STATE OF INDIANA

INDIANA UTILITY REGULATORY COMMISSION

PETITION OF INDIANAPOLIS POWER & LIGHT COMPANY ("IPL") FOR AUTHORITY TO INCREASE RATES AND CHARGES FOR ELECTRIC UTILITY SERVICE AND FOR APPROVAL OF: (1) ACCOUNTING RELIEF, INCLUDING IMPLEMENTATION OF MAJOR STORM DAMAGE RESTORATION RESERVE ACCOUNT; (2) REVISED DEPRECIATION RATES; (3) THE INCLUSION IN BASIC RATES AND CHARGES OF THE COSTS OF CERTAIN PREVIOUSLY APPROVED QUALIFIED POLLUTION CONTROL PROPERTY; (4) IMPLEMENTATION OF NEW OR MODIFIED RATE ADJUSTMENT MECHANISMS TO TIMELY RECOGNIZE FOR RATEMAKING PURPOSES LOST REVENUES FROM DEMAND-SIDE MANAGEMENT PROGRAMS AND CHANGES IN (A) CAPACITY PURCHASE COSTS; (B) REGIONAL TRANSMISSION ORGANIZATION COSTS; AND (C) OFF SYSTEM SALES MARGINS; AND (5) NEW SCHEDULES OF RATES, RULES ANDREGULATIONS FOR SERVICE.	)	CAUSE NO. 44576
IN THE MATTER OF THE INDIANA UTILITY REGULATORY COMMISSION'S INVESTIGATION INTO INDIANAPOLIS POWER & LIGHT COMPANY'S ONGOING INVESTMENT IN, AND OPERATION AND MAINTENANCE OF, ITS NETWORK FACILITIES	)	CAUSE NO. 44602

REDACTED TESTIMONY OF

RAY L. SNYDER – PUBLIC'S EXHIBIT NO. 2

ON BEHALF OF THE

INDIANA OFFICE OF UTILITY CONSUMER COUNSELOR

JULY 27, 2015

REDACTED TESTIMONY OF OUCC WITNESS RAY L. SNYDER
CAUSE NOS. 44576/44602
INDIANAPOLIS POWER & LIGHT COMPANY

I. INTRODUCTION

Q: Please state your name and business address.

A: My name is Ray L. Snyder. My business address is 115 W. Washington Street, Suite 1500 South, Indianapolis, Indiana 46204.

Q: By whom are you employed and in what capacity?

A: I am employed by the Office of Utility Consumer Counselor ("OUCC") as Analyst in the Resource Planning and Communications Division. My educational background, experience, and preparations for this case are detailed in Appendix A attached to this testimony.

Q: What is the purpose of your testimony?

A: My testimony will examine the details of "fault events," or system component (cables, splices, network protectors, etc.) failures, in Indianapolis Power & Light Company's ("IPL") downtown underground electrical distribution system. This includes the visible "manhole events" as well as non-visible events.

II. IPL DOWNTOWN UNDERGROUND NETWORK

Q: Please describe the IPL underground network addressed in your testimony.

A: On April 9, 2015, the Commission published the final issues list for its investigation. On page 1, footnote 1, the Commission noted that IPL proposed a narrow definition of "IPL's network as the underground network located in the Mile Square of Indianapolis, which is approximately bounded by North Street,

East Street, South Street, and West Street." However, the Commission rejected IPL's narrow definition and stated that "[t]he scope of this investigation is not limited to the downtown network, unless otherwise stated." Therefore, throughout my testimony, the term "IPL Network" will refer to the broader definition of underground network found appropriate by the Commission.

A description of both IPL's General Distribution System and its mile-square "Downtown Underground Network," together with the network components, is provided in the Supplemental Testimony of IPL Witness Mr. Michael L. Holtsclaw pages 2-8. These two systems are illustrated in diagrams in MLH Attachments S-1-01, -02, -03, and -04.

Q: What are the basic components of the IPL Network?

A: Basic components of the underground network include the following:

1. Manholes. Points of access to junction/splicing points for underground cables.
2. Primary Cables. Cables distributing power in the radial feed General Distribution System at 13,800 volts from substations to the Network Transformers.
3. Secondary Network Cables. Cables distributing power at 120/208 or 277/480 volts from the Network Transformers to and between vault collector buses.
4. Network Transformers. Supply power to the Secondary Network System by reducing the 13,800 volt primary voltage down to secondary service voltages of 120/208 or 277/480 volts.
5. Terminal Chambers. Enclosures attached to the Network Transformers in which Primary Cables are terminated and attached to the transformers' high

voltage connections. Cable terminations and attachments are made with either stress cones or elbow connectors.

6. Stress Cones. Hand-wrapped terminations built up on the ends of high voltage Primary Cables. Stress cones dissipate electrical stresses that would otherwise cause damage to cable insulation resulting in electrical failure.
7. Network Protectors. Connects to the low voltage side of the Network Transformers. The Network Protector opens to prevent dangerous reverse current flow when a Primary Cable fails and the substation circuit breaker opens to de-energize the primary cable.
8. Transformer Vaults. Underground structures that contain one or more Network Transformers and associated components.

III. IPL NETWORK ASSET FAILURES

Q: How has IPL defined "network asset failure?"

A: IPL states that "network asset failure" refers to "when a component has experienced an electrical short circuit or fault."[1] IPL uses the term "network event" synonymously with "network asset failure."[2] Although IPL prefers to use the term "event" that term is somewhat misleading in that most, if not all, of the events are "failures." However, for ease of discovery and for case consistency purposes, I have used IPL's terms "network event," or "event," to refer to "network asset failures."

Q: Does such an event always result in a loss of electrical power to one or more IPL customers?

[1] Attachment RLS-1, IPL response to OUCC DR 71-01.b.
[2] Attachment RLS-2, IPL response to OUCC DR 28-13.

A: No. The IPL Network is designed so that secondary circuits are connected, or "looped", in such a way that when one secondary network cable cannot supply power due to an event, power may still be provided from another secondary network cable if working properly.

Q: How many network events were there in the period from March 1, 2003 through April 1, 2015?

A: IPL first reported just 21 manhole events between January 5, 2001 and March 19, 2015 which resulted in smoke, fire, or explosions.[3] However, not all events result in visible evidence. In records obtained from IPL,[4] a total of [redacted] events occurred between March 1, 2003 and April 1, 2015.

Q: Why is it important to include all [redacted] events in your review of the IPL network?

A: From an engineering viewpoint, all network asset failures must be taken into account to get a greater understanding of what problems should be addressed and a more accurate picture of the severity of the problems in order to adequately address the issues.

The Commission understood this importance as demonstrated by the April 9, 2015 Docket Entry that included the following items in its statement of issues:

1. Issue 1 – Network Safety. "Please present the necessary data to determine whether or not there were *any ongoing, persistent network conditions* that may have contributed to the occurrence of the ongoing series of network events since 2005."[5]

[3] Attachment RLS-3, IPL response to OUCC DR 62-1, Supplemental Attachment 3.
[4] Confidential Attachment RLS-4 IPL response to OUCC DR's 71-3 and 71-4, Confidential Attachment 1
[5] Commission Docket Entry, April 9, 2015, p. 1.

2. Issue 2 – Network Maintenance. "Please analyze what effect IPL's asset management program/practices, if any, may have had in assisting IPL *predict or prevent potential network failures and other related problems*."[6]
3. Issue 3 – Network Investment. "Please discuss how *network performance, maintenance, and safety are reasonably correlated to sufficient ongoing investment*."[7]

(Emphasis added.)

Q: Have you examined and analyzed the network events reported by IPL?

A: Yes. Using data supplied by IPL in its response to OUCC DRs 71-3 and 71-4 (see Confidential Attachment RLS-4, referenced previously), I have constructed a database of the [redacted] IPL network events, and analyzed them by time period, frequency, cause, location, substation, and feeder circuit. See Confidential Attachment RLS-5.

Q: Please summarize the results of your analysis.

A: Cable failures were by far the dominant cause of network events, with failures of splices and terminal chambers the second most common cause.

1. The number of events from March 2003 to April 1 2015 averaged [redacted] per year. [redacted] events, or [redacted]% of the total.
2. Cable failures are identified as the cause for [redacted] ([redacted]%) of the events. This rose to [redacted]% in 2011. At least 10 of these cable failures were caused by heat damage from the Citizens Thermal Energy's ("CTE") steam system.
3. Splice and terminal connection failures account for [redacted] ([redacted]%) of the events.

[6] *Id.*, p. 2.
[7] *Id.*, p. 3.

4. Approximately [redacted]% of network events happened in the [redacted] and [redacted] sectors of the city, which are supplied from IPL's [redacted] Substation.
5. Of the 21 manhole events initially identified by IPL, the following causes were disclosed:
    a. Cable insulation breakdown resulting in an electrical short – 8
    b. Stress cone/splice breakdown resulting in an electrical short – 7
    c. Steam leakage or heat conduction from steam lines adjacent to cable ducts, manholes, or vaults – 5
    d. Structural failure inside vaults or manholes – 1

IV. IPL COMMITMENTS

Q: Did the 2011 O'Neill report[8] address coordination issues between IPL and CTE and make a recommendation in that regard?

A: Yes. Recommendation Number 1 was on the list of five recommendations which the report stated "carry our highest emphasis."[9] IPL and CTE made a number of commitments addressing this recommendation. IPL and CTE agreed to periodic meetings. Beginning in February 2012 operating and engineering personnel from both companies held monthly meetings to review the prior month's steam anomaly report and any other coordination issues between the two companies.[10]

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[8] "Independent Assessment of Indianapolis Power & Light's Downtown Underground Network. O'Neill Management Consulting, December 13, 2011."
http://in.gov/iurc/files/IPL_Downtown_Network_Audit_Report_-_Final_Report(1).pdf
[9] *Id.*, page 81.
[10] IPL report in response to the O'Neill report, for the year ended 2012. January 25, 2013, page 7, Section 3.1.2 "Accomplishments."

The OUCC requested and IPL provided the monthly meeting minutes for February 2012 through May 2015.[11]

However, a review of the minutes from those meetings revealed that significant items such as the three manhole events in 2014 and the two early in 2015, all of which had Root Cause Analysis reports performed by IPL, were not addressed in monthly meetings.[12] For example, the March 19, 2015 event when heat from a nearby CTE steam line likely contributed to the failure of the secondary cables[13] was not mentioned in meeting minutes. This raises doubts as to the completeness of information being shared at these meetings.

Q: Have IPL and CTE agreed upon specific commitments to communicate and coordinate information regarding steam system anomalies?

A: Yes, as stated in the January 19, 2012 IPL response to the December 2011 O'Neill report:

> IPL and Citizens Thermal have committed to notifying each other immediately when a steam leak or high heat condition is found. A notification process has been put in place so that the appropriate people at each company receives [sic] the information. Telephone calls with follow-up emails will be used. IPL has established a special joint email address to be used for these notifications. This will allow Citizens to use a single email address to notify multiple people at IPL to receive the information. [14]

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[11] Confidential Attachment RLS-6, IPL response to OUCC DR 73-5, Confidential Attachments 1 through 4.

[12] Root Cause Analysis for March 14, 2014; August 13, 2014; November 24, 2014.
http://www.in.gov/iurc/2825.htm
Cause 44576-44602 IPL Witness JAS Attachment S1, March 16, 2015 Root Cause Analysis.
Cause 44576-44602 IPL Witness JAS Attachment S2, March 19, 2015 Root Cause Analysis.

[13] Cause 44576-44602 IPL Witness JAS Attachment S2, March 19, 2015 Root Cause Analysis, page 34.

[14] "Response to: Independent Assessment of Indianapolis Power & Light's Downtown Underground Network." IPL January 19, 2012, page 4.

In the updated report for the year ending 2012, IPL stated "[A]s of December 31, 2012, IPL completed Recommendation #1."[15] Additionally, "[C]itizens Energy responded appropriately in the way IPL described in the IPL commitment response."[16]; and "[c]oordination and the flow of information between the two companies have improved in both electronic and verbal communication."[17]

However, as recently as July 13, 2015, IPL stated that CTE is not notifying IPL of steam leaks by email, and CTE instead provides an updated report of steam leaks and repairs at the monthly coordination meeting.[18] Thus, the sense of immediacy seems not to be a priority and the current practice is contrary to IPL's earlier reports of the implementation of the commitment for immediate notification of steam leak and high heat conditions.

Q: Are there reports made of CTE system steam anomalies; that is, points identified as leaking steam or of being excessively hot?

A: Yes. In IPL's response to the O'Neill report for the year 2012, it told the Commission that "[o]n January 13, 2012, Citizens Energy provided IPL 10 years of historical data with a list of locations of steam system anomalies." IPL stated it "used the Citizens Energy information to create a map of the steam anomalies' in relationship to IPL electric manholes."[19]

[15] IPL report in response to the 2011 O'Neill report, for the year ended 2012. January 25, 2013, page 7.
[16] *Id.*
[17] *Id.*
[18] Attachment RLS-7, IPL response to OUCC DR 83-03.
[19] IPL report in response to the O'Neill report, for the year ended 2012, page 7, Section 3.1.2.

Q: Did IPL make a statement on how it would utilize these CTE reports to identify potential IPL Network issues?

A: Yes. In its commitment, IPL stated it would:

> ...take that data and merge it with IPL's failure data to identify additional manholes that should be evaluated for potential cable damage from prior steam leaks. The evaluation will include taking current reading on secondary cables looking for current imbalance or current fluctuations which could be an indication of the cable insulation breaking down. The evaluation will also include collecting additional cable samples, if warranted, to be sent out for laboratory analysis and evaluation. Based on the findings of both of these evaluation methods the cables will be replaced where warranted.[20]

In IPL's follow-up report for the year ending 2012, it stated that it had completed Recommendation #1, including "all specific commitments related to recommendation #1."[21]

In response to an OUCC data request, IPL listed forty-six incidents of manholes with high temperatures and five steam-related cable failures from 2011 through 2015.[22] These fifty-one thermal anomaly incidents would have qualified for the detailed examination and analysis committed to by IPL. The OUCC requested IPL's evaluation of merging the CTE infra-red thermal scan results with the IPL's electrical system data. IPL stated that from all the CTE infra-red survey data since 2001, IPL did not plot current imbalances, only sent out two cable samples for analysis, and replaced no sections of cable as a result of lab sample analyses.[23] In addition, no information detailing the use of CTE's infra-red scans

[20] "Response to: Independent Assessment of Indianapolis Power & Light's Downtown Underground Network." IPL January 19, 2012, page 3, sub point a), IPL Commitments.
[21] IPL report in response to the O'Neill report, for the year ended 2012, page 7.
[22] Attachment RLS-8, IPL response to OUCC DR 55-01.a.
[23] Attachment RLS-9, IPL response to OUCC DR 73.6.c.

to identify areas of concern in IPL's network has been provided to the OUCC, other than a map illustrating the overlay of steam system piping with IPL electrical network. Consequently, no evidence has been provided that IPL is implementing this commitment to the use of CTE steam anomaly data.

V. IPL REMEDIAL ACTIONS

Q: How is IPL addressing weaknesses identified in its underground network?

A: IPL has performed, or committed to performing, the following remedial actions to address weaknesses:

1. Safety. In its response to the 2011 O'Neill report, IPL installed a total of 252 Swiveloc manhole covers through December 31, 2013. IPL noted the covers performed as designed and it would continue to monitor manhole cover performance and consider if additional covers should be installed in the future.[24] IPL installed 122 additional Swiveloc manhole covers (a total of 374) as of March 30, 2015. Although IPL has now committed to installing Swiveloc covers on all 1,214 of its downtown network manholes by December 31, 2015,[25] it had replaced less than one-third of the covers between issuance of the 2011 O'Neill report and March 30, 2015 while the potential for more explosions continued.

   While this does not eliminate failures and prevent all events from happening, it will prevent the launching of heavy manhole covers into the air,

[24] IPL report in response to the O'Neill report, for the year ended 2013, page 6, Section 3.7. http://www.in.gov/iurc/files/IPL_2013_Downtown_Network_Update_Report.pdf

[25] IPL response 1.a to IURC Docket Entry dated March 24, 2015.

and will avoid the secondary explosions which can occur as air is drawn in after a manhole cover is dislodged.

2. Cable failures. IPL has a ten year plan to replace primary circuit cables based on cable performance, condition, and failure impact.[26] Primary circuits which had 77% of the primary circuit cable faults from 2001 through 2011 will be replaced by the end of year 2021.[27]

3. Terminal chambers. To avoid fires and explosions resulting from stress cone failures, IPL has filled all terminal chambers with FR3[28] fluid, which is safer because it does not support combustion. This will alleviate the consequences of failure of any existing stress cone terminations. IPL has established the bolted primary termination (dead front elbow connection) as the standard for any transformer installed in a vault whether it's a new installation or a replacement of an existing unit. Furthermore, IPL modified all spare transformers with the elbow connectors, and all new transformers will also conform to the elbow connector specification.[29] Replacement of existing transformers in service will be done over a period of time, as transformers require replacement due to failure or poor results from diagnostic testing.

4. Network Protectors. Replace all 480 volt network protectors due to aging and poor original design, both of which increase risk of failure.

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[26] Confidential Attachment RLS-10. IPL's response to OUCC DR 83-1, Confidential Attachment 1.

[27] Confidential Attachment RLS-5.

[28] FR3 fluid is a "less flammable" fluid used in distribution and power transformers. http://www.cargill.com/products/industrial/dielectric-ester-fluids/envirotemp-fr3/index.jsp

[29] IPL report in response to the 2011 O'Neill report, for the year ended 2012. January 25, 2013, page 18, Section 3.3.2. http://www.in.gov/iurc/files/IPL_CBD_2012_Summary_Report.pdf

5. Transformer oil testing. IPL has re-evaluated its Dissolved Gas Analysis ("DGA")[30] transformer oil testing philosophy. It has established a baseline for all 315 network transformers, and incorporated results in its asset management database. IPL has also established an appropriate re-test cycle based on the DGA baseline results and equipment condition.[31]

6. Steam issues. As detailed previously in my testimony, IPL made a number of commitments, including the following: a commitment to "immediately identify and address, presumably through coordination with Citizens Energy, all manholes that have been too hot to safely enter and inspect[.]"[32]; examine all manholes and cables that have been exposed to high temperatures from adjacent CTE steam lines; share information in monthly meetings; and establish two-way communications between IPL and CTE.

However, IPL needs to demonstrate its ongoing and renewed commitment in this area. As noted previously, [redacted] ([redacted]%) of the events reported by IPL were the result of cable failures. Going forward, a more aggressive identification and resolution of previous and current excessive heat conditions by IPL will likely reduce the number of cable failure network events.

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[30] Dissolved Gas Analysis (DGA) is the analysis of transformer oil samples to determine the composition of gases contained in the oil. Analysis results reveal the "health" of the transformer, with trends over time indicating deterioration and a need for transformer replacement. "Dissolved Gases Reveal your Transformer's State of Health.", Electrical Construction & Maintenance. February 28, 2002. http://ecmweb.com/content/dissolved-gases-reveal-your-transformer-s-state-health.

[31] "Response to: Independent Assessment of Indianapolis Power & Light's Downtown Underground Network." IPL January 19, 2012, page 24.

[32] *Id.*, page 2, point 1.

Q: Does the OUCC have concerns regarding IPL's remedial action plans?

A: Yes. As stated in the testimony of OUCC Witness Mr. Anthony A. Alvarez at page 15, lines 8-11, "...IPL lacks a specific implementation plan that addresses the remaining primary terminations [Terminal Chambers]. The longer they remain uncorrected, the greater the risk of another explosive network event."

Q: Wouldn't an accelerated rate of transformer replacement result in increased costs for IPL, and potentially more power outages for IPL customers?

A: Increases in both cost and power outages could be minimized, or even eliminated. As stated in the 2015 O'Neill report, "We note that in 2015 IPL's planned replacement of transformers is only 3 per year.", and "...we wonder whether the replacement of those [network] protectors might be the occasion for replacing at least some of the attached network transformers at the same time if their condition warrants."[33] With such an approach, three things would be accomplished.

1. Transformers condition would be a consideration for replacement,
2. Customer outages would be minimized by replacing both the transformer and the associated network protector at the same time; and most importantly,
3. System safety and reliability would be enhanced in an expedited manner.

VI. CONCLUSIONS AND RECOMMENDATIONS

Q: What conclusions have you drawn from your analysis of the IPL Network condition, failures, and remedial actions?

A: My conclusions are as follows:

1. As stated above, IPL's plan for replacement of transformers should be reviewed for acceleration in conjunction with network protector replacements.

[33] "Investigation of IPL's Network – Cause Number 44602 – Report of Independent Consultant. Final – 22 Jun 2015" O'Neill Management Consulting, LLC, page 38.

1 This would more effectively satisfy concerns for safety, and long term
2 minimization of conditions causing network failures. Additionally, the lack of
3 documentation demonstrating IPL's implementation of its commitments made
4 in response to network failure investigations weakens IPL's assurances that its
5 asset management system will optimize a safe and reliable network.

6 2. IPL's replacement of all manhole covers with Swiveloc covers is long
7 overdue. IPL's commitment to complete this replacement by December 31,
8 2015 must be implemented, for the safety of the public.

9 3. IPL's gathering and reporting of information on network condition, issues,
10 repairs, and proactive activities should be improved in order to assure the
11 Commission and the public of network system safety and reliability. The
12 OUCC agrees with statements made in the recent O'Neill report dated June
13 22, 2015, "the time has come to…make the effort to document to the outside
14 in some detail the process by which the asset management function serves to
15 address the risk and performance of the system, all in the context of cost
16 effectiveness."[34]

17 **Q: Do you have any recommendations?**

18 A: Yes. I recommend the Commission accept the three recommendations as stated in
19 the 2015 O'Neill report[35] and require IPL to implement them. These
20 recommendations are summarized as follows:

[34] "Investigation of IPL's Network, Cause 44602, Report of Independent Consultant. Final – 22 Jun 2015." O'Neill Management Consulting, LLC., page 53, point 5.
[35] *Id.*, page 55, Section 9.3.

1. IPL's commitments to implement actions addressing concerns of this investigation should continue to be documented and monitored by the Commission.
2. IPL's asset management process should be audited by an independent entity which would report directly to the Commission to clearly document which aspects are fully operational, and which are still in progress, along with a schedule of implementation.
3. Performance metrics should be established to avoid the necessity of a new investigation with every incident of perceived poor performance.

Implementation of these three recommendations would benefit IPL, the Commission, the OUCC, and the public at large by helping assure on a continuing basis that critical assessments, inspections, and actions are being taken on a proactive, predictive, preventative basis. This approach should result in improvements to the safety and reliability of the underground network, as well as an enhanced understanding of IPL's asset management processes and performance.

In addition, I recommend the Commission require IPL to develop an accelerated transformer replacement plan in conjunction with its current plan network protector replacement plan. This would advance IPL's commitment of eliminating transformer terminal chambers for improved network system safety and reliability.

Q: Does this conclude your testimony?

A: Yes.

APPENDIX A

Q: Please describe your educational background and experience.

A: In 1971, I graduated from Purdue University with a Bachelor of Science degree in Mechanical Engineering and began employment with National Starch and Chemical (now known as Ingredion) in Indianapolis as a Project Engineer. In 1973, I accepted responsibility for the operation of the plant's powerhouse facilities, which entailed the 24/7 operation, maintenance, repair, and upgrade of coal-fired boilers, an electrostatic precipitator, a steam turbine-generator, and all of the auxiliary equipment required for operation. In this position, I became knowledgeable in various aspects of boiler and turbine-generator design, construction, and operating characteristics for the utilization of superheated steam in the production of electricity.

In 1986, I became Plant Utilities Supervisor, with increased responsibilities including 24/7 operation, repair, specification, and installation of all of the 4.16 and 13.2 kilovolt (kV) distribution transformers, circuit protection, and switchgear required to supply the twenty-three megawatt (MW) electrical load for full plant operation. In 1999, I was promoted to Utility Manager, with additional responsibilities for tracking utility rates and costs, and as liaison to the utility companies serving the plant. In October 2006, I retired from National Starch and Chemical.

In November 2006, I began employment as a Utility Analyst with the OUCC. My current assignments include the review and analysis of utility

1 petitions and, in particular, cases addressing a Certificate of Public Convenience
2 and Necessity (CPCN).
3 I am a member of the Association of Energy Engineers (AEE) and the
4 Association for the Advancement of Cost Engineering International (AACE). Since
5 2001, I have maintained the qualification of Certified Energy Manager in the AEE
6 certification program.

7 **Q: Have you previously testified before the Indiana Utility Regulatory**
8 **Commission ("Commission" or "IURC")?**

9 A: Yes. I have testified in both gas and electric cases. Recently, I led the OUCC case
10 team in Cause 44526 Duke TDSIC.

11 **Q: What did you do to prepare for your testimony?**

12 A: I reviewed documents published and/or filed by IPL, the Indiana Utility
13 Regulatory Commission ("Commission"), and other intervenors relevant to the
14 Commission investigation into IPL's investment, operation and maintenance of its
15 network facilities in this Cause. I read documents and Commission orders in
16 previous Commission investigations into IPL's underground network integrity. I
17 drafted data requests and reviewed IPL's responses. I researched available public
18 reports and records of IPL's underground network failures (collectively referred
19 to in my testimony as "events") which damaged IPL's electrical distribution
20 system components, and in some instances resulted in smoke, fires and/or
21 explosions in IPL's underground ducts, manholes and electrical vaults. I also
22 researched previous causes and investigations concerning the integrity of IPL's
23 underground electrical distribution system, including Cause 44159 regarding
24 electrical service to 151 North Delaware Street, and the Commission's 2011

investigation regarding eight events. I studied reports by IPL and by consultants hired by IPL, and follow-up documents and reports, including Root Cause Analysis Reports for network events in 2014 and 2015. I also participated in meetings and technical conferences with Commission and OUCC staff, and with IPL personnel.

In addition, I researched studies made by agencies and professional societies such as the Institute of Electrical and Electronics Engineers, the Electric Power Research Institute, Columbia University, the Massachusetts Institute of Technology, and Consolidated Edison Company of New York.

AFFIRMATION

I affirm, under the penalties for perjury, that the foregoing representations are true.

Ray L. Snyder
Utility Analyst
Indiana Office of Utility Consumer Counselor

July 27, 2015
Date

Cause No. 44576/44602
IPL

Data Request OUCC DR 71 - 01

In response to OUCC DR 28-13, IPL states it "has been formally tracking network asset failures since 2003."
a. Please state IPL's definition of "network" as used in this response.
b. Please state IPL's definition of "network asset failure" as used in this response.
c. Please identify how IPL has conducted "formal tracking" of network asset failures since 2003, including, the procedures, programs, and/or software used.

Objection:

Response:

a) IPL's definition of "network" as used in this proceeding refers to the underground network located in the Mile Square area of downtown Indianapolis, which is approximately bounded by North Street, East Street, South Street and West Street. Customers within this area are served from one of two substation, Edison substation, Gardner Lane substation, or Sub 3 substation. See Supplemental Testimony of IPL Witness Holtsclaw for general discussion of nomenclature.

b) The phrase "network asset failure" as used in IPL's response to OUCC DR 28-13 refers to when a component has experienced an electrical short circuit or fault.

c) Since 2003, IPL has used a combination of Microsoft Access databases and a Microsoft Excel spreadsheet to track network asset failures. In 2011, IPL developed a failure data analysis form. Field personnel and their direct leadership now use this form to collect the asset failure information. This information is then input by Engineering into the Microsoft Access database on a shared drive on the IPL computer network. See OUCC DR 71-01 Attachment 1 for an example of the Microsoft Excel failure data analysis form used.

Data Request OUCC DR 28 - 13

If IPL has an internal process system to document asset failures with regard to its downtown network, please list the number of asset failures in IPL's downtown network for the past fifteen years (2000 - 2015), broken down by:
a. Infrastructure failures (e.g. manholes, vaults),
b. Transformer/ancillary failures (e.g. network protectors), and
c. Cable faults.

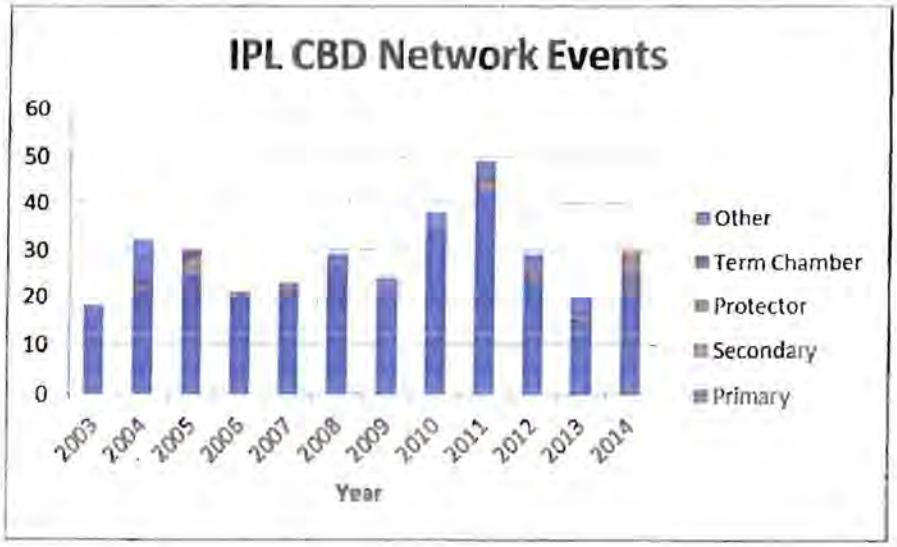
Objection:

IPL objects to the Request on the grounds and to the extent it is overly broad and unduly burdensome. IPL further objects to the Request on the grounds and to the extent the request solicits information that exceeds the scope of this proceeding and is not reasonably calculated to lead to the discovery of relevant or admissible evidence. IPL further objects to the Request on the grounds and to the extent the request seeks a compilation, analysis or study that IPL has not performed and to which IPL objects to performing. Subject to and without waiver of the foregoing objections, IPL provides the following response.

Response:

a. IPL has formally been tracking network asset failures since 2003. During this time period, IPL has had no manhole/vault structure failures as the cause of any network events.

b.-c. Please see the chart below, which shows the number of network events and causes for the last 12 years.



NETWORK EVENTS 2001 - 2015 YTD

Event #	Date	Manhole or Vault	Location	Cause
1	1/5/2001	Manhole	114 W New York	Secondary Fire
2	12/31/2004	Vault - Cust Owned	215 E Ohio (Gold Bldg)	Fire Cust. Owned Transformer
3	1/4/2005	Manhole	114 W. North St.	Cable failure in duct line
4	1/8/2005	Manhole	137 W. Market St.	Cable failure from steam leak
5	9/5/2005	Vault	Talbott and Vermont	Network protector failure
6	2/17/2010	Vault - Cust Owned	215 E Ohio (Gold Bldg)	Fire Cust. Owned Transformer
7	8/19/2010	Manhole	342 Mass. Avenue	Primay Splice failure
8	1/30/2011	Manhole	Michigan and New Jersey	Cable failure in manhole
9	4/27/2011	Manhole	20 W. Court	Customer cable faulted
10	5/31/2011	Vault	46 N Capitol	Termination Chamber
11	6/20/2011	Manhole	326 E. New York	Cable failure in duct line
12	11/19/2011	Manhole	27 S Delaware	Cable Failure, Sec. Fire
13	6/7/2012	Manhole	E. Michigan & Talbot	Sec. Cable fault
14	7/4/2012	Vault	330 W Maryland Street	Termination Chamber
15	7/5/2012	Manhole	Alley behind 342 Mass Avenue	Primary Cable Fault
16	4/7/2013	Vault	129 E Washington Street	Termination Chamber
17	3/14/2014	Manhole	156 E Market Street	Sec. Cable Fault in Ductline
18	8/13/2014	Vault	26 S Meridian Street	Network Protector Failed
19	11/24/2014	Manhole	327 E New York Street	Sec. Cable Fault
20	3/16/2015	Vault	428 Mass Avenue	Termination Chamber
21	3/19/2015	Manhole	210 W North Street	Sec. Cable Fault, Sec. Fire

Cause Nos. 44576/44602

Attachment RLS - 4
Page 1 of 1

Confidential

Cause Nos. 44576/44602

Attachment RLS - 5
Page 1 of 1

Confidential

Cause Nos. 44576/44602

Attachment RLS - 6
Page 1 of 1

Confidential

Data Request OUCC DR 83 - 03

In response to OUCC DR 73-6 e, IPL states "IPL has not received any emails from Citizens Energy notifying IPL of a steam anomaly." Please answer the following:
a. Does this response mean Citizens Energy has not found and mitigated any steam anomalies from January 2012 through the present?
b. If the answer to a. is no, please explain how Citizens Energy is notifying IPL of the steam anomalies if not through the joint email account referenced in the IPL Response to O'Neill Recommendations, page 5.

Objection:

Response:

a. No, the response to OUCC DR 73-6(e) means that Citizens had not used the email notification to advise IPL of a steam leak. Citizens would provide that type of information at the monthly meeting between IPL and Citizens Energy. Citizens has responded to IPL's emails with updates and completion of repairs on steam leaks IPL has reported.

b. Citizens Energy provides IPL with an updated report each month of steam leaks and their repair status. This report is provided to IPL at the monthly coordination meeting and the report is reviewed at that meeting.

Data Request OUCC DR 55 - 01

Regarding manhole inspection focus areas and "damage caused by steam leaks," please identify:
a. The specific location, date, time, and duration of each steam leak;
b. The specific type or nature of "damage" caused by each steam leak;
c. IPL's estimate of the cost, if any, of the damage caused by each identified steam leak;

Objection:

IPL objects to the Request on the grounds and to the extent it is overly broad and unduly burdensome, particularly to the extent it is not limited in time. IPL further objects to the Request on the grounds and to the extent the request seeks a compilation, analysis or study that IPL has not performed and to which IPL objects to performing. Subject to and without waiver of the foregoing objections, IPL provides the following response.

Response:

a) Fault events 2011-2015 where steam was thought to be a contributing factor:

Date of Event	Time of Event	Location of Event	Description of What Failed	Duration of Steam Leak
11/19/2011	21:26:00	24 S Delaware Street	Secondary cable failed in ductline between manholes	Unknown
3/2/2012	9:00:00	111 E Ohio	Primary cable failed in ductline between manholes	Unknown
6/7/2012	13:51:00	Michigan & Talbott	Primary splice failure in manhole	Unknown
6/13/2013	6:52:00	W of Pennsylvania / Southside of New York	Primary cable failed in ductline between manholes	Unknown
5/28/2014	6:39:00	N/W Corner Market & Delaware	Primary cable failed in manholes	Unknown

The data below shows the inspections results for 2012 – YTD 2015 where steam or high temperatures were found during the inspection. Whenever this condition is found, Citizens Energy is notified and they will take the appropriate actions to rectify the situation.

Date Inspected	Location	Notes
1/7/2012	North of Gardner Lane/West of West	Elevated temperatures in manhole
2/28/2012	Corner Michigan & Talbott	Elevated temperatures in manhole
3/5/2012	Corner Ohio & Pennsylvania	Elevated temperatures in manhole
3/29/2012	Corner Washington & Delaware	Elevated temperatures in manhole
4/4/2012	Corner Market & Muskingum	Steam entering manhole
4/4/2012	East of Muskingum on Market	Elevated temperatures in manhole
4/4/2012	Corner Walnut & Pennsylvania	Elevated temperatures in manhole
6/13/2012	Corner Maryland & Meridian	Elevated temperatures in manhole
9/13/2012	East of McCrea on Georgia	Elevated temperatures in manhole
9/22/2012	North of Virginia on Delaware	Elevated temperatures in manhole
10/3/2012	Corner Meridian & Court	Elevated temperatures in manhole
10/3/2012	Corner Michigan & Pennsylvania	Elevated temperatures in manhole
10/24/2012	Corner Maryland & Meridian	Elevated temperatures in manhole
11/21/2012	Corner Georgia & Illinois	Elevated temperatures in manhole
7/10/2013	Corner Wabash & Meridian	Elevated temperatures in manhole
7/11/2013	Alley South of North on Bird	Elevated temperatures in manhole
7/11/2013	Corner North & Bird	Elevated temperatures in manhole
7/16/2013	Corner New York & Meridian	Elevated temperatures in manhole
7/17/2013	Corner Ohio & Pennsylvania	Elevated temperatures in manhole
8/5/2013	North of Washington on Senate	Elevated temperatures in manhole
8/5/2013	Corner Court & Senate	Elevated temperatures in manhole
8/9/2013	Corner Michigan & Ogden	Elevated temperatures in manhole
8/12/2013	Corner New York & Pennsylvania	Elevated temperatures in manhole
8/16/2013	Corner Ohio & Senate	Elevated temperatures in manhole
9/10/2013	Corner Market & Illinois	Steam entering manhole
9/11/2013	West of Illinois on Washington	Elevated temperatures in manhole
4/22/2014	Corner Vermont & Talbott	Elevated temperatures in manhole
6/3/2014	Corner Vermont & Talbott	Elevated temperatures in manhole
10/11/2014	Corner Vermont & Senate	Elevated temperatures in manhole
10/24/2014	Corner Washington & Delaware	Elevated temperatures in manhole
2/4/2015	Corner Ohio & Pennsylvania	Elevated temperatures in manhole
3/2/2015	Corner Washington & Delaware	Elevated temperatures in manhole
3/25/2015	Corner Ohio & Pennsylvania	Elevated temperatures in manhole
3/25/2015	Corner Market & Delaware	Elevated temperatures in manhole
3/25/2015	East of Pennsylvania on Washington	Elevated temperatures in manhole
3/26/2015	Corner Walnut & Pennsylvania	Elevated temperatures in manhole
3/26/2015	South of Wabash on Delaware	Elevated temperatures in manhole
3/27/2015	Corner Capitol & Washington	Elevated temperatures in manhole
3/28/2015	West of Meridian on Ohio	Elevated temperatures in manhole
3/28/2015	Alley South of North at Bird	Elevated temperatures in manhole

3/28/2015	Corner Market & Delaware	Elevated temperatures in manhole
3/28/2015	Corner Michigan & Talbott	Elevated temperatures in manhole
3/28/2015	Corner Ohio & Alabama	Elevated temperatures in manhole
3/29/2015	Corner Court & Senate	Elevated temperatures in manhole
3/29/2015	Corner Vermont & Talbott	Elevated temperatures in manhole
3/29/2015	North of New York on Delaware	Elevated temperatures in manhole

b) Steam leaks cause high temperatures in the manhole and ductlines where the primary and secondary cables run. The high temperatures cause the insulating fluid in the cables to expand and flow away from the point of where the steam leak is heating the cables. This can result in causing the fluid to leak from the cables at a splice or weak point in the cable jacket leading to a cable or splice failure. The cable insulating papers can also dry out at the point of the steam leak resulting in a reduction in the dielectric strength of the insulation, again which can result in a cable failure.

c) The repair costs are charged to general maintenance accounts or blanket capital project numbers. The requested detail has not previously been compiled and is not readily available.

Data Request OUCC DR 73 - 06

Reference IPL's Response to Independent Assessment of Indianapolis Power and Light's Downtown Underground Network (i.e., O'Neill report dated December 13, 2011), pages 2-5, bullet points under the Tier I Recommendation.
a. Please provide access to the map in which IPL incorporated Citizens Thermal steam data and GIS data with the location of IPL's manholes and vaults.
b. Please provide the Citizens Thermal infra-red survey results since 2001 through 2012.
c. Please provide the results of IPL's evaluation of merging this data with IPL's failure data, including:
i. Current readings on secondary cables looking for current imbalances.
ii. Additional cable samples taken and results of laboratory analysis and evaluations
iii. Cables replaced as a result of these evaluations.
d. Please provide the monthly report of steam anomalies Citizens Thermal committed to provide to IPL beginning January 2012, through the present.
e. Please provide emails sent by Citizens Thermal to IPL notifying of steam anomalies and mitigation status, from 2012 through the present.

Objection:

IPL objects to the request on the grounds and to the extent it seeks specific detailed design information that constitutes Critical Energy Infrastructure Information ("CEII"). Such CEII is highly sensitive and the disclosure of which could endanger the public welfare and security. IPL further objects to the request o the grounds and to the extent it solicits confidential, proprietary and CEII information belonging to third parties. Subject to and without waiver of the foregoing objections, IPL provides the following response.

Response:

a) This map is considered Critical Energy Infrastructure Information and was made available for viewing to the OUCC at the meeting with IPL on June 17, 2015.

b) The following attachments contain Citizens Thermal infra-red survey results for the following years: 2001, 2003, 2005, 2006, 2007, 2008, 2009, 2010, 2011, and 2012. IPL was not provided with the information for 2002 and 2004.

OUCC DR 73-6 Attachment 1a & b – 2001
OUCC DR 73-6 Attachment 2a & b - 2003
OUCC DR 73-6 Attachment 3a & b - 2005
OUCC DR 73-6 Attachment 4a & b - 2006
OUCC DR 73-6 Attachment 5a & b - 2007

OUCC DR 73-6 Attachment 6a & b - 2008
OUCC DR 73-6 Attachment 7a & b - 2009
OUCC DR 73-6 Attachment 8a & b - 2010
OUCC DR 73-6 Attachment 9a & b - 2011
OUCC DR 73-6 Attachment 10a & b - 2012

c) This map is considered Critical Energy Infrastructure Information and was made available for viewing to the OUCC at the meeting with IPL on June 17, 2015.

i. Current imbalances have not been plotted
ii. Two cable samples were sent out for laboratory analysis. The lab results were inconclusive for thermal damage to the cable samples.
iii. No cable replacements were scheduled as a result of the laboratory analysis.

d) The monthly steam anomaly reports prepared by Citizens Thermal for the period of January 2012 through June 2015 are attached.

OUCC DR 73-6 Attachment 11 – 2012
OUCC DR 73-6 Attachment 12 – 2013
OUCC DR 73-6 Attachment 13 – Jan 2014
OUCC DR 73-6 Attachment 14 – Feb 2014 to Dec 2014
OUCC DR 73-6 Attachment 15 – Jan 2015 to Jun 2015

e) IPL has not received any emails from Citizens Energy notifying IPL of a steam anomaly; however, IPL does email Citizens Energy when IPL finds elevated temperatures in a manhole, as discussed in response to Staff DR 1-23.

Cause Nos. 44576/44602

Attachment RLS - 10
Page 1 of 1

Confidential