of a special contract and waiver of 807 KAR 5:041, Section 6(2)(c). Duke Kentucky responded to two requests for information from Commission Staff on August 27, 2021, and January 14, 2022. This matter is now before the Commission for a decision on the merits.

BACKGROUND

Duke Kentucky is a Kentucky corporation that provides, among other things, electric service for the public in Boone, Campbell, Grant, Kenton, and Pendleton counties, Kentucky.[1] Northern Kentucky Water District (NKWD) is a water utility and a customer of Duke Kentucky that operates a pumping station consisting of six 1,250 HP pumps in Duke Kentucky's electric service territory on Mary Ingles Highway in Ft. Thomas, Kentucky (Mary Ingles Pumping Station).[2]

Duke Kentucky serves the Mary Ingles Pumping Station from its Wilder 46 circuit, which is a 12.47 kV electric distribution circuit that also provides service to other

[1] Application 1–2.

[2] *Id.* at 2.

businesses and residences in the area.[3] NKWD currently takes service at the pumping station in accordance with Duke Kentucky's Commission-approved, Time-Of-Day Rate for Service at Distribution Voltage, Rate DT. Rate DT includes a summer on-peak demand charge of $14.05 per kW, a winter on-peak demand charge of $14.05 per kW, and an off-peak demand charge of $1.34 per kW; and a summer on-peak energy charge of $0.046825 per kWh, a winter on-peak energy charge of $0.044698 per kWh, and an off-peak energy charge of 0.038345 per kWh. The off-peak hours under Rate DT are 8 p.m. to 11 a.m. in the summer and 9 p.m. to 9 a.m. and 2 p.m. to 5 p.m. in the winter.[4]

NKWD primarily operates the pumps at the Mary Ingles Pumping Station during off-peak hours to manage its energy costs, which results in NKWD operating more pumps and starting pumps more frequently than it would if the pumps could be operated continuously, 24 hours a day.[5] Specifically, Duke Kentucky indicated that NKWD starts its pumps five to six times a day in the summer and 10 to 12 times a day in the winter to take advantage of the off-peak pricing and avoid the on-peak pricing.[6]

Duke Kentucky stated that when NKWD's pumps start that "they draw a large amount of power until they can reach normal operating levels."[7] This power draw results in a voltage drop when each pump is started that is generally in the range of

[3] *Id.*

[4] *Id.* at 2, Attachment 1.

[5] *Id.* at 2–3.

[6] Duke Kentucky's Response to Commission Staff's First Request for Information (Staff's First Request) (filed Aug. 27, 2021), Item 3.

[7] Application at 3.

6 to 8 percent.[8] Each pump start causes a voltage drop of greater than 5 percent.[9] The highest voltage drop that has been recorded is 8.8 percent.[10]

Duke Kentucky indicated that it became aware of the voltage drops on the Wilder 46 circuit in 2017 when it installed temporary and specialized monitoring equipment to investigate light flickers that were occurring for certain customers on the circuit.[11] Duke Kentucky contended that since discovering the issue it has been working with NKWD in good faith to find a solution to the voltage drops without adversely impacting NKWD's electric costs or necessitating significant capital investments or upgrades to NKWD's Mary Ingles Pumping Station or Duke Kentucky's distribution system.[12]

To mitigate the effects of pump starts at the Mary Ingles Pumping Station, Duke Kentucky and NKWD entered into the special contract for which Duke Kentucky requests approval in this matter (Agreement).[13] The Agreement modifies the amounts NKWD is charged under Rate DT for service at the Mary Ingles Pumping Station by establishing a customer charge of $138 per month, a fixed energy charge of $0.038016 per kWh, and a fixed demand charge of $3.38 per kW for all demand at 3,000 kW and below.[14] The Agreement requires NKWD to pay all other charges and charges for demand in excess 3,000 kW at the tariffed rate. The Agreement also prohibits NKWD, under normal

[8] *See id.*; *see also* Duke Kentucky's Response to Commission Staff's Second Request for Information (Staff's Second Request) (filed Jan. 14, 2022), Item 7.

[9] Duke Kentucky's Response to Staff's Second Request, Item 9.

[10] *Id.*, Item 8.

[11] *Id.*, Item 12.

[12] Application at 3.

[13] Application, Attachment 2 (Agreement).

[14] Agreement at 1–2, Exhibit A.

operating conditions, from starting more than two pumps at the Mary Ingles Pumping Station per day and from having more than 50 pump starts in any calendar month, and requires NKWD to complete all pump starts between the hours of 12 a.m. and 4 a.m.[15] The Agreement has an initial proposed term of five years from March 19, 2021, but the Agreement indicated that it would not become effective until approved by the Commission.[16]

Duke Kentucky contended that the Agreement will mitigate the adverse impacts caused by NKWD's pump starts by reducing the number of pump starts each day to two or three as opposed to the current five to six pump starts in the summer and 10 to 12 pump starts in the winter.[17] Duke Kentucky also noted that pump starts during normal operations will only occur between the hours of 12 a.m. and 4 a.m. when Duke Kentucky argues that any voltage drop will have minimal effect on other customers served by the Wilder 46 circuit.[18] However, Duke Kentucky acknowledged that scheduling changes allowed and required by the Agreement will not completely eliminate the voltage drops associated with NKWD's pump starts,[19] because the voltage drops will still occur with each pump start.[20]

[15] *Id.* at 2.

[16] *Id.* at 3.

[17] Duke Kentucky's Response to Staff's First Request, Item 3.

[18] *Id.*

[19] *See* Application at 5.

[20] *See* Duke Kentucky's Response to Staff's First Request, Item 9 (noting that each start results in a voltage drop greater than 5%).

Duke Kentucky indicated that it believes motor soft start controls or voltage compensation mitigation would be necessary to prevent the voltage drops caused by each pump start-up.[21] Duke Kentucky stated that soft start controls must be installed by the customer to each motor starting control and explained that they work by bringing the motor up to speed gradually, which thereby reduces the starting voltage for the equipment and the draw on the circuit.[22] Duke Kentucky explained that voltage compensation refers to a device that can detect and react to rapid voltage fluctuations and inject reactive power to compensate for the voltage drop and asserted that voltage compensation must be installed by the customer to each voltage motor or the primary supply for the motors.[23] Duke Kentucky indicated that a detailed engineering analysis would be necessary to estimate the cost of motor soft start controls or voltage compensation mitigation and to confirm that they would eliminate the voltage drops.[24] Duke Kentucky indicated that it has not explored those options for alleviating the voltage drops on the Wilder 46 circuit, because it contends it is ultimately NKWD's responsibility to address the matter in accordance with 807 KAR 5:041 Section 6(2)(c).[25] NKWD did provide information, through Duke Kentucky, indicating that it had installed soft starters on two pumps and that it "has budgeted $1,036,000 in its 5-year capital improvement budget to replace the other 4 existing motors starters with soft starters."[26]

[21] *Id.*, Item 4.

[22] Duke Kentucky's Response to Staff's Second Request, Item 5.

[23] *Id.*

[24] *Id.*

[25] Duke Kentucky's Response to Staff's First Request, Item 2(a).

[26] Duke Kentucky's Response to Staff's Second Request, Item 2.

Duke Kentucky indicated that it investigated modifications to its equipment to alleviate the voltage drops associated with the pump starts, including building a new substation and reconductoring the circuit.[27] Duke argued that building a new substation is not viable due to the lack of suitable land in the area and the projected cost, estimated to be between $13 million to $20 million, and that the new substation would not solve the voltage drop 100 percent of the time because of the size of the starting current.[28] Duke Kentucky stated that reconductoring is not a viable solution, because it would not correct the issue.[29]

Duke Kentucky specifically requested a deviation from 807 KAR 5:041, Section 6(2)(c). Duke Kentucky argued that the voltage variations caused by the pump starts are consistent with 807 KAR 5:041, Section 6(6), because they are in a limited area in and where NKWD conducts business.[30] Duke Kentucky also generally requested a deviation from 807 KAR 5:041 for pump starts made pursuant to the Agreement to the extent necessary.[31]

LEGAL STANDARDS

Each utility must file a copy of each special contract that establishes rates, charges, or conditions of service not contained in its tariff.[32] The Commission reviews

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[27] *Id.*

[28] Duke Kentucky's Response to Staff's First Request, Item 2(c); *see also* Duke Kentucky's Response to Staff's Second Request, Item 3(a) (indicating that a substation would likely cost $13 million to $20 million).

[29] Duke Kentucky's Response to Staff's First Request, Item 2(c).

[30] *Id.*

[31] Application at 5.

[32] 807 KAR 5:011, Section 13.

special contracts to determine whether they result in rates and conditions of service that are fair, just and reasonable pursuant to KRS 278.030(1) and whether they create unreasonable preferences or advantages prohibited by KRS 278.170(1).[33]

KRS 278.030(2) requires every utility to furnish adequate, efficient and reasonable service. To enforce that requirement, the Commission has adopted, among other things, regulations regarding the voltage that must be delivered by regulated electric utilities. Specifically, 807 KAR 5:041, Section 6(1) requires an electric utility to adopt a standard nominal voltage for its distribution system or for distinct portions thereof. Section 6(2) of that regulation then states, in relevant part, that:

> (2) Voltage at the customer's service entrance or connection shall be maintained as follows:
>
> (a) For service rendered primarily for lighting purposes, variation in voltage between 5 p.m. and 11 p.m. shall not be more than five (5) percent plus or minus the nominal voltage adopted, and total variation of voltage from minimum to maximum shall not exceed six (6) percent of the nominal voltage.
>
> (b) 1. For service rendered primarily for power purposes, voltage variation shall not at any time exceed ten (10) percent above or ten (10) percent below standard nominal voltage.
>
> . . .
>
> (c) Where utility distribution facilities supplying customers are reasonably adequate and of sufficient capacity to carry actual loads normally imposed, the utility may require that starting and operating characteristics of equipment on customer premises shall not cause an instantaneous voltage drop of more than four (4) percent of standard voltage nor cause objectionable flicker in other customer's lights.

[33] *See, e.g.* Case No. 2016-00287, *Petition of Kentucky Frontier Gas, LLC for a Declaratory Order* (Ky. PSC Dec. 14, 2016), final Order (finding that a rate in a special contract was unreasonable and violated KRS 278.170, because it required that the counterparty be charge a rate that was 95% lower than other customers).

Section 6(6) of 807 KAR 5:041 allows for "[g]reater variation of voltage than specified under [Section 6(2)] if in a limited or extended area in which customers are widely scattered or business done does not justify close voltage administrative regulation." However, Section 6(6) still requires "the best voltage administrative regulation shall be provided that is practicable under the circumstances." Section 22 of the regulation states that "[i]n special cases for good cause shown the commission may permit deviations from these rules."

DISCUSSION

Duke Kentucky and NKWD structured the rate changes in the Agreement with the intent of making them revenue[34] and cost neutral and that appears to be the likely result.[35] However, assuming the on-peak charges in Rate DT reflect the appropriate costs for demand and energy during those periods, NKWD would not be covering all of the fixed costs associated with its electricity use and demand at the rates established in the Agreement. Duke Kentucky justifies the reduced rate in the Agreement as a way for it and NKWD to avoid incurring significant costs that would otherwise be necessary to correct the voltage drops and would ultimately be passed on to other customers in Northern Kentucky through electric or water rates.

Special contracts with rates that are lower than those of tariffed rates have been approved in circumstances where the terms of the contract prevent a utility from losing

[34] Agreement at 1.

[35] The energy charge in the Agreement is similar to the off-peak tariffed rate under which NKWD currently takes its service at the pumping station. The demand charge in the Agreement is a little over twice that of the demand charge during the off-peak periods during which NKWD currently takes service under the tariff. However, the Agreement anticipates that NKWD will be able to reduce its demand by about 50 percent by operating half of its pumps for all or most of the day at the fixed rates such that the increase in the demand charge will largely be offset by a decrease in NKWD's peak demand.

significant load, which would shift fixed costs to other customers,[36] and in circumstances in which a customer agrees to limitations on its service that allow a utility to avoid costs that would otherwise be necessary to provide adequate service.[37] The Agreement here could potentially be construed as the later type of contract, because it places limits on the manner in which NKWD can take service to mitigate the voltage drops on the Wilder 46 circuit without requiring Duke Kentucky or NKWD to incur capital costs that may ultimately be passed along to other utility customers. The problem with Duke Kentucky's proposal is that the Agreement will not fully eliminate the issue with voltage drops on the Wilder 46 circuit and Duke Kentucky and NKWD have not fully investigated other potential solutions.

Duke Kentucky and NKWD recognized that the Agreement would not eliminate the voltage drops associated with pump starts, and therefore, made the Agreement contingent on Duke Kentucky receiving any necessary deviation from 807 KAR 5:041.[38] In its application, Duke Kentucky specifically requests a deviation from 807 KAR 5:041, Section 6(2)(c), but that subsection does not impose a limit on utilities. Rather, Section 6(2)(c), by its plain language, allows a utility to place limits on its customers' equipment, which, in turn, allows the utility to meet its obligations to limit variations at other customers

[36] *See* Case No. 2017-00035, *Filing of Special Industrial Contracts by Atmos Energy Corporation* (Ky. PSC Apr. 12, 2017), final Order (where a special contracts for large industrial customers were approved, in part, based on the unique competitive circumstances for the customers and a finding that the rates in the special contract would cover any variable costs associated with the customers service and a portion of the utility's fixed costs); *see also* Case No. 2001-00099, *SPIS.net v. BellSouth Telecommunications, Inc.* (Ky. PSC Dec. 19, 2002), Order at 6 ("We have, however, permitted non-telecommunications utilities to enter into lower-than-tariffed rate special contracts with customers who realistically could obtain service from another supplier.").

[37] Case No. 2010-00429, *Application of East Kentucky Power Cooperative, Inc. for the Approval of A Special Contract* (Ky. PSC Nov. 30, 2010), Order (where a special contract that permitted the utility, among other things, to curtail a portion of the customers' load to addressed reliability issues and additional costs arising from significant fluctuations in the customer's large load was approved).

[38] Agreement at 3.

connections as required by other provisions of 807 KAR 5:041, including Section 6(2)(a) and (b).

As indicated above, for service rendered primarily for lighting purposes, Section 6(2)(a) prohibits voltage drops at a customer's service connection from exceeding 5 percent of the nominal voltage during the hours of 5 p.m. to 11 p.m. and prohibits total variation in voltage from minimum to maximum from exceeding 6 percent of the nominal voltage. Duke Kentucky recorded voltage drops in the vicinity of the pump starts of 8.8 percent and indicated that voltage drops were generally in the range of 6 to 8 percent.[39] Those significant drops likely cause voltage drops at other customers service connections in excess of those permitted by Section 6(2)(a).[40]

The Agreement will move pump starts under normal operating conditions to between 12 a.m. and 4 a.m., and thereby, would eliminate any potential violations of the first part of Section 6(2)(a) for starts under normal conditions. The Agreement would also significantly reduce the number of voltage drops that occur each day by limiting the number of pump starts that can occur each day. However, pump starts under emergency conditions and for maintenance would likely violate both limitations in Section 6(2)(a) based on the size of the voltage drops caused by even a single pump start.[41] Moreover, the pump starts under normal operating conditions would also likely result in voltage variations in excess of those allowed by the second part of Section 6(2)(a), which prohibits total variations in voltage in excess of 6 percent, because that limitation is not limited in

[39] Duke Kentucky's Response to Staff's Second Request, Items 6 and 7; *see also* Duke Kentucky's Response to Staff's First Request, Item 1.

[40] *See* Duke Kentucky's Response to Staff's First Request, Item 1 (noting that voltage drops occurred at customers premises when Duke Kentucky conducted coordinated monitoring with pump starts).

[41] See *id.*

its applicability to the hours of 5 p.m. to 11 p.m.[42] Thus, Duke Kentucky would likely need a deviation from Section 6(2)(a) to implement the Agreement.[43]

Duke Kentucky argued that the limited area in which the voltage drops occur and the area in which the circuit is located justifies less regulation of the voltage pursuant to 807 KAR 5:041, Section 6(6). However, even if Duke Kentucky could establish that less voltage regulation is justified for other customers effected by the voltage drops on the Wilder 46 circuit, Section 6(6) still requires the best voltage regulation that is practical under the circumstances. While Duke Kentucky contended that NKWD is ultimately responsible for correcting the issue, Duke Kentucky acknowledged that there likely are projects that would eliminate or reduce the voltage drops, but neither Duke Kentucky nor NKWD have performed the engineering analysis necessary to determine the effectiveness or potential cost for the projects. Thus, the record does not currently support reducing the voltage regulation on the Wilder 46 circuit or in the area of the Mary Ingles Pumping Station indefinitely pursuant to Section 6(6).

The Commission does recognize that the pump starts present a complicated engineering problem and that Duke Kentucky and NKWD have been seeking to resolve it in the most cost effective means since it was discovered. Further, the Commission finds

[42] *See id.*

[43] Duke Kentucky did not address the applicability of Section 6(2)(a) in its application, and in response to questions in this matter, Duke Kentucky indicated that it did not believe Section 6(2)(a) applies to the voltage fluctuations caused by the pump starts, because they were instantaneous voltage fluctuations and Section 6(2)(a) applies to steady state supply voltage ranges. However, the language of Section 6(2)(a) does not indicate that the prohibitions on voltage variations therein are limited in the manner describe by Duke Kentucky. Moreover, the only relevant exceptions would not apply. *See* 807 KAR 5:041, Section 6(4)("The following shall not be considered a violation of this section: Voltage variations in excess of those caused by operation of power apparatus on customer premises which require large starting currents and *affect only the user of such apparatus*, by action of the elements and *infrequent and unavoidable* fluctuations of short duration *due to system operation*.") (emphasis added).

that the Agreement is a reasonable way to reduce the number of voltage drops associated with pump starts while Duke Kentucky and NKWD investigate all practical solutions to the voltage drops. Thus, the Commission will approve the Agreement for three years and will grant Duke Kentucky waivers from 807 KAR 5:041, Section 6(2)(a) and (c), to the extent necessary, for the same three-year period for any voltage variations arising from pump starts at the Mary Ingles Pumping Station made pursuant to the terms of the Agreement.

However, the Commission is approving the Agreement and granting the deviations to give Duke Kentucky and NKWD time to investigate potential solutions to the voltage drops. Further, while Duke Kentucky is ultimately responsible for ensuring customers do not experience excessive voltage drops,[44] the Commission notes that Duke Kentucky can seek to meet that responsibility by placing limits on the starting characteristics of other customers' equipment pursuant to 807 KAR 5:041, Section 6(2)(c), so both Duke Kentucky and NKWD have some responsibility in resolving this matter. Thus, the Commission finds that its approval of the Agreement and the deviations above must be subject to the conditions discussed below to ensure Duke Kentucky and NKWD continue to work to resolve the voltage drops to the extent possible.[45]

First, both Duke Kentucky and NKWD must investigate all potential solutions to the voltage drops, including conducting any engineering analysis necessary to determine the effectiveness and cost of motor soft start controls and voltage compensation mitigation. Second, within two years of the date of this Order, Duke Kentucky and NKWD must file a

[44] *See* 807 KAR 5:041, Section 6(2)(a), (b) and (d).

[45] This Order should not be construed as determining who is ultimately responsible for the voltage drops. The Commission is hopeful that Duke Kentucky and NKWD can continue to work together on this issue in good faith.

report, either jointly or separately, discussing potential solutions or combinations of solutions that were investigated, explaining whether the solutions are expected to be effective, detailing the expected cost of the solutions, and identifying the solution that Duke Kentucky and NKWD contend would be most practical and why. Third, Duke Kentucky must continue voltage monitoring on the Wilder 46 circuit pursuant to 807 KAR 5:041.

IT IS THEREFORE ORDERED that:

1. The Agreement is approved, subject to conditions established herein, effective as of the date of this Order for a period of 3 years from the entry of this Order.

2. Duke Kentucky's is granted a waiver of the requirements of 807 KAR 5:041, Section 6(2)(a) and (c) for any voltage variations arising from pump starts at the Mary Ingles Pumping Station made pursuant to the terms of the Agreement for a period of three years from the entry of this Order.

3. Within two years of the entry of this Order, Duke Kentucky and NKWD shall:

a. Investigate all potential solutions to the voltage drops, including conducting any engineering analysis necessary to determine the effectiveness and cost of motor soft start controls and voltage compensation mitigation, and

b. File a report, either jointly or separately, in this matter or in a new matter requesting an extension or modification of the Agreement and waivers granted herein, discussing each potential solution or combination of solutions that was investigated, explaining whether the solutions are expected to be effective, detailing the expected cost of the solutions, and identifying the solution that Duke Kentucky and NKWD contend would be most practical and why.

4. Duke Kentucky shall continue voltage monitoring on the Wilder 46 circuit pursuant to 807 KAR 5:041.

5. The Executive Director is directed to serve a copy of this Order on NKWD.

6. This matter is closed and removed from the Commission's docket.

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By the Commission

ATTEST:

_____
Executive Director

*Debbie Gates
Duke Energy Kentucky, Inc.
139 East Fourth Street
Cincinnati, OH 45201

*Duke Energy Kentucky, Inc.
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*Minna Sunderman
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*Rocco O D'Ascenzo
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139 East Fourth Street
Cincinnati, OH 45201

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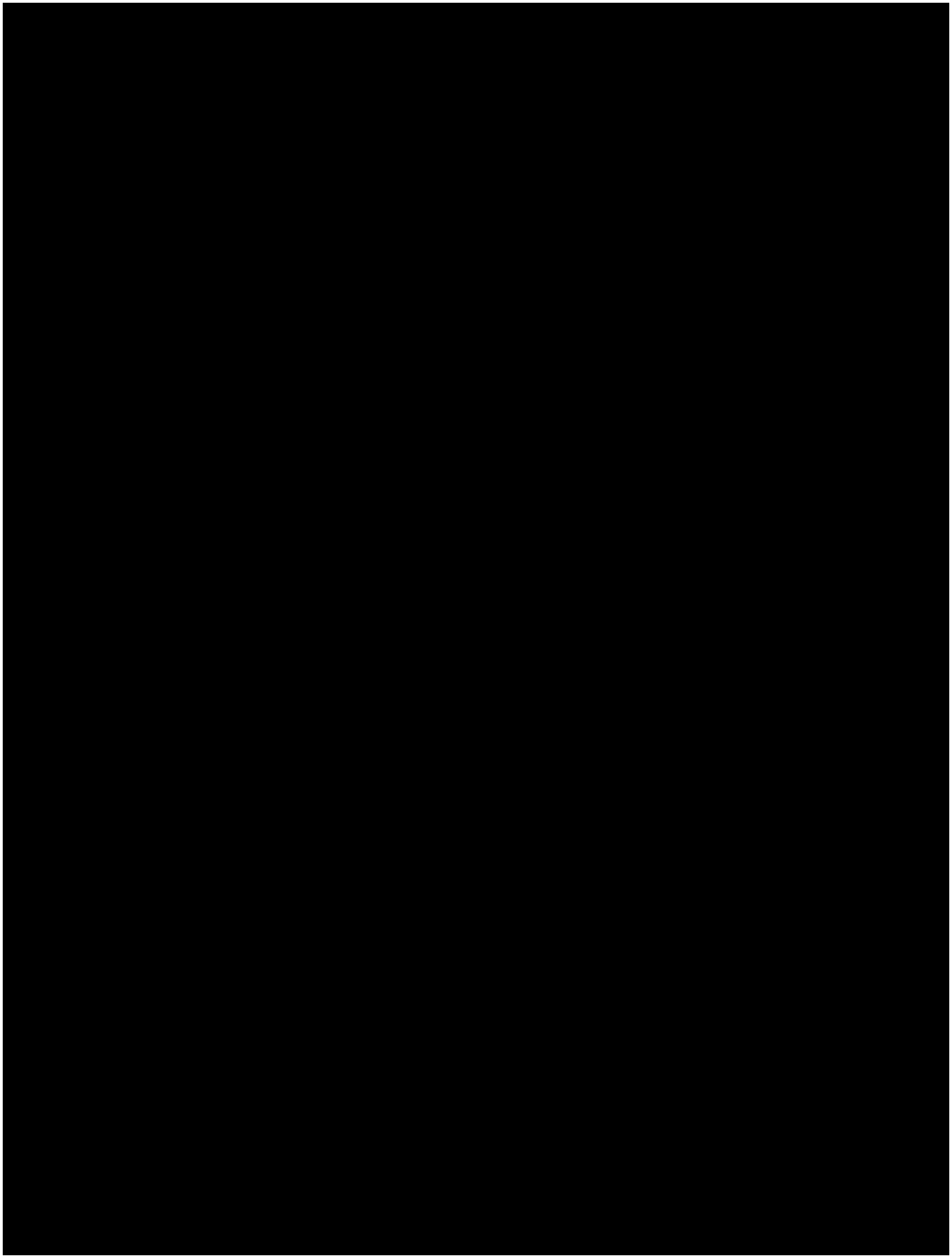

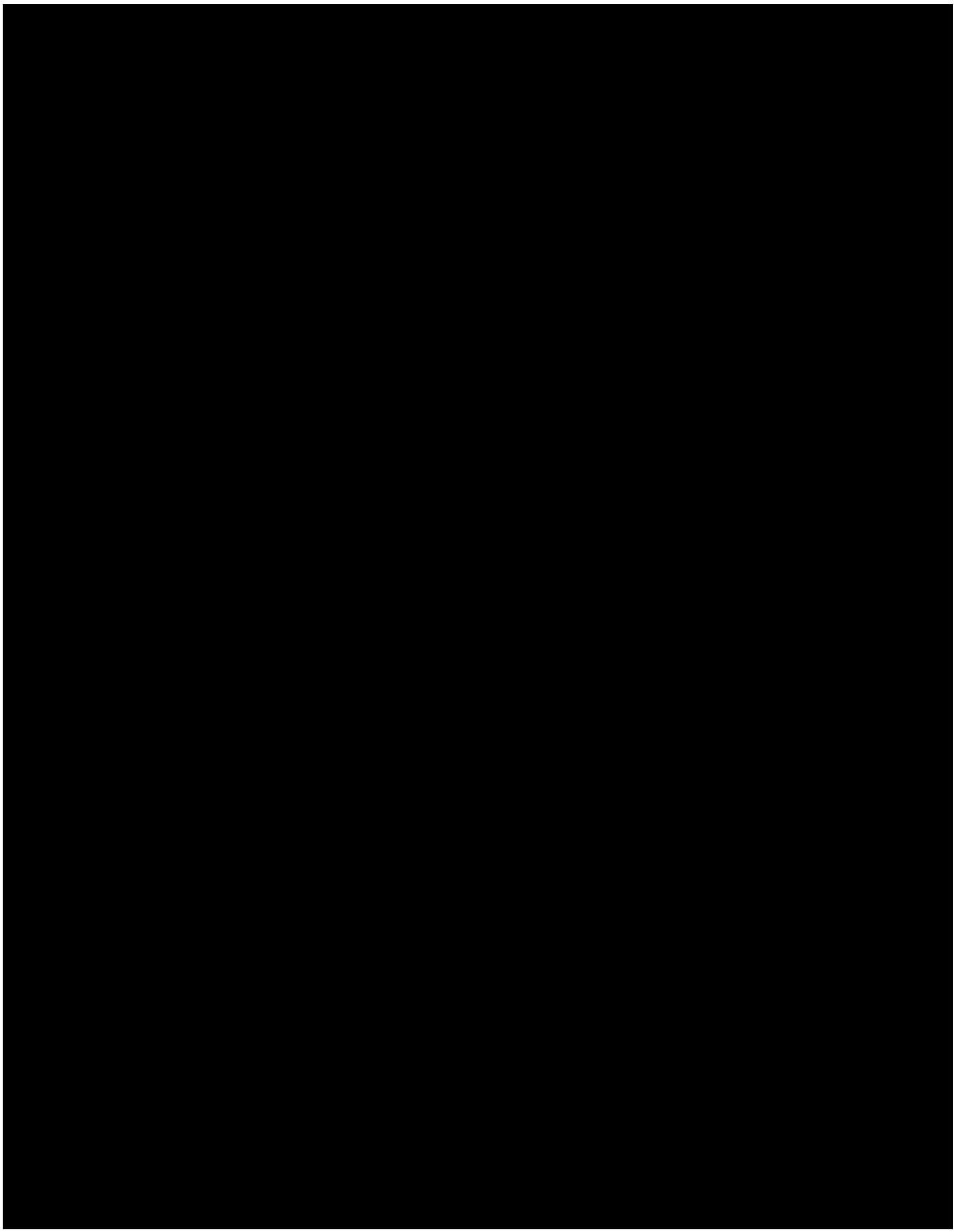

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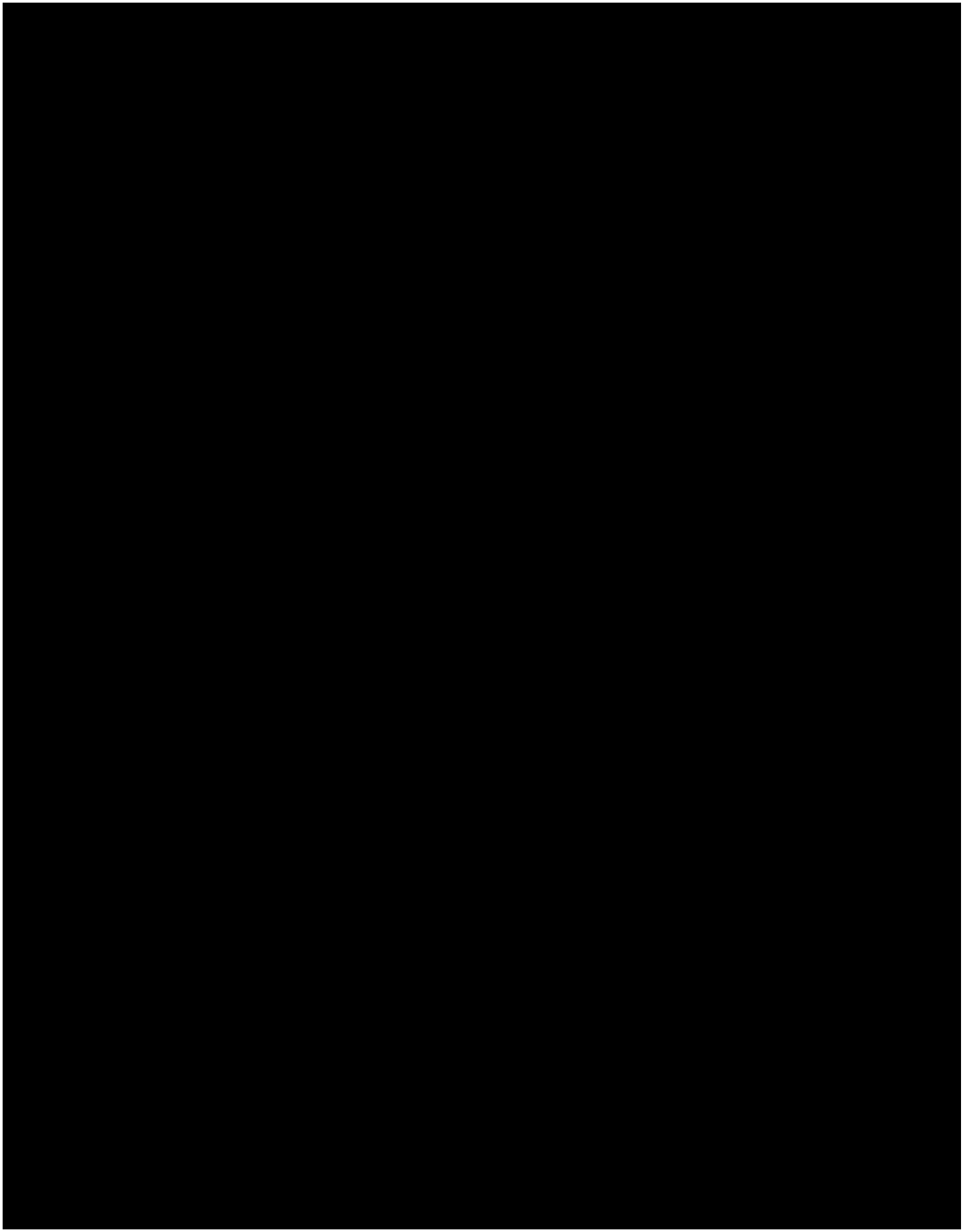

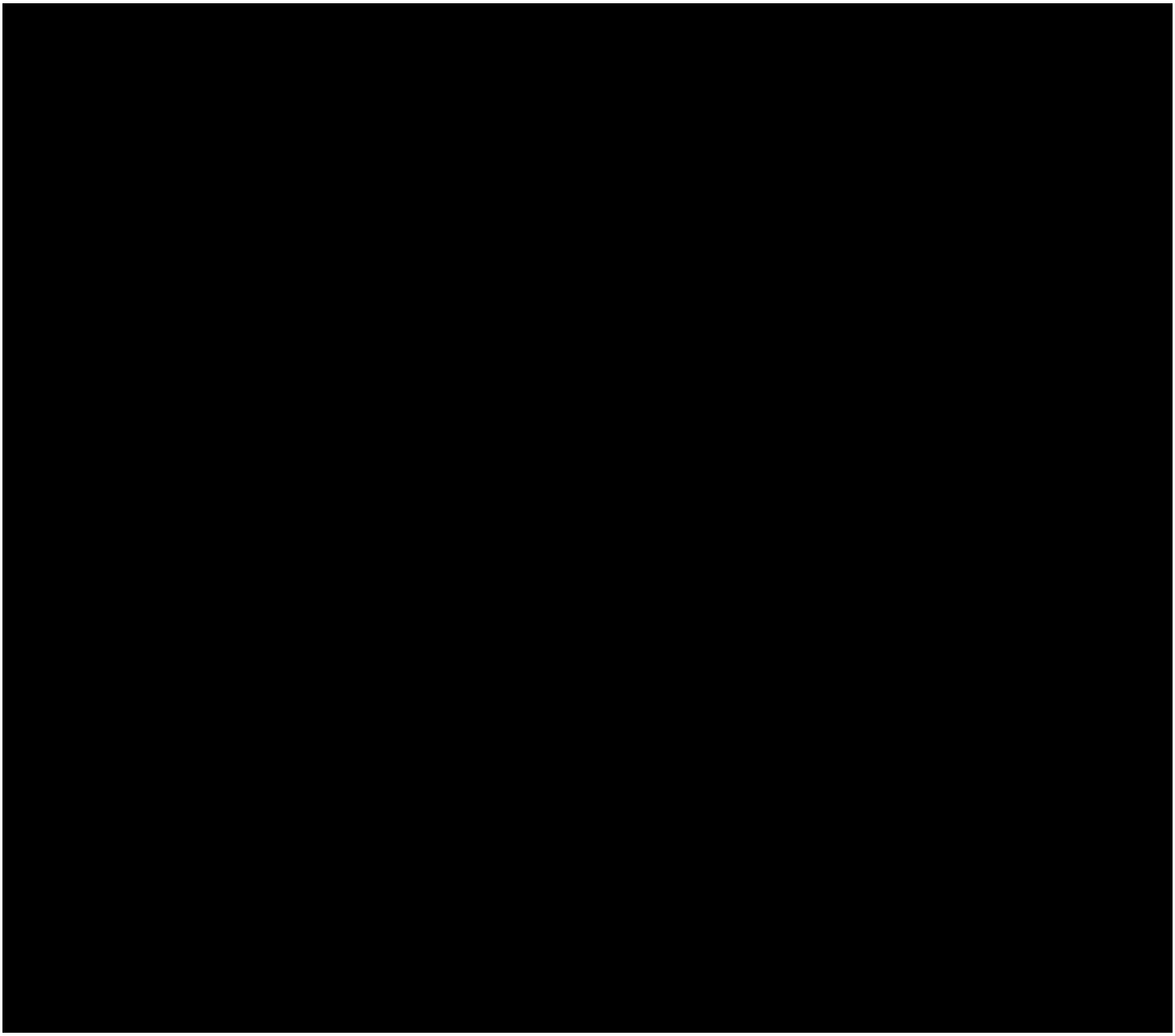

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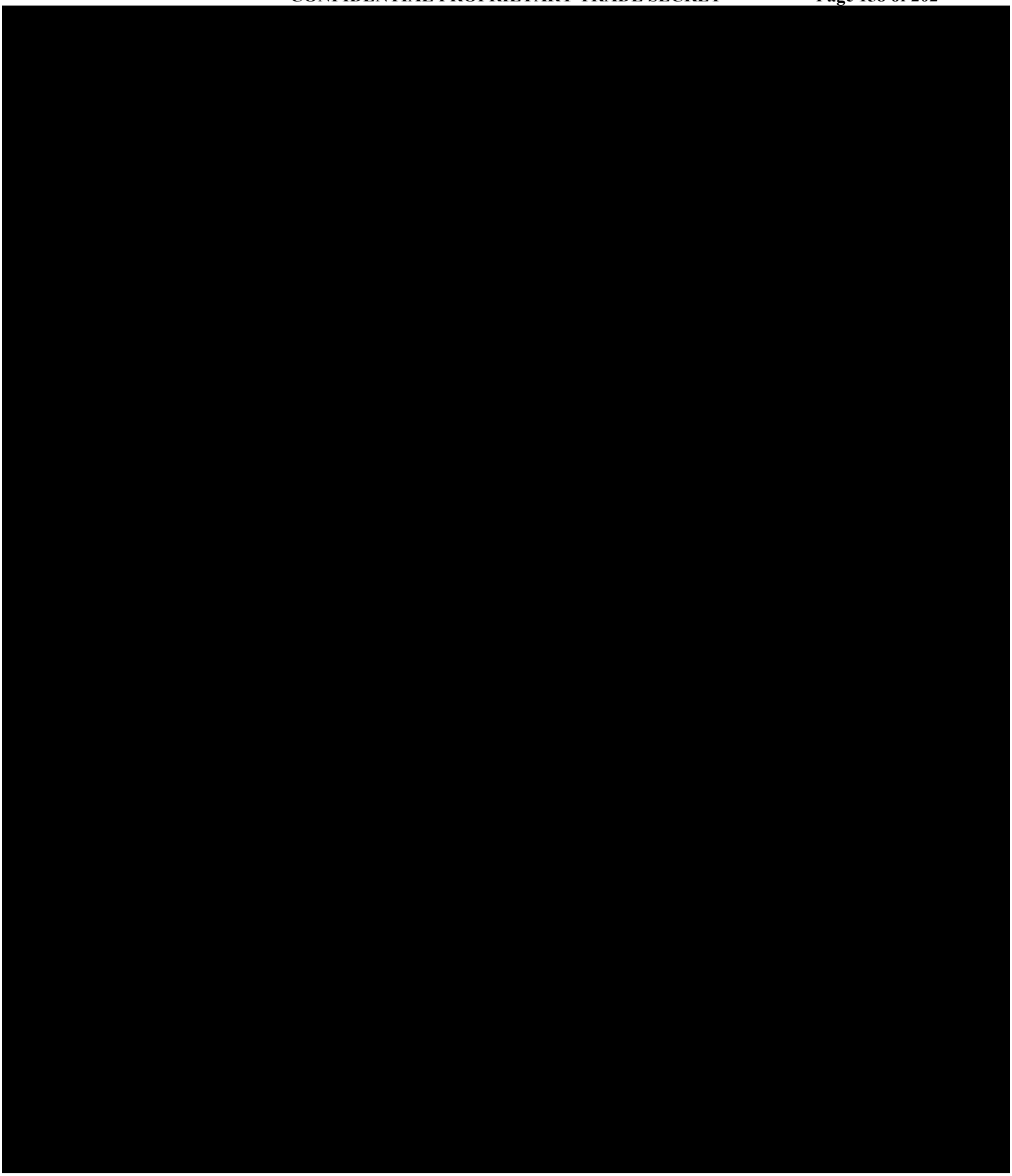

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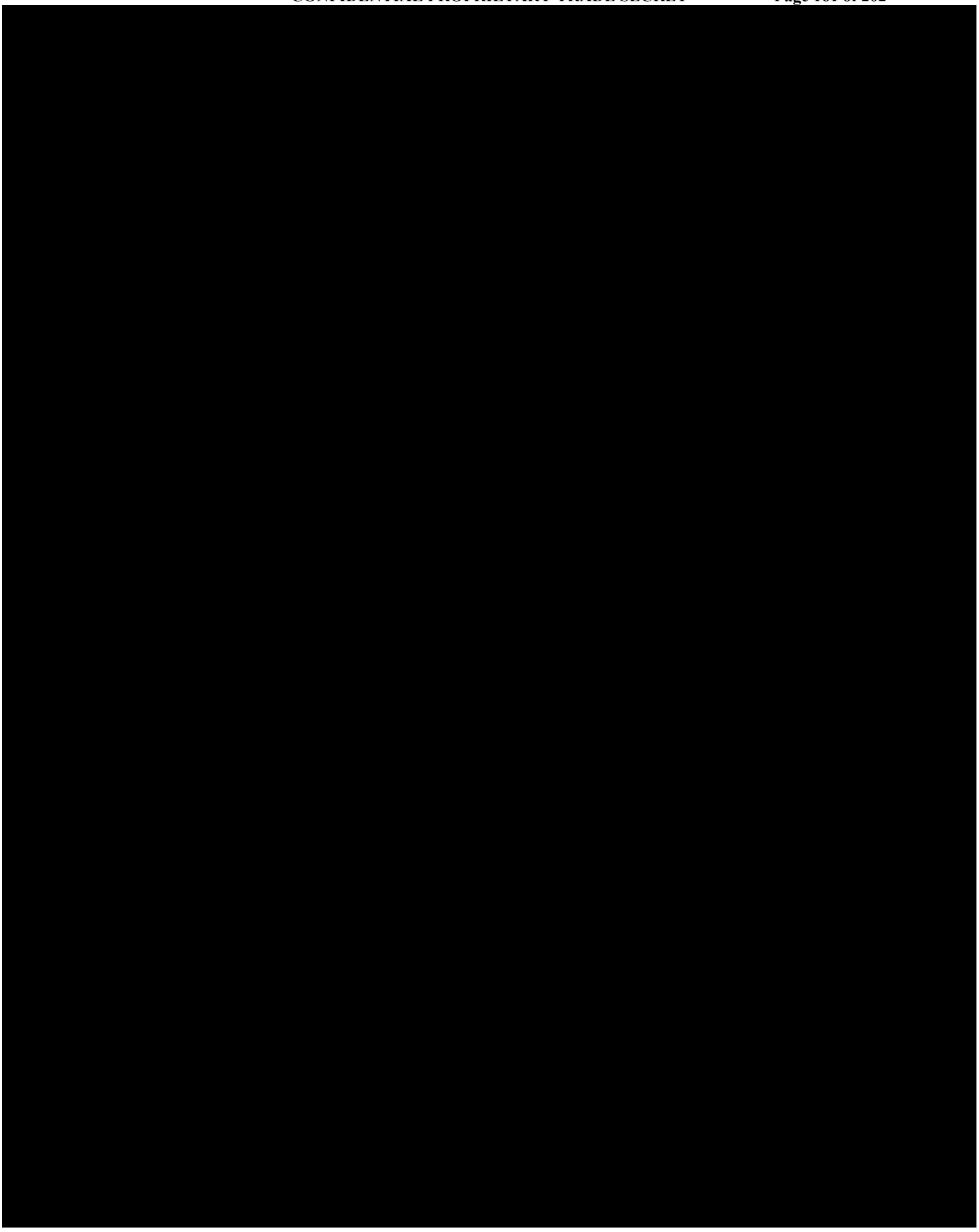

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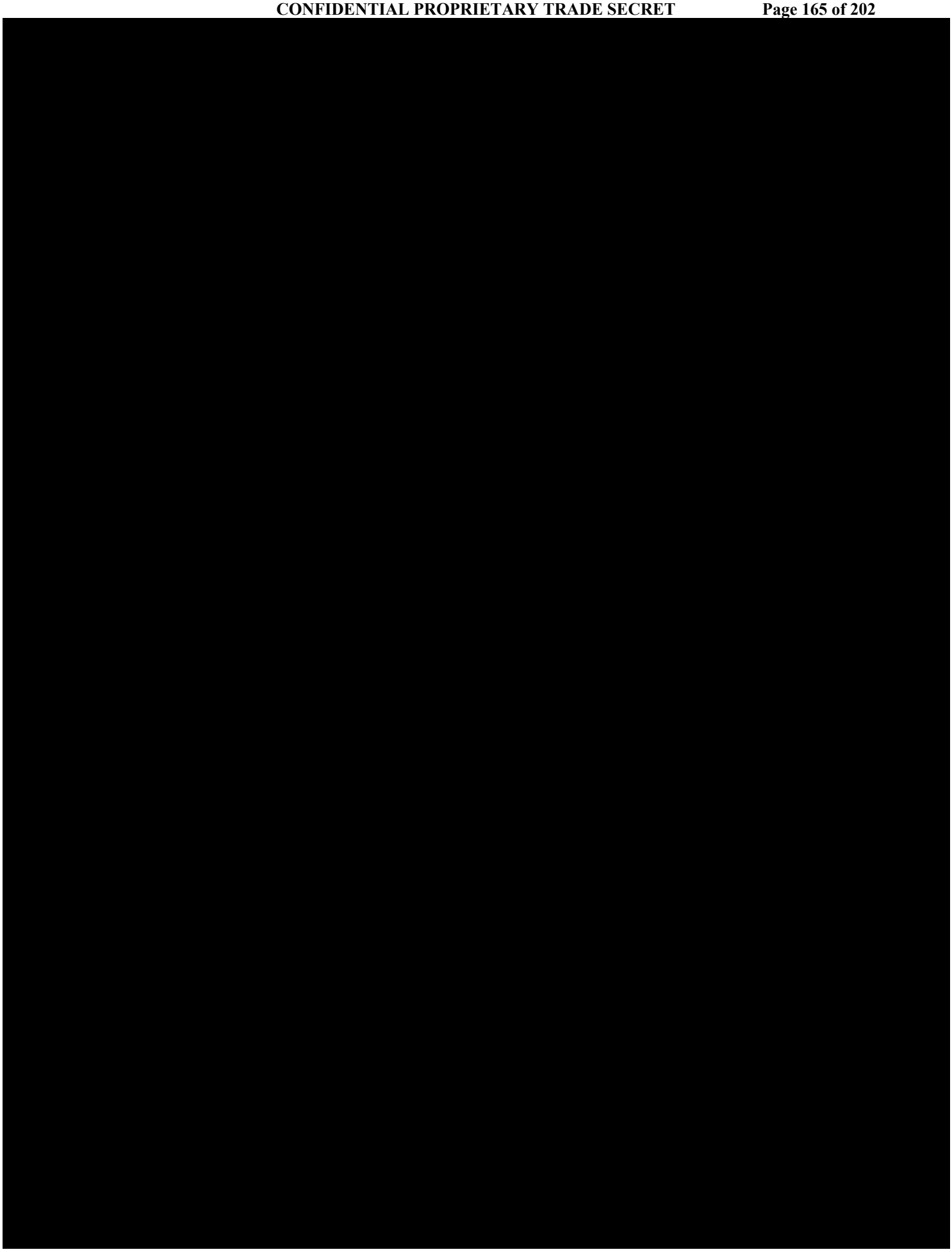

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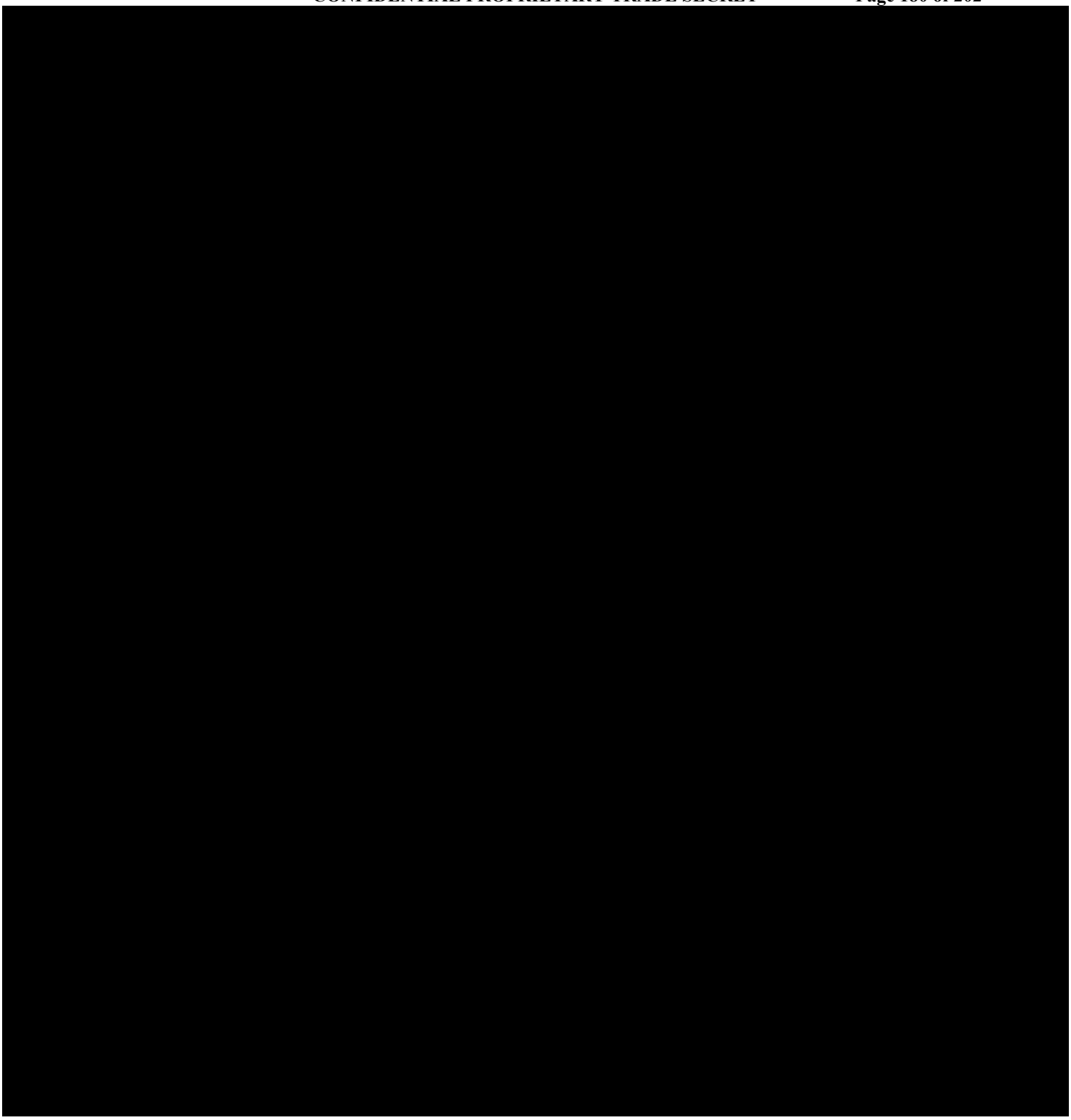

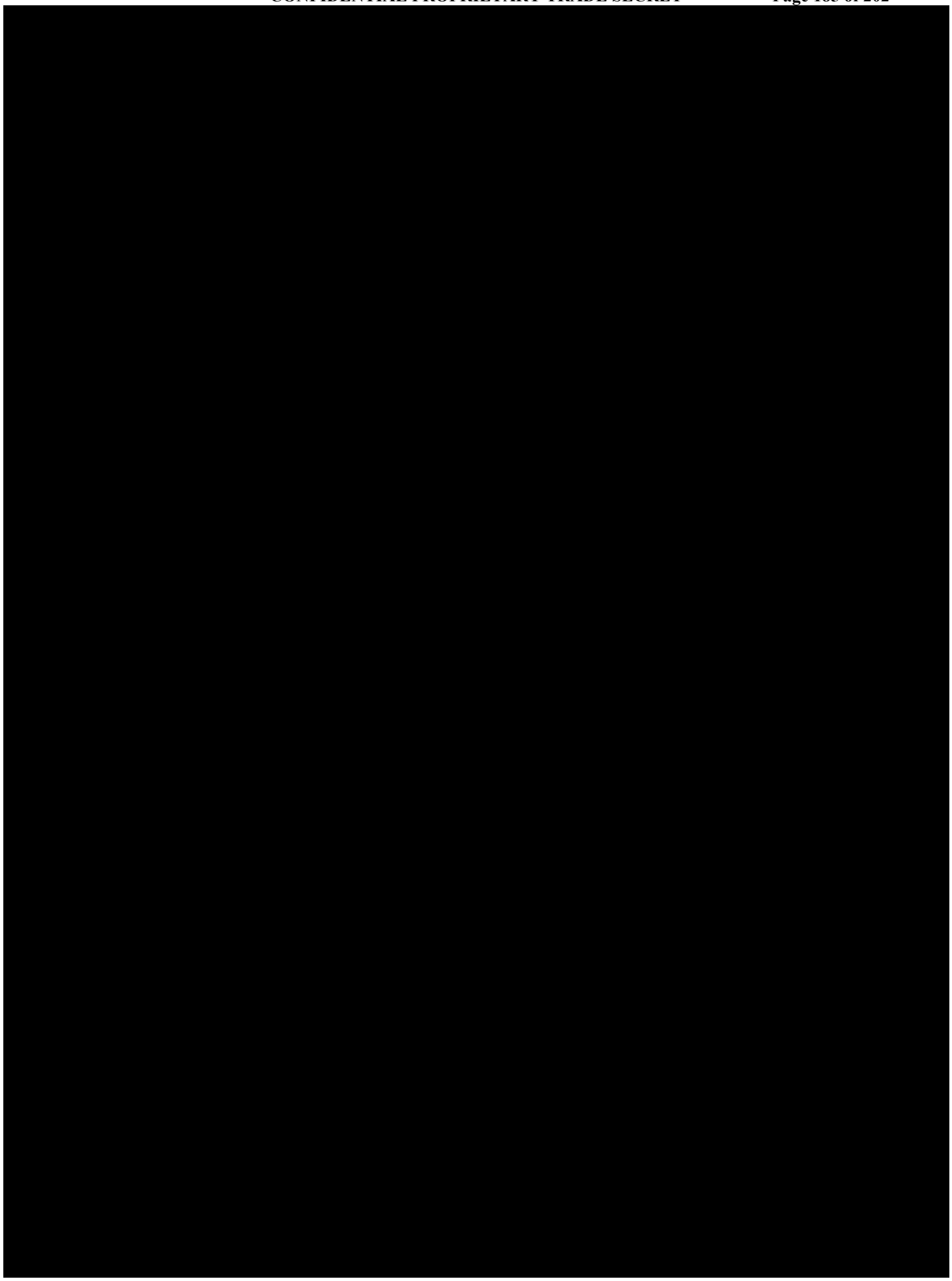

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CONFIDENTIAL ATTACHMENT 3

FILED UNDER SEAL