STATE OF INDIANA

INDIANA UTILITY REGULATORY COMMISSION

PETITION OF DUKE ENERGY INDIANA, LLC PURSUANT TO IND. CODE §§ 8-1-2-42.7 AND 8-1-2-61, FOR (1) AUTHORITY TO MODIFY ITS RATES AND CHARGES FOR ELECTRIC UTILITY SERVICE THROUGH A STEP-IN OF NEW RATES AND CHARGES USING A FORECASTED TEST PERIOD; (2) APPROVAL OF NEW SCHEDULES OF RATES AND CHARGES, GENERAL RULES AND REGULATIONS, AND RIDERS; (3) APPROVAL OF A FEDERAL MANDATE CERTIFICATE UNDER IND. CODE § 8-1-8.4-1; (4) APPROVAL OF REVISED ELECTRIC DEPRECIATION RATES APPLICABLE TO ITS ELECTRIC PLANT IN SERVICE; (5) APPROVAL OF NECESSARY AND APPROPRIATE ACCOUNTING DEFERRAL RELIEF; AND (6) APPROVAL OF A REVENUE DECOUPLING MECHANISM FOR CERTAIN CUSTOMER CLASSES	)	**CAUSE NO. 45253**

VERIFIED DIRECT TESTIMONY
OF
CICELY M. HART

On Behalf of Petitioner,
DUKE ENERGY INDIANA, LLC

Petitioner's Exhibit 26

July 2, 2019

DIRECT TESTIMONY OF CICELY M. HART
VICE PRESIDENT – CUSTOMER DELIVERY ENGINEERING
DUKE ENERGY BUSINESS SERVICES LLC
ON BEHALF OF DUKE ENERGY INDIANA, LLC
BEFORE THE INDIANA UTILITY REGULATORY COMMISSION

I. INTRODUCTION

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Cicely M. Hart, and my business address is 1000 East Main Street, Plainfield, IN 46168.

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

A. I am employed as Vice President – Customer Delivery Engineering by Duke Energy Business Services LLC, a service company subsidiary of Duke Energy Corporation, and a non-utility affiliate of Duke Energy Indiana, LLC ("Duke Energy Indiana" or "Company").

Q. PLEASE BRIEFLY DESCRIBE YOUR EDUCATIONAL AND PROFESSIONAL BACKGROUND.

A. I received a Bachelor of Science Degree in Electrical Engineering from Purdue University and a Master's Degree in Business Administration from Indiana Wesleyan University. I began my career at Cinergy Corp. as a System Protection Engineer in 2001 and have held a variety of positions of increasing responsibility across Duke Energy in the areas of transmission and distribution engineering. I am a registered Professional Engineer in both Indiana and Ohio.

Q. PLEASE BRIEFLY DESCRIBE YOUR DUTIES AND RESPONSIBILITIES AS VICE PRESIDENT – CUSTOMER DELIVERY ENGINEERING.

A. My current responsibilities include distribution design engineering, reliability engineering, project management, and geospatial mapping services for the Customer Delivery organization of Duke Energy's Midwest service territory, supporting electric service to 1.7 million customers located in Indiana, Ohio, and Kentucky.

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

A. The purpose of my testimony is to provide an overview of Duke Energy Indiana's distribution system planning and expenditures. Specifically, I will present Duke Energy Indiana's distribution practices, which includes, forward looking capital and operations outlays, under which the Company is making significant investments to maintain and improve the reliability of its distribution system, to enhance public safety, and grid modernization projects. I also discuss the metrics Duke Energy Indiana uses to measure the reliability of its distribution system. In addition, I will discuss the new and expanded reliability programs Duke Energy Indiana has implemented. To execute the work involved with operating the Company's distribution system, I support the level of distribution capital expenses and operations and maintenance ("O&M") expenses during the historical base period from January 1, 2018 through December 31, 2018, and the projected level of distribution capital expenses and O&M expenses during the forward-looking test period of January 1, 2020 through December 31, 2020.

I will discuss the distribution portion of Duke Energy Indiana's Transmission Distribution and Storage System Improvement Charge ("TDSIC") plan, approved by the Commission in Cause No. 44720 ("TDSIC Plan"). I will discuss Duke Energy Indiana's storm costs and support the need for a storm reserve. Finally, I will discuss Duke Energy Indiana's Targeted Underground project and Self-Optimizing Grid initiative.

II. DISTRIBUTION SYSTEM CONDITIONS

Q. PLEASE PROVIDE AN OVERVIEW OF DUKE ENERGY INDIANA'S DISTRIBUTION SYSTEM.

A. The Duke Energy Indiana electric delivery system provides electric service to approximately 840,000 customers located within 69 out of Indiana's 92 counties. Duke Energy Indiana owns and operates all of its electric distribution facilities.

Duke Energy Indiana's electric delivery system includes 500 substations, 106 transmission substations (locations with 69 kilovolt ("kV") or higher operating voltages) having a combined capacity of approximately 22,983 megavolt-amperes ("MVA"), 394 distribution substations (locations that supply one or more circuits at 35 kV or lower voltage) having a combined capacity of approximately 9,411 MVA. There are 22,394 distribution circuit miles in

Indiana's service territory (20, 651 at 12.47kV, 733 at 13.8kV, 98 at 34.5kV (delta), 771 at 34.5kV (wye), and 140 at 4.16kV). The Duke Energy Indiana electric delivery system includes various other equipment and facilities, such as control rooms, computers, capacitors, street lights, meters and protective relays, and telecommunications equipment and facilities.

Q. HOW HAS THE DISTRIBUTION SYSTEM CHANGED SINCE DUKE ENERGY INDIANA'S LAST BASE RATE CASE?

A. The number of counties that Duke Energy Indiana services has not increased since the last base rate case, but economic development and residential housing growth has influenced the needs for more infrastructure including substation capacity and line capacity. The number of retail Duke Energy Indiana customers has grown from 733,201 in 2002 to 830,270 in 2018.

Table 1

Year	RES	COM	IND	OPA	SL	Retail
2002	641,394	86,603	3,556	112	1,536	733,201
2003	648,572	86,642	3,400	2,472	1,350	742,436
2004	649,717	84,866	2,897	9,169	880	747,529
2005	659,371	86,310	2,907	9,414	989	758,991
2006	665,227	87,575	2,884	9,445	1,097	766,228
2007	671,839	88,687	2,868	9,471	1,188	774,053
2008	673,432	89,552	2,845	9,587	1,263	776,679
2009	672,841	89,436	2,815	9,863	1,406	776,361
2010	677,590	89,555	2,790	10,122	1,458	781,514
2011	679,432	89,502	2,755	10,352	1,440	783,483
2012	683,603	89,861	2,736	10,295	1,438	787,931
2013	688,312	89,975	2,726	10,298	1,473	792,783
2014	693,098	90,125	2,708	10,236	1,514	797,681
2015	700,023	90,407	2,707	10,221	1,574	804,932
2016	707,873	90,696	2,724	10,181	1,616	813,089
2017	714,050	91,019	2,722	10,145	1,666	819,601
2018	724,302	91,476	2,721	10,063	1,708	830,270
Total	**12.9%**	**5.6%**	**-23.5%**	**8918.0%**	**11.2%**	**13.2%**
CAGR	**0.8%**	**0.3%**	**-1.7%**	**32.5%**	**0.7%**	**0.8%**

Customer growth continues throughout 2019. Table 2 depicts the number of retail customers at time of filing.

Table 2

Year	RES	COM	IND	OPA	SL	Retail
2019	732,943	91,617	2,704	10,063	1,739	839,066

Q. PLEASE GENERALLY DESCRIBE HOW THE ELECTRIC DISTRIBUTION INFRASTRUCTURE IS DESIGNED, CONSTRUCTED, MANAGED, AND OPERATED.

A. The electric distribution infrastructure is designed to receive bulk power at transmission voltages, reduce the voltage to 34.5 kV, 12.5 kV, or 4 kV, and deliver power to customers' premises. The distribution infrastructure generally consists of substation power transformers, switches, circuit breakers, wood pole lines, underground cables, distribution transformers, and associated equipment. The physical design of the distribution system is also generally governed by the National Electrical Safety Code ("NESC").

Duke Energy Indiana operates the distribution facilities it owns in accordance with good utility practice. Duke Energy Indiana continuously runs the system with a workforce that provides customer service 24 hours per day, 7 days per week, 365 days per year, and includes trouble response crews. The Company monitors outages with various systems, such as Supervisory Control and Data Acquisition (or "SCADA"), Distribution Outage Management System, and Electric Trouble Data Mart.

Q. PLEASE GENERALLY DESCRIBE HOW DUKE ENERGY INDIANA CURRENTLY MONITORS AND MAINTAINS ITS DISTRIBUTION INFRASTRUCTURE AND ITS PERFORMANCE.

A. Duke Energy Indiana maintains its distribution infrastructure in accordance with good utility practice by adhering to inspections, monitoring, testing, and periodic maintenance programs. Examples of these existing programs include, but are not limited to, the following: (1) substation inspection program; (2) line inspection program; (3) ground-line inspection and treatment program; (4) vegetation management program; (5) underground cable replacement program; (6) capacitor maintenance program; and (7) dissolved gas analysis.

III. RELIABILITY METRICS

Q. WHAT IS DUKE ENERGY INDIANA'S MAIN GOAL FOR ITS DISTRIBUTION SYSTEM?

A. The main goal of Duke Energy Indiana's distribution system is to provide safe, reliable, and affordable power to satisfy our customers' needs.

Q. HOW DOES THE COMPANY MEASURE THE RELIABILITY OF ITS DISTRIBUTION SYSTEM?

A. Duke Energy Indiana uses various reliability indices to measure the effectiveness of its maintenance programs and system reliability. The Company also uses various indices to measure the effectiveness of its maintenance programs and system reliability. Below are the key reliability indices for Duke Energy Indiana for the 12 months ending December 31, 2018. The electric reliability measures included in Table 3 include the most recent metrics that are submitted to the Commission on an annual basis.

Table 3

Duke Energy Indiana, LLC		
Electric Reliability Measure	Reporting Year (12 Months Ending: December 31, 2018)	
	Total	Without Major Events
SAIFI	1.45 Interruptions/Customer	1.06 Interruptions/Customer
SAIDI	366.0 Minutes/Customer	156.2 Minutes/Customer
CAIDI	252.9 Minutes/Interruption	148.0 Minutes/Interruption
CEMI 6	N/A	1.37% of Customers

Q. PLEASE EXPLAIN THE VARIOUS RELIABILITY INDICES DUKE ENERGY INDIANA USES.

A. Reliability indices are generally recognized standards for measuring the number, scope, and duration of outages. These indices are defined as follows:

- System Average Interruption Duration Index ("SAIDI") is the average time each customer is interrupted and is expressed by the sum of customer interruption durations divided by the total number of customers served.
- System Average Interruption Frequency Index ("SAIFI") is the system average frequency index and represents the average number of interruptions per customer. SAIFI is expressed by the total number of customer interruptions divided by the total number of customers served.
- Customer Average Interruption Duration Index ("CAIDI") is the average interruption duration or average time to restore service per interrupted customer and is expressed by the sum of the customer interruption durations divided by the total number of customer interruptions.

- Customers Experiencing Multiple Interruptions 6 ("CEMI 6") is the percentage of customers that experienced 6 or more outages over the course of the last 12 months.

Q. ARE THERE ANY CHALLENGES WITH THESE INDICES? IF YES, PLEASE EXPLAIN.

A. Yes. For example, CAIDI is a measure of how long an average interruption lasts. CAIDI can be lowered by reducing the length of interruptions, but can also be lowered by increasing the proportion of shorter-than-average interruptions. As such, a reduction in CAIDI does not necessarily reflect an improvement in reliability; if SAIFI and SAIDI are both going down, but SAIFI is going down faster than SAIDI, CAIDI will go up even though reliability is getting better. In other words, CAIDI can move both up or down, regardless of reliability improving or degrading.

Q. WHAT EFFORTS HAS DUKE ENERGY INDIANA UNDERTAKEN TO IMPACT CUSTOMER RELIABILITY?

A. Overall, the Duke Energy Indiana grid is reliable and well-maintained. While the Company has worked hard to maintain the system to reliably meet the needs of customers, more must be done to improve the state's energy infrastructure and enhance the customer's energy experience. Duke Energy Indiana has a dedicated team supporting activities to improve customer reliability. Engineers proactively identify equipment that can improve reliability on the system and make recommendations for investments, based on their assessments. Other team members review outages that meet a certain threshold and inspect the distribution lines and recommend reliability improvement projects, such as Targeted Undergrounding. The planning group identifies automation, such as Self-Optimizing Grid, that can be installed on distribution lines to provide backup power sources and isolate issues in the event of power loss from one source. The Targeted Undergrounding and Self-Optimizing Grid programs are explained in further detail, later in my testimony.

Q. WHAT ARE THE PRIMARY CAUSES OF DISTRIBUTION OUTAGES IN DUKE ENERGY INDIANA'S SERVICE TERRITORY?

A. Over the last four years, the three major causes of outages have been vegetation related outages, equipment failure, and planned outages to perform system upgrades. For example, in 2018, 28.63% of all distribution outages were related to vegetation and 21.58% to equipment failure.

Table 4

Outage Cause	% of Total Number of Outages Excluding Planned Outages & MEDs			
	2015	2016	2017	2018
Vegetation	23.19%	24.14%	27.99%	28.63%
Wildlife	12.97%	9.06%	10.92%	9.80%
Public Accident/Damage	8.47%	8.07%	8.70%	7.38%
Unknown Cause	11.02%	11.92%	11.14%	11.37%
Lightning Strike	4.70%	4.79%	5.12%	3.83%
Equipment Failure	22.93%	20.29%	20.59%	21.58%
Other Cause	8.16%	8.73%	8.48%	11.40%
Loss of Transmission/Generation	3.79%	5.75%	1.51%	1.45%
Weather	4.78%	7.24%	5.54%	4.57%

Q. DOES DUKE ENERGY INDIANA TRACK CUSTOMER OUTAGE SATISFACTION?

A. Yes. A key driver of satisfaction in Indiana is the outage restoration experience. Outage net satisfaction demonstrates a year over year increase. From 2018 to 2019, the average time to restore an outage in Indiana has improved from 124 minutes to 73 minutes.

The number of outage information points provided via proactive SMS text and the Company's new Outage Maps (including Crew Status, estimated time of restoration ("ETR") and Cause code rates) are up, signaling the Company's field crews' continuous improvement and dedication to keeping customers informed. These increases in satisfaction highlight how key investments the

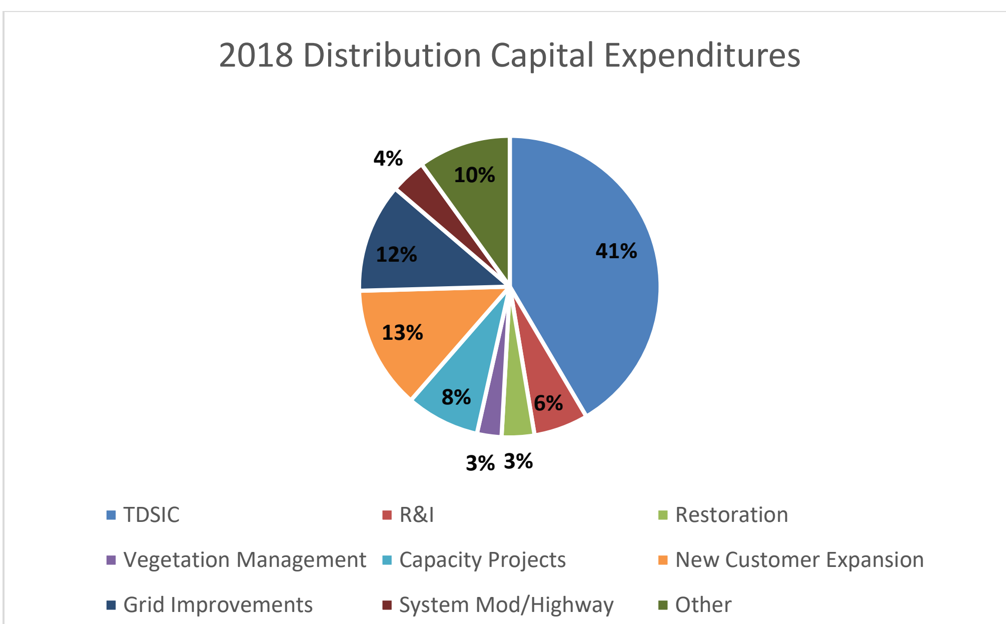
Company has made in its customer digital channels (like proactive outage alert SMS text and new outage maps, for example) are supporting our customers' desire for more and faster communication.

IV. DISTRIBUTION EXPENDITURES

Q. WHAT IS DUKE ENERGY INDIANA'S AMOUNT OF DISTRIBUTION EXPENSE IN 2018?

A. Total distribution Operations and Maintenance ("O&M") expenditure in 2018 was $117 million. Total capital expenditures in the distribution system totaled $342 million in 2018, including $142 million in TDSIC expenditures. The figure below provides a breakdown of Duke Energy Indiana's 2018 distribution related capital expenditures.

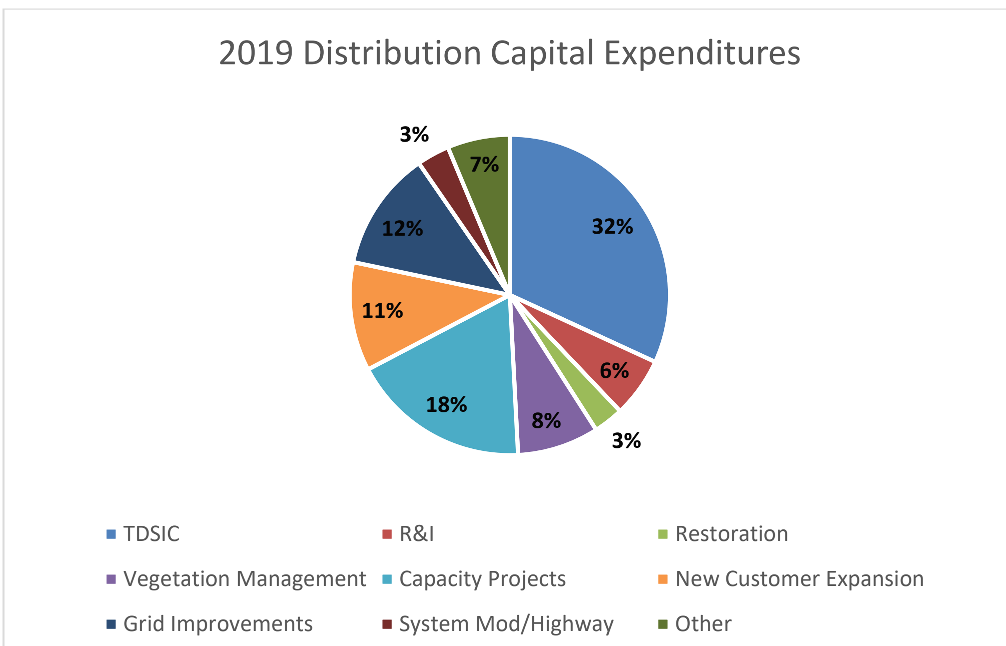
Chart 1



Q. WHAT IS DUKE ENERGY INDIANA'S FORECASTED AMOUNT OF DISTRIBUTION EXPENSE IN 2019?

A. Duke Energy Indiana forecasts $92 million in O&M distribution expense in 2019. Total capital investment in the distribution system is projected at $363 million in 2019, including $116 million in TDSIC expenditures. The figure below provides a breakdown of Duke Energy Indiana's 2019 distribution related capital expenditures.

<u>Chart 2</u>

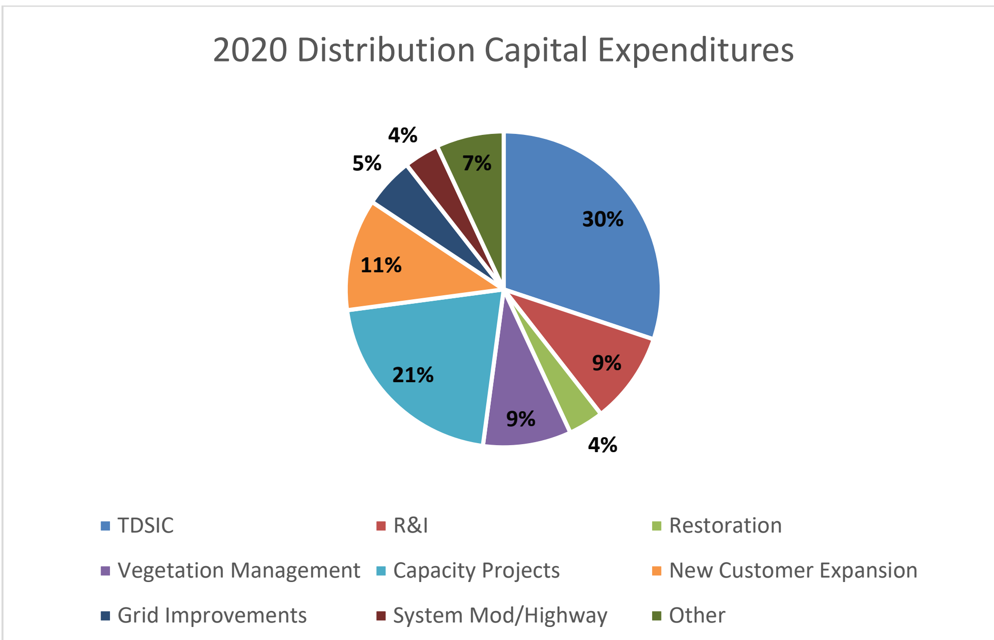


Q. WHAT IS DUKE ENERGY INDIANA'S FORECASTED AMOUNT OF DISTRIBUTION EXPENSE IN 2020?

A. Duke Energy Indiana projects $128 million in O&M distribution expense in 2020. Total capital investment in the distribution system is projected at $332 million in

2020, including $100 million in TDSIC expenditures. The figure below provides a breakdown of Duke Energy Indiana's 2020 distribution related capital expenditures.

Chart 3



Q. PLEASE EXPLAIN HOW DUKE ENERGY INDIANA'S DISTRIBUTION O&M AND CAPITAL COSTS HAVE CHANGED FROM 2018-2019 AND FROM 2019-2020.

A. Distribution O&M budget target levels have remained relatively flat over the past few years. O&M variances (see Table 4) from year to year are typically driven by larger events in a given year or due to program initiatives. Major storm restoration costs are a significant driver for the O&M decrease between 2018 and 2019. Actual distribution major storm costs for 2018 were $21 million as compared to the annual 2019 budget for major storms of $10 million. 2018 O&M costs also reflect higher TDSIC project O&M and higher outage maintenance and underground restoration activity.

The major distribution O&M change from the 2019 Budget to 2020 Forecast is primarily driven by the $26 million increase in Duke Energy Indiana's planned distribution vegetation management program spend and increased project O&M, primarily TDSIC and system capacity projects.

Table 5

$ in Millions	2018 A	2019 B	2020 F
Distribution O&M	$117	$92	$128
Increase / (Decrease)		($25)	$36

As can be seen in Table 6, there is a $21 million increase in capital expenditures between 2018 and 2019. The main drivers of this difference are the increased number of capacity projects in 2019 and the increase associated with the hazard tree removal program discussed below.

Duke Energy Indiana's distribution capital spend reduction from 2019 to 2020 is primarily driven by $32 million reduction in AMI project spend as AMI nears full deployment at the end of 2019. For further explanation on the Company's AMI deployment see the testimony of Duke Energy Indiana witness Mr. Donald Schneider.

Table 6

$ in Millions	2018 A	2019 B	2020 F
Distribution Capital Expenditures	$342	$363	$332
Increase / (Decrease)		$21	($31)

Q. PLEASE BRIEFLY EXPLAIN ANY COST SAVING EFFORTS UNDERTAKEN TO MANAGE COSTS.

A. Duke Energy Indiana's 2019 budget includes cost reductions associated with multiple Customer Delivery initiatives such as changes to our Line & Vegetation Contractor Oversight model, implementation of Technology enhancements (referred to internally as Lighthouse), implementation of Operations Center Standardization, changes to our non-Duke "Foreign Owned" pole inspection process, refinement of our replace versus repair policy, Inventory Optimization improvements, and better management of time spent in meetings & training.

Q. **DID YOU PROVIDE THE 2020 DISTRIBUTION O&M EXPENSES REFLECTED ABOVE, TO WITNESS MR. CHRISTOPHER M. JACOBI FOR INCLUSION IN THE DUKE ENERGY INDIANA FORECASTED TEST PERIOD PROPOSED IN THIS CASE?**

A. Yes.

A. Vegetation Management

Q. PLEASE SUMMARIZE THE COMPANY'S PLANNED DISTRIBUTION VEGETATION MANAGEMENT PROGRAM.

A. The testimony of Duke Energy Indiana witness Mr. T.K. Christie explains the distribution vegetation management program in detail. The program includes both normal tree trimming cycles, as well as an increasing focus on hazard trees that can be located outside the Company's right-of-way but still impact the system, particularly in times of extreme weather. As part of that effort, Duke Energy Indiana contractors are targeting the identification and removal of approximately 20,000 hazard trees during 2019 and 2020.

Q. WHAT ARE THE BENEFITS OF DUKE ENERGY INDIANA'S PROPOSED VEGETATION MANAGEMENT PROGRAM?

A. The Company anticipates its reliability metrics, as they pertain to the distribution system, to improve after the implementation of the proposed hazard tree vegetation management program and with increased funding of normal vegetation management trim cycles. Duke Energy Indiana anticipates that a fully funded vegetation management program will improve restoration efforts and reduce outage times.

B. <u>TDSIC</u>

Q. WHAT IS TDSIC?

A. TDSIC is an acronym that stands for Transmission Distribution and Storage System Improvement Charge which is a legislatively enacted recovery mechanism codified in Indiana Code § 8-1-39 *et seq*.

Q. DOES DUKE ENERGY INDIANA HAVE AN APPROVED TDSIC PLAN?

A. Yes. Duke Energy Indiana's TDSIC Plan was approved in 2016 in IURC Docket No. 44720. The Commission further approved plan updates and cost recovery in Docket Nos. 44720 TDSIC 1 - 6.

Q. HOW MUCH OF DUKE ENERGY INDIANA'S DISTRIBUTION CAPITAL EXPENDITURES ARE RELATED TO ITS TDSIC PLAN?

A. Duke Energy Indiana's distribution capital expenditures, related to TDSIC, is $142, million in 2018, $116 million in 2019, and $100 million in 2020.

C. Reliability and Integrity ("R&I") Programs (Outside of TDSIC)

Q. PLEASE SUMMARIZE THE COMPANY'S R&I PROGRAMS REFLECTED IN THE CAPITAL FORECAST PERIOD AND TEST YEAR.

A. There are a few R&I programs outside of TDSIC. These are completed in response to emergent or outage conditions.

Cable replacement. Replaces medium voltage underground cable that is nearing end-of-life. Underground cable installation started in the 1970s and in the 1980s became the default installation method for most residential customer connects supporting residential neighborhoods and subdivisions. Duke Energy Indiana currently has an estimated 8,471 miles of underground cable installed. Cable technology has improved through the years and life expectancy continues to increase. Cable technology used during the 1970s was non-jacketed, concentric neutral using high molecular weight insulation. This cable is now beyond its anticipated life span and experiences increased failure rates and needs replaced.

Declared Protection Zone. Improvement work performed on a circuit that is experiencing an above average number of momentary and sustained power outages. These circuits may also be considered the worst-performing circuits on the distribution system. Circuit components are evaluated for repair or replacement from a visual circuit walkdown by reliability engineers.

Circuit Sectionalization. This is a power outage mitigation project designed to improve the reliability of distribution circuits by reducing the number of customers exposed to power outages associated with circuit faults. Examples of interruptions include outages caused by cars hitting poles, trees falling into lines, and outages caused by storms. This reduction of exposure is accomplished by adding and/or re-configuring a number of protective devices on mainlines, circuit backbones, and branch circuits. The settings for these protective devices are coordinated to cause the devices to operate in a manner that isolates only the faulted section of a circuit. This minimizes the number of customers on the faulted section of a circuit that experience an interruption. For Circuit Sectionalization, reliability improvement is defined as a reduction in interruptions, customer minutes, or both. The desired state is a fully developed five-year sectionalization cycle for all circuits. This will improve optimization, overall reliability, and rehabilitation of aging protective devices.

Switchgear Replacements. A switchgear is a pad mounted metal enclosure that contains switches and fuses used for switching underground circuits and underground fault isolation. These replacements are made for failed devices and devices that have reached the end of their useful life.

Recloser Replacements. Reclosers are used on overhead distribution systems to detect and interrupt momentary faults. An example of things that may cause a fault is a tree falling on a circuit or a car hitting a pole. Reclosers open when a fault occurs on the part of the distribution circuit, beyond where it is connected. A timing device enables them to reclose a predetermined number of times for short durations to allow the fault to clear. If the fault is of a temporary nature, such as wires swaying together or a tree limb falling on the line, the recloser will open and close and service will be restored. Should the fault persist, the recloser will remain open, de-energizing that part of the circuit. These replacements are made for failed devices and devices that have reached the end of their useful life.

Capacitor Replacements. A capacitor stores a charge of electricity and returns the charge to the line when certain electrical conditions occur. Capacitors improve the efficiency of the flow of electricity by reducing energy losses and providing improved power factor. Capacitors, in an operating state, can reduce power losses along distribution circuits, reduce reactive requirements from generators, assist in maintaining the operating voltage for distribution customers, and provide voltage stability on the transmission system. Capacitors are a critical and essential device for operating an efficient electrical distribution grid. They are strategically located on our system as identified by circuit analysis studies.

These replacements are made for failed devices and devices that have reached the end of their useful life.

Q. WHAT ARE THE DRIVERS OF THE COMPANY'S R&I PROGRAMS?

A. The drivers for R&I Programs are asset age, technology upgrades, and inspection based replacements.

Q. WHAT ARE THE BENEFITS OF THE R&I PROGRAMS?

A. Duke Energy Indiana's R&I programs facilitate proactive identification of problems, thus enabling efficient resolution. In other words, Duke Energy Indiana is identifying issues that may not have been caught during routine inspections before they become a problem.

D. Capacity Projects

Q. WHAT TYPE OF CAPACITY PROJECTS ARE REFLECTED IN THE COMPANY'S CAPITAL FORECAST PERIOD AND TEST YEAR OPERATING EXPENSES, AS WELL AS THE DRIVERS FOR THESE PROJECTS.

A. The Company has plans to execute projects that will enable the power distribution system to deliver more power to customers and improve the reliability and quality of the voltage that is supplied. The current infrastructure was designed with a limited capacity to distribute power. This capacity was based on the cost of construction at the time and the amount of power needed to supply customers. Aside from addressing capacity concerns, the Company maintains acceptable system performance by executing projects that provide alternate sources to supply customers. This operating philosophy improves reliability by establishing backup sources for customers, in the event a primary source is out of service. Finally, physical characteristics of the distribution system can cause the quality of voltage delivered to the customer to be unacceptable to operate their equipment. In these cases, the company executes projects to modify the distribution system to ensure the power supply meets the needs of customers' equipment.

Q. WHAT ARE THE WORK SCOPES AND TIMING OF THE COMPANY'S PLANNED MAJOR PROJECTS RELATED TO CAPACITY OF THE DISTRIBUTION SYSTEM?

A. System capacity projects are developed for both actual load growth and projected load growth. Projects that are developed to expand the capacity of the distribution system include the addition of substations, addition of transformers in existing substations, extension of new circuits, and the replacement of existing circuits with larger wires. From conception through execution, the timing of these projects ranges from one to five years. After engineers develop scoping documents, designers collaborate to ensure all necessary components are integrated into the design to meet customer needs and system operational needs. Aside from load growth projects that result from collaboration with the Company's Large Account Management and Economic Development organizations, planning engineers review system peak load data (summer and winter) looking for overloaded infrastructure/equipment or projected overloading due to impending load growth. Load projections are made using historical data and growth rates. There are times when large customers do not provide long-term plans for growth, which drives Duke Energy Indiana's need to execute short-term projects.

Capacity projects are initiated with in-service dates that ensure the necessary capacity will be in service to meet imminent load growth. These projects usually transition from scope development to completion within 18-24 months. Whereas, longer range projects result from forecasted growth trends.

Q. WHAT ARE THE WORK SCOPES AND TIMING OF THE COMPANY'S CAPACITY PROJECTS RELATED TO RELIABILITY AND POWER QUALITY OF THE DISTRIBUTION SYSTEM?

A. Some system capacity projects enable the transfer of customers' supply between sources; thereby enabling faster restoration of service when a customer's primary source is unavailable. The system voltage must remain at the level necessary to operate customers' equipment. This can be accomplished by increasing size of the circuit. Duke Energy Indiana's planning engineers analyze the system for proper voltage, reliability improvement opportunities, and system protection conditions resulting from system loading. The system reliability improvement aspect of the planning engineer's work involves evaluating the system for optimal protective device installation and coordination, then developing projects that are designed to improve reliability. If the voltage delivered to the customer is incapable of operating the customer's equipment, planning engineers develop projects to mitigate the system issues. These projects include replacing distribution circuits, transferring load between the three phases of a circuit, transferring load between circuits, and adding voltage regulation devices. Considering the customer satisfaction impact, these projects are typically scheduled to be executed within two years.

Q. PLEASE EXPLAIN THE FORECASTED INCREASE IN CAPACITY PROJECT EXPENDITURES.

A. In 2019 and 2020 the Company will be completing several substation and circuit upgrades projects. Substation projects include the addition of new substations and/or the addition of transformers in existing substations. This is necessary to prevent the overloading of transformers when new customer load is added to the distribution system. Distribution circuit projects include extending new circuits or increasing the size of existing circuits. New or larger circuits are necessary to supply new load or prevent the overloading of existing circuits. Table 7 includes some of the customer addition projects underway in 2019 and currently projected for 2020.

<u>Table 7</u>

2019 Capacity Projects	2020 Capacity Projects
Chatham Hills Development	Bloomington 11th St
IU Health Hospital	Carmel Rohrer Rd 69 Sub Bus Circuit
Grand Park Expansion	Hoosier Energy Springport 1201
Midwest Poultry Farms	West Lafayette Cumberland Ave Bank 2
Spelterville Substation	Westfield Ditch 1291 & 1293
GEICO Expansion	Westfield Ditch Bk #1 22.4MVA
Med Tech Park, Fishers Field House	Zionsville Turkeyfoot 22.4 MVA Bk 2
Tredegar	Dist. OH/UG Line Improvements
KAR International Addition	West Lafayette 1227 Ln Ext
County Materials	Zionsville Turkeyfoot 1264-1265

Q. HOW DOES THE COMPANY PRIORITIZE ITS CAPACITY PROJECTS?

A. To ensure the most viable and cost-efficient distribution projects are funded each year, a project prioritization matrix has been developed. The intent of this matrix is to maximize the use of objective data while minimizing subjective data. The matrix uses loading criteria and reliability data for an overall project ranking. The following considerations are used in determining project priority:

- Percent Loading of Transformer
- Percent Loading of Feeder
- Estimated Unserved Load
- Growth Rate

Other factors such as regulatory requirements and management discretion are also considered on a case-by-case basis.

Q. WHAT ARE THE BENEFITS OF THE PLANNED CAPACITY PROJECTS?

A. Capacity projects can benefit both the ability to supply load and the quality of the supply. As it relates to system capacity, these projects provide the ability to supply new load. If projects that are designed to supply new load are not completed, we may not be able to supply new customers. In some cases, capacity projects provide a secondary supply to existing load. Secondary supplies provide backup sources for customers. These backup sources enable load transfers for maintenance purposes and expedite restoration during system faults. Finally, capacity projects could be designed to eliminate power quality issues caused by low voltage. Eliminating low system voltage permits customers' equipment to operate as designed.

Q. ARE THERE ANY ALTERNATIVES TO THE COMPANY'S CAPACITY PROJECTS?

A. Capacity projects must be completed to supply customer load and ensure the quality of serve is acceptable. These projects provide the ability to supply new load. If projects that are designed to supply new load are not completed, the Company might not be able to supply new customers. If capacity projects that are designed to provide a secondary supply to existing load are delayed, the Company might not be able to transfer load to another source for maintenance purposes. Failure to completes these projects could also increase the time needed to restore service during system faults. If capacity projects that are designed to eliminate power quality issues are not completed, customers could experience low voltage that possibly disables their equipment. During the project scoping phase, planning engineers vet alternatives. They seek to resolve system capacity and reliability concerns by implementing the most viable, cost-efficient solutions. Generally, alternative solutions are either impractical, less economical, or both.

E. New Customer Expansion

Q. PLEASE EXPLAIN THE TYPE OF PROJECTS THAT ARE CLASSIFIED AS NEW CUSTOMER EXPANSION?

A. Customer expansion projects for Duke Energy Indiana can be separated into 4 basic categories:

1) Extensions of the Duke distribution system to serve an individual residential single-family home.

2) Extensions of the Duke distribution system to serve subdivisions or multi-family buildings.

3) Extension of the Duke distribution system to serve Commercial or Industrial businesses or companies.

4) Customer-requested relocations of existing Duke distribution facilities to accommodate new customer facilities on a lot/parcel.

Q. WHAT IS THE WORK SCOPE AND TIMING OF THESE PROJECTS RELATED TO THE DISTRIBUTION SYSTEM?

A. The scope and timing for a customer expansion project is driven by the customers projected load requirements, the existing Duke distribution system nearest the project, and the customers requested in service dates.

For residential single-family homes, the scope is typically the extension of overhead or underground primary conductors, poles, with the installation of a single-phase transformer. These projects typically take 2 to 3 months to complete, depending on complexity of the line extension.

The scope of a subdivision project typically includes an extension of overhead primary distribution conductors and poles to get to the subdivision entrance. From there it includes the extension of underground primary conductors, pad-mounted transformer and sectionalizing module installations, secondary conductors, and service lateral installations. Depending on the number of lots in the subdivision, there could be a need for multiple distribution phases to be extended throughout the development. Timing for the average typical subdivision today is around 4 months.

Commercial and Industrial project scope is driven by customer load more so than your typical residential installations. The customers' load requirements or requests could lead to the installation of a customer substation and/or primary distribution service. Large commercial developments also requiring capacity and planning discussions and typically involve extensions or upsizing of the existing distribution system. Once plans are finalized, these projects could take 12 months or more to complete based on the complexity of the development

Customer-requested relocation project scopes are driven by the length of the distribution system that needs relocated and the distribution feeder routing. These projects can require the interconnection of multiple distribution feeders, and the upgrading of existing feeder conductors to handle load growth/swap to the feeder. These projects require completion prior to the customer being able to start construction and the timing varies greatly depending on the size of the customer's development.

Q. HOW DOES THE COMPANY PRIORITIZE ITS NEW CUSTOMER EXPANSION PROJECTS?

A. Duke Energy Indiana works with its customers to prioritize new customer expansion projects based on the customers requested need and timing.

F. Grid Improvement Projects

Q. PLEASE SUMMARIZE THE COMPANY'S GRID IMPROVEMENT PROJECTS REFLECTED IN THE CAPITAL FORECAST PERIOD AND TEST YEAR OPERATING COSTS.

A. Duke Energy Indiana's grid improvement projects comprise two major components: Self-Optimizing Grid and Targeted Undergrounding. As explained in more detail later in my testimony, the Self-Optimizing Grid project will utilize advanced technology to redesign key portions of the distribution system and transform it into a dynamic self-healing network that can detect and isolate issues and limit the impact to customers. Targeted Undergrounding is the name for a program whereby Duke Energy Indiana will strategically identify outage prone overhead power line sections and relocate them underground.

Q. WHAT ARE THE DRIVERS OF THE COMPANY'S GRID IMPROVEMENT PROJECTS?

A. Duke Energy Indiana's electrical network contains an extensive amount of overhead distribution lines. These lines contain both backbone feeder conductors, which carry power from electrical substations to neighborhoods, and tap lines that distribute power throughout those neighborhoods. As customers expect more from the Company, it must invest in the grid to provide ever-improving service and maintain a reliable distribution system. To meet these expectations, Duke Energy Indiana is utilizing technology that supports faster restoration to optimize the total customer experience and transform the grid to prepare it for the energy opportunities that lie ahead. Duke Energy Indiana is also selecting a subset of these smaller overhead lines to implement targeted undergrounding.

Q. PLEASE EXPLAIN WHAT A SELF-OPTIMIZING GRID IS AND WHY IT IS NEEDED.

A. The Self-Optimizing Grid, also known as the "smart-thinking grid," utilizes advanced technology to redesign key portions of the distribution system and transform it into a dynamic self-healing network that can detect and isolate issues and limit the impact to customers, by finding the most efficient real-time solution to restore power.

Today the Company's system is constructed for one-way power flow in a radial design with limited ability to integrate renewable energy. Self-optimizing technology can reduce outage impacts on customers and provide the foundation for the two-way power flows needed to support more rooftop solar, battery storage, electric vehicles and microgrids - technologies that will increasingly power the lives of customers. Self-Optimizing Grid bears a relationship and complements the Company's investments in self-healing "teams" included in its TDSIC Plan; however, this is an even more integrated and "real time" response that represents the next level of "smart" operation. Self-Optimizing Grid investments seek to: 1) Increase system "connectivity" by building more circuit ties that allow for more flexibility in restoration options. By tying more circuits together, the system will shift from a radial design to more of a "spider web" design. 2) Increase "capacity" by installing larger wires, transformers and system banks to be able to handle dynamic switching and increased two-way power flow from adjacent circuits and renewable generation. 3) Increase "control" through additional system automation and intelligence. Increased automation and intelligence is becoming a necessary requirement to manage an increasingly dynamic system. Please see Petitioner's Exhibit 26-A (CMH) for a schematic of self-optimizing grid.

Q. WHAT ARE THE BENEFITS OF THE SELF-OPTIMIZING GRID PROJECT?

A. With increased connectivity, capacity, and control, the Company will have an increasingly more resilient system with greater flexibility in restoring and preventing outages. Instead of having circuit pairs that can back each other up, the network allows for multiple options to re-energize circuit segments. With a fully functional self-optimizing grid, a majority of Duke Energy Indiana's customers will benefit from a decrease in sustained outages.

Q. WHAT ARE THE EXPECTED COSTS OF THE SELF-OPTIMIZING GRID PROJECT?

A. During the next couple of years, Duke Energy Indiana plans a small roll-out of this functionality, with budgets of $7.0 million in 2019 and $8.0 million in 2020, for this program. This represents approximately 100 reclosers per year.

Q. PLEASE EXPLAIN WHAT TARGETED UNDERGROUNDING IS AND WHY IT IS NEEDED.

A. Using the Targeted Undergrounding, Duke Energy Indiana will strategically identify outage-prone overhead power line sections and relocate them underground in an effort to harden the system against severe weather and reduce the impact of vegetation related power quality issues, thereby increasing overall reliability. Underground installations carry less exposure to environmental factors that often cause electrical faults. The locations will be selected based on an evaluation of the following: operational performance, costs (average outage costs), construction designs that are inconsistent with the Company's current standards, and age of the assets. Part of the selection process will be to identify circuit segments using Duke Energy Indiana's outage history records, specifically looking for repeat outage areas. Once located, engineers will overlay this information with where vegetation management is most costly and where the Company has limited access for its trucks, which drives up restoration costs, outage duration, and increases employee risks. Targeted Undergrounding will also be used to address infrastructure that is nearing its end of design life. Instead of rebuilding the system with "like for like," this program proposes to uplift facilities, bringing them up to current standards, many of which address reliability gaps. Please see Petitioner's Exhibit 26-B (CMH) for more on targeted undergrounding.

Q. WHAT ARE THE BENEFITS OF THE PLANNED TARGETED UNDERGROUND PROJECTS?

A. Undergrounding overhead tap lines may reduce the frequency and duration of outages for Duke Energy Indiana customers, especially in areas that historically see the most damage in major storms. Restoration in other areas can be accomplished faster due to the material reduction in outage events for these outlier segments of overhead facilities. Faster restoration means life returns to normal more quickly for Duke Energy Indiana's customers, decreasing the economic impact major storms can have. This program also allows for vegetation management resources to be reallocated to benefit more customers.

It's important to note that this is not a full undergrounding effort, as undergrounding distribution and transmission lines can be very costly and may also require longer outages to repair when they fail. This is a very targeted program that addresses problem areas only.

Q. WHAT ARE THE EXPECTED COSTS OF THE TARGETED UNDERGROUND PROJECT?

A. During the next couple of years, Duke Energy Indiana plans a small roll-out of this project. Duke Energy Indiana has budgeted $2.5 million in 2019 and $5 million in 2020, for this program.

Q. IN SUMMARY, WHY ARE THE GRID IMPROVEMENT PROJECTS NECESSARY?

A. Duke Energy Indiana is committed to providing safe and reliable service to our customers. Continually improving operations and making investments that improve reliability, avoid outages, and reduce restoration times are central to this commitment. Further, as customer energy needs evolve, a smart thinking grid that can communicate and provide information to Duke Energy Indiana and its customers and automatically react to grid events is essential. Duke Energy Indiana engages in a plan of continuous improvement of its distribution grid and these programs represent two vital additions to the Company's efforts to provide safe, reliable, and affordable service to customers.

V. STORM RESTORATION COSTS

Q. DOES DUKE ENERGY INDIANA CLASSIFY STORMS?

A. Yes. Duke Energy Indiana has four classifications, or severity levels, used to determine the level of activation and support personnel required for a storm or natural disaster; Level 0 is the least severe and Level 3, the most severe.

Q. PLEASE PROVIDE A BRIEF DESCRIPTION OF EACH LEVEL.

A. Level 0 (non-declared): Storms or events that affect or could affect only one part of the service territory with minor isolated damage. Restoration is normally accomplished by the affected area's resources without outside assistance and typically within 6 hours.

Level 1: Storms or events with minor damage affecting one or a few Operations areas. Restoration is normally accomplished by the affected area's resources without outside assistance and typically between 6-12 hours.

Level 2: Storms or events causing damage to one or several Operations areas. Restoration efforts require the movement of line resources, including possible off-system contractors, to the affected areas. Restoration will typically take between 12 and 24 hours.

Level 3: Storms or events producing extensive damage to the service territory. Restoration efforts require management of large compliments of off-system crews, as well as extensive materials, logistics, and engineering support. Restoration will take more than 24 hours.

Q. HOW OFTEN DOES DUKE ENERGY INDIANA EXPERIENCE LEVEL 1, 2 AND 3 STORMS?

A. The table below summarizes storm activity since 2014.

Table 8

Storm Level	2014	2015	2016	2017	2018	2019 (through June 9th)
Level 1	10	2	6	3	10	3
Level 2	0	4	10	11	4	4
Level 3	1	0	1	1	3	0
Number of MEDs	5	6	4	10	7	5

Q. HOW DOES DUKE ENERGY INDIANA DETERMINE IF A STORM QUALIFIES AS A MED STORM?

A. A Major Event Day ("MED") is defined by IEEE 1366 as a day in which the daily system SAIDI exceeds an MED threshold value (calculated from a 5-year average daily SAIDI). MEDs should be analyzed and reported separately.

Q. WHAT LEVEL OF ANNUAL O&M EXPENSE HAS DUKE ENERGY INDIANA INCLUDED IN ITS 2020 FORECAST FOR MED STORMS?

A. Our annual O&M budget for MED Storm expense is $10.0 million, but our actual expenditures will vary year to year based on the actual number of MED storms and the types of restoration required. Over the past 5 years (2014-2018) our MED storm expenses were as follows ($ in Millions):

Table 9

Year	Distribution	Transmission	Total
2014	$5.2	$1.3	$6.5
2015	$6.8	$.4	$7.2
2016	$12.1	$.7	$12.8
2017	$14.8	$.8	$15.6
2018	$20.9	$.5	$21.4
5 Year Average	$12.0	$.7	$12.7

Based upon the trend in rising storm costs and the variability and unpredictability of annual MED storm level amounts, Duke Energy Indiana believes it is appropriate to establish an MED storm level amount in base rates and then establish a reserve for any amounts below or above that level.

VI. CONCLUSION

Q. WERE PETITIONER'S EXHIBITS 26-A (CMH) AND 26-B (CMH) PREPARED BY YOU OR UNDER YOUR DIRECTION?

A. Yes, they were.

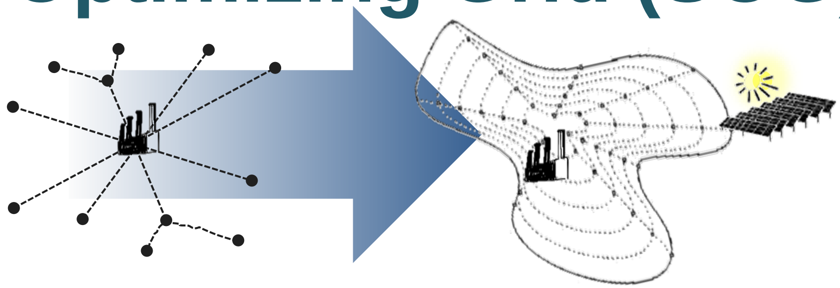
Q. DOES THIS CONCLUDE YOUR PREFILED TESTIMONY?

A. Yes, it does.

Self-Optimizing Grid (SOG) Vision

Existing Distribution

- One way power flow
- Radial design
- Any lockout of a breaker or recloser results in a large # of customers out.
- Limited capacity to manually back-feed from other circuits and for renewables



Future Distribution

- Networked system with dynamic energy flow. i.e. most circuits will have restoration capabilities from alternate sources.
- Solar/Renewable ready
- Essentially transform the distribution system into one big self healing network that can react automatically to faults and accommodate renewables

The Goal: Customers rarely experience interruptions due to a dynamic self-optimizing grid which automatically reacts to and mitigates failures and accepts and effectively manages renewable energy.

The Self Optimizing Grid is transforming the radial distribution system to an automated distribution network that provides:

- ✓ **Connectivity** with automated devices between circuits.
- ✓ **Capacity** on circuits and substation banks to allow dynamic switching. Can’t back-feed without capacity.
- ✓ **Segmentation** such that circuits have much smaller line segments, thus reducing the number of customers that are affected by outages.
- ✓ **Automated Control** to manage the grid. This is the automated head-end system, plus SCADA enabled field devices.

Self-Optimizing Grid (SOG) Objective

Duke Energy's objective is to build a better energy future for Duke Energy Indiana customers by making smart investments to strengthen the distribution electrical grid.

Self-Optimizing Grid

Adding capacity, grid connectivity and control *to enable* ***distribution customers*** *to be served from a self-optimized grid.*

SOG Design Criteria

- Average **400 customers** in each line segment *or*
- Average **3 miles** of exposure in each line segment *or*
- Average **2MW peak load** in each line segment
- Add capacity/connectivity to **serve all un-faulted line segments**

A self-optimized grid will:

- Improve power quality and reliability.
- Position Duke Energy Indiana to meet customers' growing expectations, demands, and needs.
- Further locate and isolate faults (short circuits) into smaller line segments and automatically reconfigure the system.

DUKE ENERGY.

DUKE ENERGY.

Targeted Undergrounding

Leveraging historic data to strategically move thousands of miles of hard-to-access overhead power lines underground to improve reliability for customers

TARGETED UNDERGROUNDING BENEFITS

- Significantly reduce outages
- Minimize momentary interruptions
- Restore power faster
- Eliminate tree trimming in hard-to-access areas

Targeted undergrounding drives higher reliability by significantly reducing risk on outage-prone power line segments.

DUKE ENERGY®

Targeted Undergrounding

DOWNED POWER POLES

LINEMAN IN RAIN

IN AREAS INACCESSIBLE BY BUCKET TRUCK, LINEMEN HAVE TO CLIMB POLES TO MAKE REPAIR

VERIFICATION

I hereby verify under the penalties of perjury that the foregoing representations are true to the best of my knowledge, information and belief.

Signed: Cicely M. Hart
Cicely M. Hart

Dated: 7/2/2019