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Timothy S. Cragin Assistant General Counsel Legal Services - Regulatory

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July 5, 2018

By Hand Delivery Ms. Lora W. Johnson, CMC, LMMC Clerk of Council City Hall - Room 1E09 1300 Perdido Street New Orleans, LA 70112

> Re: Resolution Directing Entergy New Orleans, Inc. to Investigate and Remediate Electric Service Disruptions and Complaints and to Establish Minimum Electric Reliability Performance Standards and Financial Penalty Mechanisms – CNO Docket No. UD-17-04

Dear Ms. Johnson:

Please find enclosed for your further handling an original and three copies of Entergy New Orleans, LLC's ("ENO") Revised Reliability Plan with exhibits on CD, which is submitted pursuant to Council Resolution R-18-98 and is being filed in the above-referenced docket. Please file an original and two copies into the record and return a date-stamped copy to our courier.

Thank you for your assistance with this matter.

Sincerely,

Cragin Timothy A. Timothy S. Cragin

TSC\rdm

Enclosures

cc: Official Service List (UD-17-04 via electronic mail)



BEFORE THE

COUNCIL OF THE CITY OF NEW ORLEANS

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RESOLUTION DIRECTING ENTERGY NEW ORLEANS, INC. TO INVESTIGATE AND REMEDIATE ELECTRIC SERVICE DISRUPTIONS AND COMPLAINTS AND TO ESTABLISH MINIMUM ELECTRIC RELIABILITY PERFORMANCE STANDARDS AND FINANCIAL PENALTY MECHANISMS

DOCKET NO. UD-17-04

ENTERGY NEW ORLEANS, LLC'S REVISED RELIABILITY PLAN SUBMITTED PURSUANT TO COUNCIL RESOLUTION R-18-98

Entergy New Orleans, LLC ("ENO" or the "Company") respectfully submits this Revised Reliability Plan pursuant to Council Resolution R-18-98 (the "Resolution"). Specifically, Council Resolution R-18-98 directs ENO to modify the Reliability Plan for its distribution system that was previously submitted on November 10, 2017 ("Original Reliability Plan"), pursuant to Council Resolution R-17-427, and to submit a revised Reliability Plan ("Revised Reliability Plan") that includes, at a minimum:

- (1) A substantive evaluation and analysis of the root causes of the problems;
- (2) ENO's proposed technical and engineering approach to the remediation of the problems;
- (3) A time schedule for completion, including proposed construction budget and expenditures by fiscal quarter;
- (4) Priority and interim projects to quickly alleviate the most severe customer service quality problems; and
- (5) Such other analysis and information as may be required by the Council and its Advisors to evaluate the effectiveness of ENO's proposed plans.

This filing, together with previous filings with the Council that are attached or incorporated by reference, contains extensive data and information that addresses these areas.

I. Executive Summary

The utility industry as a whole is undergoing a period of tremendous change. In recent years, among other major changes, there have been significant technological advances that are allowing and requiring utilities to rethink how they address distribution reliability. At the same time, utilities' customers are becoming ever more reliant on electricity-driven technology to conduct their everyday work and leisure activities. So while many utilities are dealing with aging physical infrastructure, including their distribution systems, and operating the distribution system with dated outage management and data management systems, customers are expecting maximum reliability and instantaneous restoration when outages do occur. Like other utilities, ENO, too, is working to maintain and improve its aging distribution infrastructure, while simultaneously working to understand, assess, implement, and utilize the technological innovations that are becoming available to assist in getting closer to achieving the near-perfect reliability that customers demand and that ENO wants to deliver at an affordable cost.

ENO's Average Reliability Spending for 2016 through 2022 Is Expected to Be Approximately Three Times the Average Reliability Spending from 2013 through 2015; Average Vegetation Management Spending in 2017 through 2022 Expected to Be More Than Double the Average for 2013 through 2016

ENO's Revised Reliability Plan addresses the maintenance and improvement of its legacy distribution system, while also looking toward a future that includes Advanced Metering Infrastructure ("AMI") and Grid Modernization, including Smart Cities technologies. ENO's current plan with regard to the maintenance and improvement of its legacy distribution system involves, in addition to completing its Storm Hardening initiatives, implementing the eight reliability programs discussed in its Response to Council Resolution R-18-98, filed on June 6,

2018 and in its Original Reliability Plan. (A copy of the Original Reliability Plan and ENO's Response to Council Resolution R-18-98 ("Show Cause Response") are incorporated herein by reference.) That annual plan was developed through an analysis conducted in 2017 and is being adjusted as warranted during 2018. It is intended to address the most severe customer service quality problems that had occurred recently and those that might occur in the near future, while still allowing for flexibility to address new issues that might arise during the year. That plan encompasses reactive and proactive programs typical of those used throughout the utility industry. It also includes a substantial increase in annual reliability spending when compared to historical reliability spending as can be seen from the chart below:

Current Reliability Spending 2013-2017 and Estimated 2018-2022 (Capital and O&M, excluding Storm Hardening and Vegetation Management) (\$000s)

2013	2014	2015	2016	2017	2018E	2019E	2020E	2021E	2022E
\$3,727	\$2,989	\$2,699	\$3,363	\$7,330	\$9,410	\$10,447	\$10,948	\$10,995	\$10,742

Vegetation Management Spending 2013-2017 and Estimated 2018-2022 (\$000s)

2013	2014	2015	2016	2017	2018E	2019E	2020E	2021E	2022E
\$975	\$1,187	\$1,263	\$1,576	\$3,110	\$3,551	\$3,285	\$3,285	\$3,285	\$3,285

As shown above, this increased reliability spending is currently expected to continue at approximately the 2019 estimated level into the 2020 through 2022 timeframe. It should be noted that the chart above does not include the approximately \$10 million of Reliability Blitz spending that occurred in 2016 or the approximately \$30 million of Storm Hardening spending in 2017 and 2018.

In addition to the increased reliability spending, the plan is being conducted with an intense focus by a dedicated and motivated workforce of line supervisors, linemen, design

engineers, customer service representatives and many more who want to improve the distribution system and deliver top class distribution reliability to New Orleans in the coming years. Detailed reliability meetings are being held on a bi-weekly basis to review reliability results and discuss upcoming work, with additional ad hoc reliability discussions taking place daily as system circumstances warrant. Needless to say, managing distribution reliability for a city such as New Orleans is a dynamic process that involves both planning and flexibility to be able to address new issues as they arise.

<u>Year-to-date 2018 Customer Interruptions Decreased by Approximately 30% When</u> <u>Compared to Same Period in 2017; Customer Interruptions on Devices Worked</u> <u>During Reliability Blitz Down 64%</u>

The focus, dedication and hard work that is taking place under the current plan is beginning to show results. Customer interruptions through mid-year 2018 are approximately 30% below customer interruptions for the same period in 2017. See Exhibit 1 attached hereto. Similarly, customer interruptions on devices worked during the 2016 Reliability Blitz were down approximately 64% in 2017. ENO believes that continuing to work this plan with revisions each year based on most recent reliability experience will result in continued significant improvements to ENO's customers' distribution reliability. ENO will begin the work necessary to develop the specifics of its 2019 plan in the 3rd quarter of 2018. Additionally, ENO is presently seeking to retain the services of a nationally-recognized firm to consult with ENO's distribution reliability team and provide independent third party reliability expertise and a national perspective on reliability. While ENO firmly believes that a firm that advises multiple utilities around the country on reliability matters can provide unique insights or tools that may be able to make ENO's plan even more effective. ENO pledges to work with the Council, its

Technical and Legal Advisors, Intervenors (which include several neighborhood associations), and its independent third party reliability consultant to ensure that it addresses the distribution reliability issues in New Orleans and that the system continues to experience the significant improvements that have occurred year-to date in 2018.

<u>AMI Will Provide the Foundation for Grid Modernization, Which Will Lead to</u> <u>Improved Reliability</u>

As noted briefly above, in addition to working the reliability plan for the legacy distribution system, ENO, with the Council's recent approval, is embarking on AMI deployment, including conversion to new outage management and distribution management systems. See Council Resolution R-18-37 and corresponding Agreement in Principle. Additionally, ENO has recently received Council approval to deploy advanced meters approximately one year earlier than originally planned and is therefore expecting all AMI meters to be deployed by the end of 2020. See Council Resolution R-18-99. It is also expected that the new outage management system ("OMS") and distribution management systems ("DMS") will be in place by the end of 2019. With the new information and connectivity available through AMI, integrating the OMS and DMS is expected to enhance the Company's ability to identify the location and scope of outages more quickly and provide more detailed information to ENO about devices operating throughout the distribution network. These capabilities are expected to allow quicker and more accurate detection of service problems, improved outage and restoration communications with customers, and overall faster outage restoration. AMI will also provide the technological foundation for implementing grid modernization in New Orleans.

ENO's longer-term reliability planning and operations will be significantly enhanced and improved through the implementation of a comprehensive grid modernization initiative. To date, ENO has identified five specific grid modernization projects that are expected to be implemented beginning in 2018 and continuing through the first quarter 2022, and which ENO anticipates will result in significant decreases in customer interruptions for numerous areas of the distribution system. For details relating to these projects, see p. 12 of ENO's Grid Modernization and Smart Cities Report, filed with the Council on April 10, 2018, and attached hereto as Exhibit 2. These projects address five different areas serving almost 83,000 customers, involving deployment of over 500 smart devices at an estimated cost of approximately \$52 million, and are estimated to result in approximately 45,000 avoided customer interruptions, as well as estimated average System Average Interruption Duration Index ("SAIDI") and System Average Interruption Frequency Index ("SAIFI") reductions of approximately 54% and 51%, respectively, for the five project areas. The experience gained in developing and implementing these grid modernization projects will also enhance the planning process, which is presently underway, for additional grid modernization projects that should continue to improve customer reliability. A more detailed discussion of grid modernization, including the specific projects and the myriad of additional functionalities (beyond enhanced reliability) that grid modernization can enable, is being prepared for submission with ENO's base rate case that is due to be filed by July 31, 2018.

II. Substantive Evaluation of the Root Causes of Outages

In conjunction with its Show Cause Response, ENO provided very detailed outage and outage cause data for all outages from 2013 through the 1st quarter of 2018. See Show Cause Response, Exhibit TSP-3 to Direct Testimony of Tad S. Patella. When ENO linemen are working an outage, it is sometimes difficult, or even impossible, to determine the exact cause of an outage. The linemen do their best to determine the specific cause of the outage based on the system evidence available (*e.g.*, blown fuse, snapped conductor, broken crossarm, *etc.*) and other physical evidence at or near the location of the outage (*e.g.*, dead rat, squirrel, or snake on ground or in equipment, broken or burnt tree limb near conductor, *etc.*). After assessing the

circumstances of the outage, the linemen communicate the most likely cause of the outage to a system operator who enters that data in the distribution outage system. Of course, the main objective in working an outage is to get the power flowing back to customers as quickly as possible, without compromising the safety of ENO's employees.

Attached as Exhibit 3 is a Root Cause Analysis presentation that provides a bar graph showing the top 10 causes of power outages on the ENO distribution system since 2013 and the trend of these causes over that time period. Additionally, each of the top 20 outage causes is analyzed in a separate bar chart covering that same period and showing both number of outages and customer interruptions by cause. Each chart also includes a brief description of the typical root cause or causes of the specific type of outage. A discussion of the top 10 types of outages and their typical causes are also discussed below.

Lightning

Slide 1 of Exhibit 3 reflects that since 2013, lightning is the overall number one cause of distribution outages. It should be noted, however, that lightning-related outages decreased by approximately 35% in 2017 when compared to 2016, and at approximately the halfway mark in 2018 is only 36% of the outages in all of 2017, suggesting the possibility for a further decrease in 2018.

Lightning can affect the distribution system either through a direct strike to one of the electrical facilities (*e.g.*, pole, insulator, arrester, transformer, *etc.*) or through an indirect strike to an object near the electrical facilities (*e.g.*, tree, flagpole, *etc.*). A direct strike will severely damage the facility that is hit, whereas an indirect strike will typically cause a flashover on nearby distribution facilities. An indirect strike may damage distribution facilities that have insufficient Basic Insulation Level ("BIL") (*i.e.*, cannot withstand a lightning impulse).

ENO's technical and engineering approach to remediation of lightning outages involves increasing the BIL on distribution facilities, as explained in some detail in Exhibit 4, "ENO Remediation Plan for 2018 Devices," at slides 13 and 14. Additionally, ENO has implemented what it refers to as the R1 Strategy, which is part of its Reliability Champion Guidebook, a copy of which is attached as Exhibit 5. The R1 strategy is a strategic proactive approach to improving reliability every time a crew performs primary work by taking action to correct issues at that location known to cause outages or to lead to a higher probability of an outage, *e.g.*, by addressing components that are deteriorating even though not yet to the point of failure. The R1 strategy is outlined in detail at p. 4 of Exhibit 5, and specifically addresses ENO's approach to improving BIL of distribution facilities.

Equipment Failure – Transformer

The second highest cause of distribution outages over the 2013 to year-to-date 2018 timeframe was transformer failures. Although transformer failures decreased somewhat in 2017 when compared to 2016, at the halfway mark in 2018, transformer failures are approximately 60% of failures for all of 2017, suggesting a possible increase in transformer failures during 2018. A significant portion of this possible increase is attributable to the severe cold weather snap that occurred in early 2018. See Exhibit 3, Root Cause Analysis, Slide 5 showing 76 transformer failures in January 2018. When multiple customers connected to a single transformer increase their electric heating demand simultaneously, this can overload a transformer and cause it to fail. Based on month-to-month data, it appears that a significant number of transformer failures occurred during this cold weather period. There are many other reasons why a transformer may fail, including excess voltage due to lightning strikes, excess

current due to unusual load spikes, and external flashovers caused by lightning, animals or mechanical damage.

The technical and engineering approach to a failed transformer is simply to replace it with a new transformer. It is difficult to predict a transformer outage before it occurs and therefore transformers are typically replaced only when they have failed or have obviously been damaged.

Scheduled Interruptions

The third highest cause of distribution outages were scheduled interruptions. These outages involve purposeful disruption of service to allow ENO to safely perform necessary work on the distribution system or, in some cases, to allow customers to perform needed repairs on their portion of their electric service. These outages are required when the work to be performed cannot be done safely while the line is energized (*i.e.*, SELA project). Where possible, these outages are scheduled in a manner that minimizes the duration of the outage and the number of customers affected. Because of the nature of the outage, there is no technical or engineering approach to remediation of scheduled interruptions.

<u>Equipment Failure – Primary Conductor</u>

The fourth highest cause of distribution outages over the 2013 through year-to-date 2018 time period was primary conductor failures. There was an approximate 19% decrease in primary conductor failures in 2017 as compared to 2016, and at the halfway mark of 2018, primary conductors are approximately 43% of the total primary conductor failures in 2017. Primary conductors sometimes fail because they have become structurally weakened over time due to exposure to the elements and constant current. An overloaded conductor may sag to the point of structural failure. Additionally, mechanical damage to the conductor may occur due to prior

events (*e.g.*, storms, contact with trees, vehicles, *etc.*) and may lead to structural failure from deficiencies that were introduced but did not result in failure at the time of the incident. It is important to note that many of the outages in this category are single point issues that can remedied relatively quickly and safely with common repair materials. In other words, the entire conductor does not warrant replacement. Additionally, underground conductors may fail due to ampacity overload, deterioration in insulation, or damage from dig-ins by outside contractors.

The technical and engineering approach to primary conductor failure involves frequent vegetation management (*i.e.*, ENO has an aggressive two-year trimming cycle due to the limited trim width allowed by the City's Parks and Parkway regulations), the BIL strategy outlined in Exhibit 4, at slides 13 and 14, the R1 strategy outlined at p. 4 of the Reliability Champions Guidebook, at Exhibit 5, and identification and correction of potential issues through the Backbone program. Additionally, ENO will periodically perform strategic replacements of primary conductors deemed to be at risk of failure.

Equipment Failure – Secondary and Service Conductors

The fifth highest cause of distribution outages for the period reviewed was the failure of secondary and service conductors. There was an approximate 10% decrease in these failures in 2017 as compared to 2016, and at the halfway mark in 2018, such failures are at approximately 40% of 2017 failures. The causes of the failure of these conductors are similar to those that cause primary conductor failures and the technical and engineering approach to remediation is similar as well, except that service lines and secondary lines are not considered components of ENO's backbone, and accordingly are not a part of ENO's Backbone program.

<u>Equipment Failure – Crossarms</u>

The sixth highest cause of distribution outages for the period was failed crossarms. Outages due to crossarm failure decreased by approximately 17% in 2017 compared to 2016, and at the halfway mark in 2018 are approximately 39% of the 2017 total crossarm failures. Legacy crossarms are typically made of Douglas Fir and are treated with Pentachlorophenol as a wood preservative. New Orleans, with it heat, humidity, and periodically wet weather, is in the highest wood deterioration zone as defined by the NESC. Over time the wood preservative becomes less effective against fungal and insect decay, which can lead to failure in storms or on windy days or when other stresses are placed on the crossarms or the facilities attached to them.

ENO's technical and engineering approach to mitigate crossarm failures involves implementing the BIL strategy, the R1 reliability strategy (*i.e.*, changing out broken or fragile crossarms when encountered), and identifying potential crossarm failures through inspections in conjunction with the FOCUS and Backbone program and taking the necessary corrective action. Additionally, ENO is replacing wooden crossarms with crossarms made of a non-wood composite material, such as fiberglass, that is less susceptible to decay from exposure to the elements and insects.

Equipment Connector – Connector/Sleeve

The seventh highest cause of distribution outages over the period was failed connectors or sleeves. Connector-related outages from 2013 through 2016 averaged approximately 130 failures per year, but jumped up to 217 in 2017 and are at 105 at the halfway mark of 2018. Connection failures may be caused by deterioration over time due to wind vibration shaking the connections loose. Additionally, failure can result from loosening over time due to the expansion and contraction of metals over years or decades of service or from contamination defects that may be introduced during installation leading to corrosion over time.

ENO's technical and engineering approach to failed connectors is to repair them proactively when identified or to repair them after failure. For example, ENO uses infrared cameras to detect elevated temperatures at a particular point on the line (also known as "hot spots"), which could be a precursor to failure. ENO prioritizes findings from these inspections based on the severity of the elevated temperature reading, along with any visible deterioration, in order to proactively address potential issues from becoming outages. It is important to note that infrared inspections are not only part of the remediation plan to identify and address potential issues with connector/sleeves, but also other equipment such as disconnect switches, potheads on terminal poles (connections where feeders transition from overhead to underground and vice versa), wire jumpers, and switchgear components.

<u>Unknown Outage Cause</u>

The eighth highest cause of distribution outages is the "Unknown category." As discussed above, certain outages do not provide enough system or physical environment clues to determine the cause of the outage. Unknown outages increased by approximately 29% in 2017 compared to 2016, but so far in 2018 are only about 30% of the 2017 outages and 40% of 2016 unknown outages. It is not clear at this time the cause of the increase in unknown outage causes in 2017. Because the cause is unknown, it is not possible to devise a technical and engineering approach to remediation of such outages.

<u>Equipment Failure – Fuse Link</u>

The ninth highest cause of distribution outages for the relevant time period was identified as an equipment failure of a fuse link. Failures identifying the cause as fuse link failure increased very slightly in 2017 as compared to 2016, but such outages year-to-date in 2018 are approximately 37% of such failures in 2017. A fuse link is a replaceable element that is a portion of the fuse switch. The fuse link extinguishes due to higher than normal current transfers. This overcurrent protection device isolates faulted feeder branches and/or other equipment on the distribution system. Accordingly, a fuse link is meant to blow open when a fault occurs downstream and normal operation of a fuse link should not be considered or coded as an "equipment failure." ENO believes that some portion of the outages coded as a "fuse link equipment failure" are actually outages in which the fuse link operated properly to protect other equipment on the system and that the actual cause could be lightning, vegetation, windborne debris or animals. There are, however, certain instances in which fuse links can fail, such as miscoordination between other protection devices due to human error in sizing that may result in undesired fuse link operation, or deterioration of fuse barrels over time due to weather and/or contamination resulting in the inability of the fuse link to open when it should have.

Due to the nature of these outages, there is no technical or engineering approach to remediate the problems other than to ensure that outages are coded correctly.

<u>Vehicle Contact with Facilities – Public Inflicted Damage</u>

The tenth leading cause of outages over the time period is damage resulting from vehicular contact with electrical facilities. These outages increased slightly during 2017, as compared to 2016, and year-to-date outages attributable to this cause in 2018 are about 30% of 2017 outages. Vehicular damage to ENO's facilities is not a controllable outage, so there is no technical or engineering approach to remediate these outages (other than to repair the damage after it occurs). Each of these outages is unique, and the time needed to restore power safely depends on the nature and extent of the damages.

III. ENO's Technical and Engineering Approach to the Remediation of Reliability Issues and Identification of Priority Projects to Address Most Severe Customer Service Quality Issues

ENO's technical and engineering approach to remediation of reliability issues and its process for identifying priority projects is described in detail in Exhibit 4, "ENO Remediation Plan for 2018 Devices." This exhibit describes the FOCUS and Backbone programs and the inspection and design process that occurs prior to construction of the projects. Importantly, slides 27 and 33 demonstrate the effectiveness of the work performed in these programs by showing the low occurrence of multiple outages on these devices after being worked through the FOCUS or Backbone programs.

IV. Budget and Timeline for Project Completion

ENO typically budgets its reliability programs on an annual basis, with adjustments during the year as circumstances warrant. ENO, however, has prepared a spreadsheet, attached at Exhibit 1 that details the reliability projects worked in 2018 and scheduled to be worked in 2018 with estimated budgets and quarterly expenditures by project. Exhibit 1 also includes Storm Hardening projects worked in 2018 or scheduled to be worked in 2018 with estimated budgets and quarterly expenditures by project.

V. Conclusion

ENO has presented herein a reasonable short-term and long-term plan for addressing the reliability of its distribution system here in New Orleans, including increased reliability spending, root cause analyses, technical and engineering approaches to remediation and identification of priority projects based on ENO's algorithmic approach, and a spreadsheet detailing the projects identified and being worked with quarterly budgeted and actual costs. The data and information included herein and attached hereto, as well as the filings incorporated

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herein by reference, are highly detailed and complex and difficult to fully address in a narrative filing. ENO reiterates its request (made with the filing of its Original Reliability Plan in November 2017) to conduct a technical conference with the Council Advisors and other parties to discuss reliability issues, answer questions, and provide additional color around the reliability issues that ENO is working to address. ENO intends to contact the Advisors and the parties in an attempt to find a mutually agreeable date to hold such a technical conference.

Respectfully Submitted:

By:

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ATTORNEYS FOR ENTERGY NEW ORLEANS, LLC

CERTIFICATE OF SERVICE

Docket No. UD-17-04

I hereby certify that I have served the required number of copies of the foregoing report upon all other known parties of this proceeding, by the following: electronic mail, facsimile, overnight mail, hand delivery, and/or United States Postal Service, postage prepaid.

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New Orleans, Louisiana, this 5th day of July 2018.