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 AND REGULATIONS 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

PETITIONER INDIANAPOLIS POWER & LIGHT COMPANY
COMPLIANCE FILING: ASSET MANAGEMENT
AND PERFORMANCE METRICS COLLABORATIVE

Petitioner Indianapolis Power & Light Company ("IPL"), by counsel and in compliance with the Order in this Cause dated March 16, 2016 (pp. 20 and 21), hereby files the attached report on the Asset Management and Performance Metrics Collaborative, which includes an updated Central Business District Underwork Network Gantt Chart, Asset Management Program

Oversight plans, 2016 Annual Performance Metrics Report and IPL Asset Management Self-Assessment.

Respectfully submitted,

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CERTIFICATE OF SERVICE

The undersigned certifies that a copy of the foregoing was served upon the following via electronic email, hand delivery or First Class, United States Mail, postage prepaid this 31st day of March 2017 to:

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Asset Management

&

Performance Metrics Initiative

March 31, 2017

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Executive Summary

In response to the Indiana Utility Regulatory Commission's ("IURC") Order (Cause No. 44602/44576, particularly P. 19-21), Indianapolis Power & Light Company ("IPL"), Commission staff, the Indiana Office of Utility Consumer Counselor ("OUCC"), and interested Intervenors developed a Collaborative to initially review IPL's implementation of the O'Neill Report recommendations, and collaborate on how to transparently track, report and verify IPL's improvements and progress in its Asset Management strategy including expanding IPL's previous focus on the Central Business District ("CBD") through its Underground Network Asset Life Cycle Plan. The Collaborative further reviewed and considered existing performance indices and ideas for enhancements to current metrics and adopted an initial set of performance measures for further review and development.

The Collaborative first met on April 22, 2016 at IPL's Morris Street facility and then regularly through March 8, 2017. The initial meetings included updating Stakeholders on the current state of IPL's CBD underground network system, reviewing IPL's asset management implementation, and developing a Collaborative Project Charter. With focus on common Collaborative goals established by the IURC's Order, the Stakeholders began discussing and drafting the Oversight Process and determining appropriate performance metrics.

The Oversight Process, including categories of measurement metrics presented in this filing, addresses IPL's Asset Management Process in a cost-effective and efficient manner in order to report on IPL's progress in implementing its Asset Management Process by, among other things, developing holistic performance metrics to measure IPL's performance over time and in comparison to other utilities. As part of the Oversight Process, the Collaborative engaged in initial "deep dives" into particular Asset Management topics.

Within the oversight process, the following Performance Domains were established as representative of IPL's performance:

- Safety
- Reliability
- Customer Satisfaction
- Operational Efficiency
- Affordability
- Financial
- Asset Management
- CBD Underground Network
- Staffing
- Generation

Within each Domain, specific Tier 1 and Tier 2 metrics were identified. These metrics represent a set of measures that are intended to enable the Stakeholders and the IURC to gauge IPL's performance across the Domains and relate to asset management performance. Tier 1 Metrics represent metrics and an evaluation framework that is expected to be published to the Collaborative on a monthly basis through August 2017, and annually to the IURC in each March

filing throughout the Collaborative process. Tier 2 Metrics will generally not be included in the standard Annual Performance Metrics Report; however, Collaborative stakeholders will be provided Tier 2 metrics in March 2018 and retain the right to request information from IPL throughout the Collaborative process.

The Collaborative has been successful in offering a path for the asset management assessment and performance metrics initiative, while leaving open the opportunity for adjustments and improvements as needed. In addition, all matters pertaining to this initiative were discussed collegially and generally resolved with engagement of all participating Stakeholders.

In this filing, IPL has incorporated numerous revisions provided by the OUCC and participating Intervenors. The OUCC and participating Intervenors provided the following explanation to further detail their involvement in the Collaborative:

As part of the Collaborative effort it is understood by IPL and all other participants that the OUCC and participating Intervenors offered their good faith initial observations and comments in the collaborative process in order to further the Asset Management system reliability and Performance Metrics goals enunciated by the IURC's Order, and are grateful for the IURC creating the opportunity and for IPL's participation in this initial effort. While IPL has been cooperative in implementing discussing and in some cases incorporating suggestions and observations from the OUCC and Intervenors, the final control over the content of this document and outcomes from this Collaborative and its documents rests with IPL, and the lack of a separate filing from the OUCC or Intervenors does not imply that the content here is necessarily the best possible or the same content that would have been created had they made their own independent filing. Further, OUCC and Intervenors do not control the content, implementation, measurement or future developments regarding IPL's Asset Management efforts or any measurement or data point included in the initially selected set of Performance Metrics. Similarly the OUCC and Intervenors did not perform independent engineering or financial analysis in this Collaborative. As such, for clarity, the documents contained within this filing, including Appendix B, C, D, E, F, and G, are documents generated by IPL and reviewed, not validated, by the OUCC and participating Intervenors. Further, the OUCC's and Intervenors' participation in and the results of this stakeholder Collaborative process are not intended to be nor should be construed as any admission, waiver or acquiescence by the Intervenors of any possible future positions, concerns, actions or issues related to the Collaborative topics, e.g. Asset Management or Performance Metric content, implementation, financing, progress, data, measurement and all other matters related to the topics of this Collaborative.

Finally, the IURC's Order required the Oversight Process to reflect feedback from the OUCC and participating Intervenors and include a summary of their discussions and alternative proposals. As mentioned above, while IPL is the main author of this filing, significant revisions and proposals from the OUCC and participating Intervenors have been incorporated. Currently, IPL is unaware of any alternative proposals that may rise to the level of a separate filing, as all components of the Oversight Process have been determined through the Collaborative process and with consensus of the OUCC and participating Intervenors. Additionally, the OUCC and participating Intervenors reserve the right to file comments in response to this filing.

Background

As a result of the IURC investigation into IPL's ongoing investment in, and operation and maintenance of, its network facilities (Cause No. 44602/44576), the IURC ordered that a Collaborative be established including IPL, Commission technical staff, as well as potentially the OUCC and any other Intervenors that desire to meet and collaborate on a path moving forward in reviewing IPL's implementation of its Asset Management strategy, expanding on its focus on the CBD Underground Network, and assessing the efficacy of existing performance indices, enhancements to current metrics, and adoption of new performance measures going forward.

IPL established the Collaborative by requesting any interested party to the rate case ("Stakeholders") notify the Company of its desire to participate in the Collaborative. Participating Stakeholders include the IURC Staff, OUCC, Citizens Action Coalition ("CAC"), IPL Industrial Group[1], and the City of Indianapolis. The first meeting among the Collaborative participants was conducted on April 22, 2016 by a professional third party facilitator[2] retained by IPL at IPL's Morris Street facility. At this meeting, IPL presented information regarding the state of its CBD underground network system as well as an overview of its asset management implementation. Meeting participants were engaged in a discussion regarding the initial Project Charter and the process for the Collaborative (see Appendix A for Collaborative Project Charter).

The second Collaborative meeting was held on May 11, 2016. This meeting's agenda included a discussion of a strawman of the Oversight Process and performance metrics. The Collaborative next met on May 31, 2016 to further discuss the Oversight Process and performance metrics. At this time, a subgroup was established to focus on how best to track, report and verify the progress IPL has made, as well as to define metrics regarding asset management and the CBD underground network system. The subgroup had a number of teleconferences between the May 31, 2016 and June 24, 2016 Collaborative meetings to establish recommendations for the full Collaborative group.

At the fourth Collaborative meeting, held June 24, 2016, the Collaborative reviewed the work products of the subgroup, further discussed the strawman of the Oversight Process and discussed how performance metrics would be reported. The fifth Collaborative meeting was held July 14, 2016. During this meeting, the Collaborative reviewed the work products of the subgroup, the draft Performance Metrics Report and the draft July 22nd Filing.

At the July 14th Collaborative meeting, Stakeholders scheduled three monthly "Deep Dive" meetings rather than the bi-monthly meetings anticipated by the Oversight Process. Those meetings took place on August 3, 2016, September 7, 2016 and October 4, 2016. Topics of these meetings included further refinement of the Oversight Process and "Deep Dive" discussions on

[1] Counsel for the IPL Industrial Group participated in the first meeting. They did not participate in subsequent meetings. Counsel for the Industrial Group was, however, a party to all communications exchanged within the Collaborative and among participating Stakeholders.
[2] All Collaborative meetings were facilitated by Stewart Ramsay, Senior Partner at Vanry & Associates, Inc.

various topics, such as CBD inspection and work order process, Customer Service and Residential affordability and capital project prioritization.

Starting in November, the Collaborative met bi-monthly until March 8, 2017. At the November 10th meeting, the Collaborative reviewed A&G expenses and methodologies and continued to refine the performance metrics with the inclusion of Generation metrics. During the January 12th meeting, the Collaborative further discussed appropriate Public Safety metrics and reviewed the draft Annual Performance Metrics Report.

The Collaborative will next meet in March 2018 to discuss the March 31, 2018 Annual Performance Metrics Report. All communication between the Collaborative stakeholders and IPL after March 31, 2017 will continue to be subject to Nondisclosure Agreements associated with IURC Cause No. 44602/44576 and should be directed to IPL's regulatory counsel . The Collaborative stakeholders retain the ability to share documents and information with each other through the document sharing website (Kiteworks), and through electronic communication using the Collaborative email distribution list.

Following the first Collaborative meeting and continuing through May and June 2016, IPL responded to requests for information from Stakeholders as they considered various approaches to evaluate the utility's performance.

Agendas and attendee sheets for each of the meetings through March 8, 2017 discussed above are included as Appendix B.

Oversight Process

Objectives

In accomplishing the outlined objectives, the Oversight Process should help facilitate an alignment of priorities, improved Stakeholder communication and increased confidence in IPL's management of the business. Consistent with the objectives outlined in the Commission's Order in IURC Cause No. 44602/44576, the goal of the Collaborative Oversight Process is to provide a framework to evaluate IPL's Asset Management practices in a cost-effective and efficient manner. Further, the Order calls for a report on IPL's progress in implementing its Asset Management Process, among other things, by developing holistic performance metrics to measure IPL's performance over time and in comparison to other utilities. Without incurring any unnecessary costs, the objectives of the Collaborative Oversight Process are to provide transparency to IPL's performance and increase the confidence of the Commission and Stakeholders in IPL's management through:

- Tracking, reporting and verifying progress of IPL in implementing its Asset Management process and executing its CBD Underground Network Asset Lifecycle Plan; and

- Periodic reporting of a set of metrics focused on, but not exclusive to, the electric distribution business, (e.g. including areas such as safety, reliability and customer satisfaction) and that also considers the customer experience.
- Establishing metrics that are both directly and indirectly related to asset management that will be useful over time to measure the performance of IPL at the present time and in the future and to facilitate comparisons to other utilities.

All elements of the process are subject to change/refinement over the course of the Collaborative to improve the quality and usefulness of information tracked in the process or to improve the overall flow and cadence of the process itself.

Table 1 – Oversight Process Overview

Objectives	In accomplishing the above objectives, the Oversight Process should help facilitate an alignment of priorities, improved Stakeholder communication, and increased confidence in IPL's management of the business. • Tracking, reporting and verifying progress of IPL in implementing its Asset Management process and executing its CBD Underground Network Asset Lifecycle Plan; and • Periodic reporting of a set of metrics focused on, but not exclusive to, the electric distribution business, (e.g. including areas such as safety and customer satisfaction) and that also contemplates the customer experience. • Establishing metrics that are both directly and indirectly related to asset management that will be useful over time to measure the performance of IPL at the present time and in the future and to facilitate comparisons to other utilities.	
	Phase 1 **Build/Execute/Refine**	**Phase 2** **Sustain/Refine**
Activities	• Test/validate/adjust decisions made during the Collaborative regarding scope and function of the Oversight Process • Refine communication and reporting protocols • Achieve consensus, where possible, on any open issues emanating from the Collaborative • Develop/deliver reporting on selected metrics • Periodic in-person meetings to review progress and discuss changes in performance • Refine content of information and frequency of reporting and meetings as deemed appropriate by Stakeholders • "Deep Dives" – in-depth study of particular topics, including asset management.	• Reporting on key measure areas • Annual review of Performance Metrics • Define peer groups and other sources of comparison • Discuss appropriate matters of interest • Discussion of potential innovation • Discussion of aspirational performance levels, objectives and impacts • Discuss areas of beneficial change or refinement of the Oversight Process
Participants	• All participating Collaborative stakeholders	
Deliverables	• Performance metrics • Lessons learned / insights gained • Process and measurement refinements	• Performance metrics • Innovation briefs • Performance initiative briefs
Roles	• IPL – Performance reporting • All – review of metrics and "deep dives" into particular topics and discussion of progress and underlying performance	• IPL – performance reporting, innovation briefs, initiative briefs • All – Review and feedback on IPL-approved innovation and initiative briefs • All – Development of innovation briefs on innovations being proposed by the IURC

Schedule / Durations	• Begins upon completion of design phase ("the Collaborative") • 12 months ended March 31, 2017	• Begins once confidence is sufficient • Transitions to an ongoing process

Oversight Process Overview

The Oversight Process is to evaluate IPL's Asset Management Process in a cost-effective and efficient manner in order to report on IPL's progress in implementing its Asset Management Process, among other things, by developing holistic performance metrics to measure IPL's performance over time and in comparison to other utilities.

Table 2 – Cadence of the Oversight Process

MONTHLY	
• IPL issues the Performance Metrics Report (defined in collaboration with all Stakeholders) monthly until August 2017 and then annually until further addressed by the IURC. • Stakeholders review the report, make assessments and forward any questions or concerns to IPL (copying all Stakeholders). The questions will be addressed as part of the in person meetings through March 31, 2017, or through electronic communication after March 31, 2017, unless the IURC or Stakeholders identify the question as being of an urgent nature.	
EVERY SECOND MONTH[3]	
• Meeting of all Stakeholders will be bi-monthly for 12 months ending March 8, 2017, unless otherwise determined by the Collaborative. • All Stakeholders collaboratively assess the value of the Performance Metrics Report and "Deep Dives" into particular topics and identify, agree upon, and implement enhancements.	
Time Frame	**Activity**
T-2 weeks	Stakeholders may provide discussion topics to IPL
T-1 weeks	IPL provide Agenda and most recent Standard Reporting Package of Metrics and any relevant information in relation to the areas highlighted by the Stakeholders.
T+0	Bi-Monthly Meeting (see below for initial Agenda)

[3] At the Collaborative meeting held on July 14, 2016, Stakeholders scheduled monthly meetings rather than the bi-monthly meetings anticipated by the Oversight Process. Those meetings took place on August 3, 2016, September 7, 2016, October 4, 2016 and November 10, 2016 and subsequently returned to the bi-monthly cadence. Topics of these meetings included further refinement of the Oversight Process and "Deep Dive" discussions on various topics, as determined by the Collaborative.

The following standard agenda provides the framework for the bi–monthly Collaborative Meeting:

- Safety Message
- Review of Action Tracking Log (as applicable)
- Review of Monthly Performance Metrics Report (as applicable) (addressing metrics and other agreed upon focus areas) with specific discussion on any Performance anomalies
- Additional Items and "Deep Dive" session (based on Stakeholder requests)
- Summarize Actions

Asset Management

The Commission's Order at page 19 provides for an initial assessment of and recommendation for IPL's asset management, including documenting in some detail, the process by which the asset management program serves to address the risk and performance of the system to be submitted by the Collaborative within six months of the first meeting of the Collaborative and in follow-up annual reports to the Commission.

To initially meet this directive, IPL's progress in further improving its Asset Management process was tracked and reported through use of an Asset Management Oversight Report (see Appendix D), to assure that both the strategic and tactical elements of an effective Asset Management process are in place and that the underlying objectives of increased transparency and improved stakeholder confidence are achieved. Appendix D was updated as of March 31, 2017. There are three facets to consider in providing this oversight:

- Asset Life Cycle Planning, where IPL reported progress achieved in developing and implementing Asset Life Cycle Plans ("ALCPs") for 19 of the more critical asset classes, and monitoring and managing the performance of these assets. In this manner, stakeholders were able to see the extent to which IPL has implemented actions related to the maintenance, replacement and repair of its assets.
- Asset Management Program Implementation, where IPL reported progress in complying with and continually improving its implementation of an Asset Management process. Whereas the focus on Asset Life Cycle Planning confirms the extent to which IPL complies with its stated commitments (*i.e.;* tactical), this portion of the report addresses the more strategic and foundational elements that assure that in meeting these commitments, the right things are being done correctly. Both perspectives are required to garner confidence that the program is achieving its stated purpose.
- Acknowledging the limitations of routine reporting in capturing the full essence of the concepts that underlie effective Asset Management, the report maintains a listing of relevant topics for "Deep Dives," which took place during the update meetings outlined in the "Cadence of the Oversight Process." Topics addressed at those Deep Dives included:

    - CBD Inspection and Work Order Process

- CBD Asset Health Indexing Method
- Residential Customer Affordability
- Capital Project Prioritization Process
- Asset Life Cycle Plan Status
- Administrative and General Expenses and Methodologies
- Pilot Projects / Innovation Currently Being Applied within IPL (Duct Line Temperature Monitoring)

Further, IPL's progress in implementing its CBD Underground Network Asset Life Cycle Plan through March 8, 2017 was reported through use of a CBD Underground Network Asset Management Oversight Report (see Appendix E) presenting three key perspectives:

- The CBD UG Asset Life Cycle Program Oversight, summarizing the completeness of IPL's CBD UG Life Cycle Plan for 9 asset classes across 13 attributes that define a complete Asset Life Cycle Plan,
- The Current CBD UG Network Initiatives Tracking Report, providing a listing of all open CBD UG initiatives with scope, objective, next steps (near-term view) and projected completion date, and
- Completed / Ongoing CBD UG Initiatives, providing a listing of all CBD UG initiatives that were listed in the CBD UG Asset Life Cycle Plan, deemed completed by IPL. In this context, "ongoing" refers to those initiatives that have a continuing aspect to them even after initial completion to satisfy a requirement.

In each annual March filing with the Commission, starting on March 31, 2017, IPL commits to updating its Gantt chart with these strategic and tactical elements of its asset management process, in order to continue to keep the Collaborative stakeholders and the IURC apprised of its progress. This will continue until the commitments outlined in the Gantt chart are complete.

In addition to the Gantt chart and performance metrics details in this document, in each Annual Report IPL will include in narrative form a summary of updates to the Asset Management Program Oversight Report in Appendix D. This narrative will serve to update the Commission on the status of IPL's progress in implementing its asset management commitments. The narrative will also include asset management related work completed in the previous year and a description of the status of any new technologies or programs.

Performance Domains and Metrics

The following Performance Domains have been established through the Collaborative process. These are the Performance Domains that the Collaborative determined are of greatest importance to all Stakeholders. A multi-dimensional framework, summarized in Table 3 below, will be used by IPL to account for the varying levels of detail that may apply in monitoring and reporting its performance across the agreed upon Performance Domains.

The Metrics, identified in Table 3, represent a set of measures that are intended to allow the Stakeholders and the IURC to gauge IPL's performance across these Domains.

- Tier 1 Metrics represent those metrics and evaluation frameworks that will be monitored and reported to the Collaborative on a monthly basis through August 2017, and annually to the IURC in each March filing throughout the Collaborative process.
- Tier 2 Metrics will generally not be included in the standard Annual Performance Metrics Report; however, Collaborative stakeholders will be provided Tier 2 metrics in March 2018 and retain the right to request information from IPL throughout the Collaborative process.[4]

In the case of Asset Management and the CBD Underground Network, the measurement of performance extends beyond Performance Metrics, and focuses on two distinct Oversight Sub-processes within this process. They are addressed below and expanded upon in Appendices E and F through issuance of an initial report for each area. The specific key performance indicators ascribed to these areas will be included in the monthly Performance Metrics Report through August 2017, and annually in each March filing throughout the Collaborative process.

IPL will offer for inspection and discussion specific key reliability performance data and metric indicators to support and provide better understanding of its Tier 1 Reliability Domain and Metrics relating to SAIDI on Major Event Day ("MED") and threshold MED ("T_{MED}").[5]

Table 3 –Proposed Performance Metrics and Evaluation Frameworks

Domain	Tier 1 Metric / Measure	Tier 2 Metric / Measure
IPL Safety	Lost Time Incident Rate (employee and contractor)	OSHA Incident Rate
Public Safety	Number of tickets from Indiana 811 to locate underground facilities received versus number of ticket not located in 2 working days	
	CBD Contact Voltage Inspection Results	
	Section 114 Notices Submitted to the IURC	
Reliability	SAIDI – MED (System Average Interruption Duration Index) (Including and Excluding MEDs)	CELID-5 (Non-MED) (Customers Experiencing Long Interruption Durations > 5 hours)
	SAIFI – MED (System Average Interruption Frequency Index) (Including and Excluding MEDs)	CEMI-4 (Non-MED) (Customers Experiencing Multiple Interruptions in excess of 4 per year)
	CAIDI – MED (Customer Average Interruption Duration Index) (Including and Excluding MEDs)	
	MAIFI – Non- MED (Momentary Average Interruption Frequency Index)	
	T-MED - Major Event Day threshold value (T_{MED}) calculated in accordance with IEEE Standard 1366.[6]	
	MED – Major Event Day (a day in which the daily SAIDI exceeds the threshold MED, T_{MED}. Year-To-Date number of MED)	

[4] At any time the Collaborative may determine it necessary to move certain metrics between Tier 1 and Tier 2.
[5] This information will be made available to participating Stakeholders that have executed a nondisclosure agreement with IPL.
[6] IEEE Guide for Electric Power Distribution Reliability Indices, IEEE Standard 1366-2012, May 31, 2012.

	MED – daily statistics of SAIDI and SAIFI	
Customer Satisfaction	First Call Resolution	Billing Accuracy
	Service Level (Calls answered within 60 seconds)	JD Powers Survey
		Internal IPL Customer Satisfaction Survey
		IURC Customer Complaints
Operational Efficiency	O&M Spending per Customer	
	Capital Expenditure per Customer	
Affordability	Comparison of IPL residential bills per 1000 kwh with other Indiana IOUs	Number of Residential Services
	Comparison of IPL residential bills per 1000 kwh with 20 largest cities served by IOUs	LIHEAP Participants
	Service Disconnections for Non-payment	
	Percentage of Accounts Receivable in Arrearages	
	Accounts Sent Notice of Disconnection for Non-payment	
Financial	T&D Current vs. Historic Spending – CAPEX	
	T&D Current vs. Historic Spending – O&M	
Asset Management	Percent of Planned Maintenance Completed	
	Renewal Rates	
	Asset Condition Rating	
CBD Underground Network	CBD Underground Network Milestone Schedule / Updated Gantt Chart	
	Reportable[7] CBD Underground Events	
	Number of customer outages associated with Reportable CBD Underground Events	
	Equipment/Component Failures	
Staffing	Employee Turnover Rate	Employee Turnover Rate for Substation and CBD
Generation (PETE & HSS Units 5, 6, & 7)	EFOF (Equivalent Forced Outage Factor)	
	EAF (Equivalent Availability Factor)	
	ESOF (Equivalent Scheduled Outage Factor)	
	NCF (Net Capacity Factor)	

The following discussion defines each of the "Tier 1" metrics and explains the relevance of each metric to the Oversight Process, including the manner in which each metric will be reported.

IPL Safety – Lost Time Incident Rate, a metric reported to the Federal Occupation and Health Administration (OSHA) and the State of Indiana, is a standard metric used across the industry. Intended to be a rate per 100 full-time employees ("FTEs"), it is calculated by multiplying the number of lost time cases by 200,000 (100 FTEs x 2,000 hours per year) and dividing that result by the total number of employees (and "full-time" contractors) labor hours worked. In this

[7] A Reportable CBD Network Event is one in which sustained fire or smoke emanates from a manhole or through the grate of a transformer vault and may involve a response from Indianapolis Fire Department ("IFD"). Not all Reportable CDB Network Events are significant or due to IPL facilities. Additionally, a response by IFD is not dispositive of a significant event.

manner, both full and part-time employees (as well as contractors fulfilling supplemental staffing roles) are included in the statistic. This will be reported annually and will show a five-year historical trend, separating IPL employees and "full-time" contractors.

Public Safety – Public safety is an integral part of providing safe and reliable electric service. Likewise, ensuring the safety of IPL's employees, customers, suppliers, and the public is of the highest priority.

- Public safety can be monitored by reviewing the number of tickets from Indiana 811 to locate underground facilities received versus number of ticket not located in 2 working days. The "call before you dig" process helps to protect the public from accidental contact with energized equipment.
- Section 114 Notices submitted to the IURC will be reported to indicate the number of incidents where the public was injured by IPL equipment (segregating events where IPL was not at fault)
- In in 2015 and 2016, IPL performed contact voltage surveys in the downtown area to identify abnormal voltages. The survey is a proactive measure to look for potential hazards to the public and remediate as necessary. The equipment used can detect voltage differences over 1 volt. All voltages over 5 volts are remedied.

Reliability – In 2012, IPL adopted the IEEE-1366 methodology and definitions of Reliability Metrics for purposes of reporting reliability performance and representing customer experience. Since 2013, IPL filed its Annual Performance report with the Commission based on the IEEE-1366 definitions.

- SAIDI and SAIFI measure the experience of the average customer (system-wide) in terms of electrical power interruption duration and frequency. In reporting these metrics with and without major events (i.e. including and excluding MEDs), IPL is reporting its overall system performance in terms of (1) what they can be held accountable for (performance excluding MEDs) and (2) the total customer experience (including MEDs).
- CAIDI provides a measure of the average outage duration for a customer experiencing an outage; and again, for the sake of presenting both what IPL can be held accountable for and the total customer experience, this metric will be reported including and excluding major event days (MEDs).
- MAIFI accounts for the fact that the previous SAIDI and SAIFI metrics exclude service interruptions of less than five minutes (referred to as "momentary" interruptions), but this category of interruption can cause frustration among both residential (inconvenience of resetting older digital devices) and commercial / industrial (costly impact in the form of lost productivity) customers.
- T-MED (or T_{MED}) is the Major Event Day (MED) threshold value calculated at the end of each year using daily SAIDI of five sequential years. Any day (of the reporting) with daily SAIDI that exceeded the threshold value T_{MED} is classified as an MED. T_{MED} is calculated in accordance with the IEEE Standard 1366. Daily SAIDI and SAIFI will be provided for each MED to help indicate the severity of the service interruptions.

Customer Satisfaction – IPL is committed to continuous improvement in the area of customer satisfaction, acknowledging that many of the metrics presented in the other Domains (e.g. Reliability, Operational Efficiency, and Affordability) are as important to customer satisfaction as they are to the Domains they serve. With that in mind, IPL will track and report on the following customer satisfaction centric metrics:

- Service Level (Calls Answered within 60 Seconds): Speedy answering of a call is an obvious factor in satisfying a customer, particularly given that many calls start with a dissatisfied individual or challenging situation. Having only started tracking this metric since 2015, IPL will report the percent of calls answered within 60 seconds by month starting in 2015. The goal will be to show a five-year historical trend.
- First Call Resolution: First Call Resolution is somewhat similar to the Service Level metric (Calls Answered within 60 Seconds), but takes it to the next level: the issue is actually resolved satisfactorily. IPL currently tracks this metric and will provide a five-year trend of percent of calls resolved during first call.

Operational Efficiency – Operational efficiency, viewed in conjunction with Reliability and actual Capital Investment and O&M Spending levels, provides a fairly comprehensive view of how well an electric utility is managing its assets. By comparing and trending Capital Investment per customer and O&M Spending per customer, and correlating any trends with its reliability and asset renewal rates, one will likely be able to identify strategic inflection points prior to an obvious deterioration in electric system performance.

Affordability – Affordability represents the fourth leg of the customer satisfaction challenge (operational efficiency, reliability and customer satisfaction itself representing the other three).

- IPL currently tracks its residential bill on a dollar per 1,000 kwh basis, and compares these costs with the other Indiana IOUs and 20 of the largest cities served by investor-owned electric utilities in the US on an annual basis. This information will be provided in the monthly Performance Metrics Report through August 2017, acknowledging that it will be updated annually.
- Service Disconnections for Non-Payment: Though likely not an indicator of electric utility performance, it can serve to inform stakeholders of any trends that may be developing, and prompt dialogue and response. IPL will report Number of Disconnects and Number of Accounts Sent Notice of Disconnection, showing a five-year trend by month. In addition, IPL will report the Percentage of Accounts Receivable in Arrearages.

Financial – Viewed by themselves, the actual investment (CAPEX) and spending (O&M) levels may not be particularly informative. But viewed together, trended and in the context of the other Performance Domains (particularly Reliability, Asset Management, the CBD UG Network and Operational Efficiency), and with variations shown over time, they can be helpful at isolating any issues that might arise during this oversight process. IPL will provide a five-year profile of Capital Investment and O&M Spending levels.

Asset Management – The following performance metrics will be included within the framework of IPL's monthly Performance Metrics Report through August 2017, and annually in each March filing throughout the Collaborative process:

- Percent of Planned Maintenance Completed, reported annually by type of inspection or test (system and CBD UG Network), is simply the number of planned maintenance activities completed divided by the total number of planned maintenance activities scheduled.
- Renewal Rate (Percent of Assets Replaced), reported annually, is calculated on an asset class basis as the ratio (expressed in terms of percent) of number of assets replaced or refurbished to total number installed.
- Asset Condition Rating is used to determine the health of individual assets and to identify the risk of an asset failure by scaling the health of an asset by the consequence of failure for that asset. The health of an asset indicates how the asset compares to the desired condition. Assets are prioritized for remediation by the risk as asset failure.

These Asset Management metrics provide a glimpse into the effectiveness of IPL's Asset Management program, offering a macro view of its adherence to a maintenance plan, a sound replacement / refurbishment program, and once placed in operation, use of asset condition and performance data to inform Asset Management decisions.

NOTE: In addition to the Asset Management metrics designated in this filing, the Collaborative developed an Asset Management Program Oversight Report to assess IPL's Asset Management practices on an ongoing basis. The Asset Management Assessment Program Oversight Report has been memorialized in Appendix D (updated as of March 31, 2017).

CBD Underground Network – The following performance metrics will be tracked within the framework of IPL's monthly Performance Metrics Report through August 2017, and annually in each March filing throughout the Collaborative process:

- CBD Underground Network Milestone Schedule and Updated Gantt Chart, providing continued visibility to the activities that have been tracked by all stakeholders since the submittal of the O'Neill Management Consulting Investigative Report (see Appendix F).
- Number of Reportable[8] CBD Underground Events per Year, reported annually and will show a five-year historical trend.
- Number of customer outages associated with Reportable CBD Underground Events, reported annually and will show a five-year historical trend.
- Total Number of Equipment / Component Failures, reported annually and will show a five-year historical trend.

[8] A Reportable CBD Network Event is one in which sustained fire or smoke emanates from a manhole or through the grate of a transformer vault and may involve a response from Indianapolis Fire Department ("IFD"). Not all Reportable CBD Network Events are significant or due to IPL facilities. Additionally, a response by IFD is not dispositive of a significant event.

NOTE: In addition to the CBD Underground metrics designated in this filing, the Collaborative developed an CBD Underground Network Asset Management Program Oversight Report to assess IPL's Asset Management practices in the CBD Underground Network on an ongoing basis. The CBD Underground Network Asset Management Program Oversight Report has been memorialized in Appendix E (updated as of March 31, 2017).

Staffing **–** In order to provide greater visibility to the sustainability of the business from a staffing perspective, IPL will report Employee Turnover Rate (the ratio of terminations, resignations and retirements to total number of employees in IPL's Transmission and Distribution organization).

Generation – To maximize the availability of assets, an optimal balance is achieved by planning the amount of scheduled outages to reduced forced outages. IPL will report the following Generation metrics:

- EFOF is the percent of time that a unit was unavailable because of a forced event (derate or outage) for a given period of time.
- EAF is the percent of time that a unit was available to run for a given period of time.
- ESOF is the percent of time that a unit unavailable because of a scheduled event (derate or full outage) that is either planned or to perform maintenance for a given period of time.
- NCF is the ratio of actual realized generation to a Unit's rated net maximum capacity expressed as a percent for a given period of time.

Peer Group / Industry Comparisons

Peer Group / Industry comparisons will be introduced as the Oversight Process matures from Phase 1 (Build / Execute / Refine) to Phase 2 (Sustain/Refine).

Peer Group Panels (depending on the Domain and specific metrics, it is not unusual to utilize multiple panels) will be selected among utilities that operate under similar circumstances. So, in addition to the Indiana utilities, other utilities of similar size (300k to 600k customers), serving a State Capital, and/or having other similar characteristics regarding urban / rural, underground / overhead mix will be considered.

Not every metric lends itself to be a benchmarked comparison. In some instances, IPL trends may be more appropriate to track.

Last, the identification of Industry Best Practices will not be constrained by those in use by the participants in a Peer Group. We would intend to adopt an industry-wide perspective, applying the following criteria in qualifying a practice as "industry leading." These practices should:

- Be relevant to metrics being tracked or reported on (not unrelated);
- Add "demonstrable" value (e.g., lower cost, higher reliability, reduced risk, greater transparency, higher customer satisfaction, etc.)

- Not be a marginal or risky practice – should actually be used by a reasonable group of electric utilities with acknowledged strong performance in the area specific to the practice being considered; and
- Be practical and affordable for IPL with respect to funding constraints and overall prudence.

Thus, IPL, the IURC, and Stakeholders will be able to make clear distinctions between "Best Practice" and innovative ideas that may be worth exploring.

Reportable Performance Metrics

In reviewing the section, "Performance Domains and Metrics," one can see the Collaborative has established a Performance Metric Reporting Framework that spans beyond IPL's Electric Transmission and Distribution business (*e.g.;* Safety, Affordability, Customer Satisfaction, and Generation). The following Table 4 restates the "Tier 1" metrics and provides current state (where possible) or directs the reader to the Annual Performance Metrics Report which is issued in tandem with the Oversight Process document as Appendix G.

Table 4 – Reportable Performance Metrics
(Definitions, Context and Reporting Summarized in Table 3 and Expanded Upon in Subsequent Discussion)

Domain	Tier 1 Metric	Current State (December2016)
IPL Safety	Lost Time Incident Rate (employee and contractor)	0.35
Public Safety	Number of tickets from Indiana 811 to locate underground facilities received versus number of ticket not located in 2 working days	87.2%
	CBD Contact Voltage Inspection Results	All Correctable Items Repaired
	Section 114 Notices Submitted to the IURC	2
Reliability	SAIDI (excl. / incl. MEDs) - minutes	61.7 / 232.3
	SAIFI (excl. / incl. MEDs) - incidents	0.75 / 1.17
	CAIDI (excl. / incl. MEDs) - minutes	82.7 / 198.2
	MAIFI - incidents	2.32
	T-MED (*Unit must be in accordance with IEEE Std 1366 calculations) - minutes	2.7 (Actual value for 2016)
	MED (number of Major Event Days)	9
	MED – daily statistics of SAIDI and SAIFI	NOTE 1
Customer Satisfaction	First Call Resolution	86%
	Service Level (Calls answered within 60 seconds)	80%
Operational Efficiency	O&M Spending per Customer	$130
	CAPEX per Customer	$203
Affordability	IPL Residential Bill per 1,000 kwh vs. other Indiana IOUs[9]	$107.42 (least expensive) (As of July 1, 2016)
	IPL Residential Bill per 1,000 kwh vs. 20 largest cities served by IOUs[10]	$107.42 (3rd least expensive) (As of July 1, 2016)
	Service Disconnections for Non-payment	1,425 (Monthly)

[9] Survey results are based on the 2016 IURC Residential Bill Survey.
[10] Survey results are based on an annual national survey by an outside accounting firm.

	Percentage of Accounts Receivable in Arrearages	15.6%
	Accounts Sent Notice of Disconnection for Non-payment	71,352 (Monthly)
Financial	T&D Current vs. Historical Spend – CAPEX	$100M
	T&D Current vs. Historical Spend – O&M	$64M
Asset Management	Percent of Planned Maintenance Completed	NOTE 2
	Renewal Rates	NOTE 3
	Asset Condition Rating	NOTE 4
CBD Underground Network	Milestone Schedule / Gantt Chart	Appendix F
	Reportable CBD Underground Events	1
	Number of customer outages associated with Reportable CBD Underground Events	1
	Equipment & Component Failures	15
Staffing	Employee Turnover Rate	9%
Generation **(PETE & HSS Units 5, 6, & 7)**	EFOF	2.9% PETE / 4.8% HSS
	EAF	86.7% PETE / 69.5% HSS
	ESOF	10.4% PETE / 25.7% HSS
	NCF	61.6% PETE / 30.9% HSS

NOTES:

1. Refer to Page 9 of the Annual Performance Metrics Report for MED data.
2. Refer to Page 21 of the Annual Performance Metrics Report as the percent of Planned Maintenance Completed is specific to each type of test and inspection.
3. Refer to Page 22 of the Annual Performance Metrics Report as the renewal rates vary by Asset Class.
4. Refer to Pages 22 – 24 of the Annual Performance Metrics Report as the asset condition ratings vary by Asset Class.

Conclusion

Consistent with the IURC Order, IPL and Collaborative participants collegially developed a path for moving forward with the asset management assessment and performance metrics initiative. Specifically, the Oversight Process outlined above serves the following objectives:

- Aids IPL in improving its asset management processes.
- Increases transparency to the Commission and the public, especially with respect to how key asset decisions are made and documented.
- Addresses areas in which additional written processes may be appropriate, in order to avoid ad-hoc improvements that respond to current needs or desires of other entities, rather than from a well-developed and well-documented internal process.
- Determines what part of IPL's asset management process is mature and solid versus what is still aspirational.
- Determines how best to track, report, and verify IPL's progress in further improving its Asset Management process and executing the CBD Underground Network Asset Lifecycle Plan.
- Defines a set of metrics to measure IPL's performance over time and facilitate comparisons to other utilities to better foster continual improvements, and support

constructive dialogue between the IURC and IPL with regard to progress and performance.

- Establishes an approach to performance management that is cost-effective and efficient, demonstrating IPL's focus on the performance of IPL.

Appendix

A. Collaborative Project Charter

Appendix A is the result of discussion and consensus reached by the OUCC, IURC, and IPL. Appendix A was offered to the Stakeholders for additional comments and as of the time of this filing, no additional comments have been received.

B. Meeting Agendas and Attendee Sheets

The Facilitator, with input from the participating Stakeholders, established detailed agendas for each Collaborative meeting. Attendance was taken at each of the Collaborative meetings.

C. AES Asset Management Policy – US Strategic Business Unit

Appendix C is a copy of the US Strategic Business Unit Asset Management Policy. The AM Policy is a high level statement of the principles, approach and expectations relating to asset management. The AM Policy receives the same level of commitment as the Safety Policy. The AM Policy provides the framework around which the AM Strategy, Objectives and Plans are developed and implemented.

D. IPL's Asset Management Program Oversight Report

The document in Appendix D reflects IPL's assessment of its progress in implementing an Industry-Leading Asset Management Program. Though the reporting formats and attributes used to present this information have been accepted by the Collaborative, the assessment itself reflects IPL's view of progress-to-date. It illustrates IPL's status of asset life cycle plan building blocks and documents IPL plans to continue to improve the asset management processes. Appendix D was updated as of March 31, 2017.

E. IPL's Central Business District (CBD) Underground (UG) Network Asset Management Program Oversight Report

Appendix E is a report reflecting IPL's assessment of its progress in implementing an Asset Management Program for its CBD UG Network. Similar to Appendix D, the reporting formats and attributes used to present this information have been accepted by the Collaborative, but the assessment itself reflects IPL's view of progress-to-date, and should not be construed to imply that of the Collaborative. Additionally, the many

completed, on-going and new initiatives are documented in this report. Appendix E was updated as of March 31, 2017.

F. CBD Underground Network Gantt Chart

A Gantt chart is provided in Appendix F. IPL has been tracking CBD initiatives in a formal Gantt chart since January 2012. This chart tracks not only commitments, but new initiatives to further improve the performance of the network system. Appendix F was updated as of March 29, 2017.

G. 2016 Annual Performance Metrics Report

The Metrics identified in the Annual Performance Metrics Report represent a set of measures that are intended to allow the Stakeholders and the IURC to gauge IPL's performance. These Metrics were established through the Collaborative process and were determined to be of greatest importance to all Stakeholders.

H. IPL Asset Management Self-Assessment

This self-assessment, relying on specific findings and observations, addresses the extent to which IPL's asset management function serves to address the performance of the system and the risk levels within which IPL operates the system.

Appendix A – Collaborative Project Charter

Collaborative Project Charter

Asset Management Assessment and Performance Metrics Initiative

Background

As a result of the Indiana Utility Regulatory Commission's ("IURC") investigation into Indianapolis Power & Light Company's ongoing investment in, and operation and maintenance of, its network facilities (Cause No. 44602), the IURC has ordered that IPL, Commission technical staff, the Indiana Office of Utility Consumer Counselor ("OUCC"), and any Intervenors that desire, meet to collaborate on a path moving forward in reviewing IPL's implementation of its Asset Management strategy with particular focus on the Central Business District (CBD) Underground Network, and assessing the efficacy of existing performance indices, enhancements to current metrics, and adoption of new performance measures going forward. Though viewed as a multi-year effort, specific milestones have been established for an initial 12-month period from the effective date of the Order in this Cause (March 16, 2016), thus defining the time frame for this charter.

Objectives:

Consistent with the IURC order, the objectives of the collaborative process are:

1. Aids IPL in improving its asset management processes. P. 17, para. 2;
2. Increases transparency to the Commission and the public, especially with respect to how key asset decisions are made and documented. P. 18, para. 2.
3. Addresses areas in which additional written processes may be appropriate, in order to avoid ad-hoc improvements that respond to current needs or desires of other entities, rather than from a well-developed and well-documented internal process. P. 18, para. 3.
4. Determines what part of IPL's asset management process is mature and solid versus what is still aspirational. P. 19, para. 1.
5. Ensure that Dr. O'Neill's recommendations are implemented in a timely and cost-effective manner, including how best to track, report, and verify IPL's progress in further improving its Asset Management process and executing the CBD Underground Network Asset Lifecycle Plan. P. 21, para 1.
6. Defines a set of metrics to measure IPL's performance over time and facilitate comparisons to other utilities to better foster continual improvements, and support constructive dialogue between the IURC and IPL with regard to progress and performance. P. 21, para. 2.
7. Establishes an approach to performance management that is cost-effective and efficient, demonstrating IPL's focus on the performance of IPL. P. 21, para. 3.

In accomplishing these objectives, the overarching goal is that all matters pertaining to this initiative be resolved collegially and with high levels of engagement of all interested parties.

Deliverables

The deliverables specified in the Order require IPL to file with the Commission the following:[1]

By July 22, 2016, (3 mos. after the first meeting) IPL shall file:

- An updated quarterly Gantt chart, along with a narrative detailing progress made implementing each commitment IPL has made. P. 18, para. 2.

- A Strawman of the oversight process (including the categories of metrics that progress will be measured against and the present performance / condition against that metric). P. 20, no. 1.

- A draft method of how to best track, report, and verify IPL's progress in further improving its Asset management process. P. 21, para. 1.

By October 24, 2016, (2nd quarterly report and 6 mos. after the first meeting), IPL shall file:

- An updated quarterly Gantt chart, along with a narrative detailing progress made implementing each commitment IPL has made. P. 18, para. 2.

- Initial assessment of and recommendation for IPL's asset management, including documenting in some detail, the process by which the asset management program serves to address the risk and performance of the system. P. 19, para. 3.

- A draft version of the oversight process, reflecting stakeholder feedback (including a summary of subsequent stakeholder discussions and any considerations of alternative proposals). P. 20, no. 2.

By January 23, 2017:

- An updated quarterly Gantt chart, along with a narrative detailing progress made implementing each commitment IPL has made. P. 18, para. 2.

- Progress report and on-going assessment of the performance measures and recommendations. P. 21, para. 4.

[1] To the extent the collaborative concludes a different schedule is more appropriate, any proposed change should be reflected in the quarterly updates. P. 20, para. 4. Each collaborative participant may file their own report, objection, or clarification within 15 days of IPL's compliance filing. P. 21 para. 4.

By March 31, 2017:

- An updated quarterly Gantt chart, along with a narrative detailing progress made implementing each commitment IPL has made. P. 18, para. 2.
- Final Oversight Plan. p. 20, no. 3.
- The final proposed set of metrics so they can begin to be piloted and refinements can be envisioned, researched, and developed. P. 20, para. 2.
- Follow up assessment of IPL's asset management program. P. 19, para. 3.

By March 31 of each following year:

- Progress report and ongoing assessment of the performance measures and recommendations, including an update as to the implementation of the final proposed set of metrics filed on March 31, 2017. P. 21, para. 4.

- An updated Gantt chart, along with a narrative detailing progress made implementing each commitment IPL has made. P. 18, para. 2.

Responsible Party

Indianapolis Power & Light Company (IPL)

Stakeholders

(To be confirmed during the initial meeting)

Indiana Utility Regulatory Commission Staff (IURC)

Indiana Office of Utility Consumer Counselor (OUCC)

Citizens Action Coalition (CAC)

IPL Industrial Group

The City of Indianapolis

Appendix B – Meeting Agendas and Attendee Sheets

Collaborative Attendee List through March 8, 2017, meeting			Meeting Dates																			
Name	Organization	Email Address	April 22, 2016		May 11, 2016		May 31, 2016		June 24, 2016		July 14, 2016		August 3, 2016		September 7, 2016		October 4, 2016		November 10, 2016		January 12, 2017		March 8, 2017	
			Attended	Absent	Attended	Absent	Attended	Absent	Attended	Absent	Attended	Absent	Attended	Absent	Attended	Absent	Attended	Absent	Attended	Absent	Attended	Absent	Attended	Absent
External																								
Brad Borum	Indiana Utility Regulatory Commission	bborum@urc.in.gov	X		X		X		X		X		X		X		X		X		X		X	
Jeremy Comeau	Indiana Utility Regulatory Commission	jcomeau@urc.in.gov	X		X		X		X		X		X		X		X		X		X		X	
Bob Pauley	Indiana Utility Regulatory Commission	mpauley@urc.in.gov	X		X		X		X		X		X		X		X		X		X		X	
Bob Veneck	Indiana Utility Regulatory Commission	rveneck@urc.in.gov	X		X		X		X			X	X		X		X		X		X			X
Anthony Alvarez	Office of Utility Consumer Counselor	aalvarez@oucc.in.gov			X		X		X		X		X		X		X			X	X		X	
Peter Boerger	Office of Utility Consumer Counselor	pboerger@oucc.in.gov	X		X		X		X		X		X		X		X		X		X		X	
Leon Golden	Office of Utility Consumer Counselor	lgolden@oucc.in.gov	X		X		X			X		X	X		X		X			X	X		X	
Randy Helmen	Office of Utility Consumer Counselor	rhelmen@oucc.in.gov		X		X		X		X		X		X		X		X		X		X		X
Ron Keen	Office of Utility Consumer Counselor	rkeen@oucc.in.gov		X		X		X		X		X		X		X		X		X		X		X
Tiffany Murray	Office of Utility Consumer Counselor	timurray@oucc.in.gov	X		X		X		X		X		X		X		X		X		X		X	
Barb Smith	Office of Utility Consumer Counselor	bsmith@oucc.in.gov		X		X		X		X		X		X		X		X		X		X		X
Melody Park	City of Indianapolis	melody.park@indy.gov	X			X		X		X		X		X		X		X		X		X		X
Kobi Wright	City of Indianapolis																					X		X
Kerwin Olson	Citizens Action Coalition	kolson@citact.org	X		X		X			X	X		X		X		X		X			X		X
Margo Tucker	Citizens Action Coalition	margotucker@gmail.com	X			X		X		X		X		X		X		X		X				
Jennifer Washburn	Citizens Action Coalition	jwashburn@citact.org		X	X		X		X		X		X		X		X			X	X		X	
Jesse Wyatt	Citizens Action Coalition	jwyatt@citact.org							X		X		X		X			X	X		X		X	
Bob Glennon	Robert Glennon & Associates, P.C.	robertglennonlaw@gmail.com	X		X		X		X		X		X		X		X		X		X		X	
Anne Becker	Lewis & Kappes	abecker@lewis-kappes.com	X			X		X		X		X		X		X		X		X		X		X
Joe Rompala	Lewis & Kappes	jrompala@lewis-kappes.com		X		X		X		X		X		X		X		X		X		X		X
Ted Sommer	London Witte Group	ted.sommer@lwgcpa.com		X		X		X		X		X		X		X		X		X		X		X
Charlie Fijnvandraat	O'Neill Management Consulting Group, LLC	charlie.fijnvandraat@fcgenergy.com	X		X		X			X		X	X		X		X		X		X		X	
Dr. Daniel O'Neill	O'Neill Management Consulting Group, LLC	dan@oneillinc.com	X		X - WebEx		X		X		X		X		X		X			X	X		X	
Erik Adams	UMS Group Inc.	eadams@umsgroup.com	X		X		X		X			X	X		X		X		X		X		X	
Jeffrey Cummings	UMS Group Inc.	jcummings@umsgroup.com	X		X		X		X		X		X		X		X		X		X		X	
Josh Hoops	UMS Group Inc.	jhoops@umsgroup.com									X			X		X		X		X		X		X
Jack Shearman	UMS Group Inc.	jshearman@umsgroup.com	X		X		X		X		X		X		X		X		X		X		X	
Facilitator																								
Stewart Ramsay	Vanry and Associates	stewart@vanry.com	X		X		X		X		X		X		X		X		X		X		X	
Internal																								
Joe Bentley	Indianapolis Power & Light Company	joe.bentley@aes.com	X		X		X		X		X		X		X			X	X		X		X	
Leah Brown	Indianapolis Power & Light Company	leah.brown@aes.com													X									
Steve Clouse	Indianapolis Power & Light Company	steve.clouse@aes.com	X		X		X		X		X		X		X		X		X		X		X	
Claire Dalton	Indianapolis Power & Light Company	claire.dalton@aes.com													X									
Paul Farris	Indianapolis Power & Light Company	paul.farris@aes.com											X		X		X		X		X		X	
Barry Feldman	Indianapolis Power & Light Company	barry.feldman@aes.com	X		X		X		X		X		X		X		X		X		X		X	
Ken Flora	Indianapolis Power & Light Company	ken.flora@aes.com	X		X		X		X		X		X		X		X		X		X		X	

Collaborative Attendee List through March 8, 2017, meeting			Meeting Dates																					
Name	Organization	Email Address	April 22, 2016		May 11, 2016		May 31, 2016		June 24, 2016		July 14, 2016		August 3, 2016		September 7, 2016		October 4, 2016		November 10, 2016		January 12, 2017		March 8, 2017	
			Attended	Absent	Attended	Absent	Attended	Absent	Attended	Absent	Attended	Absent	Attended	Absent	Attended	Absent	Attended	Absent	Attended	Absent	Attended	Absent	Attended	Absent
Jared Heltsley	Indianapolis Power & Light Company	jared.heltsley@aes.com	X		X		X		X			X	X		X		X		X		X		X	
Bill Henley	Indianapolis Power & Light Company	william.henley@aes.com	X		X		X		X		X		X		X		X		X		X		X	
Mike Holtsclaw	Indianapolis Power & Light Company	mike.holtsclaw@aes.com	X		X		X		X		X		X		X		X		X		X		X	
Scott Perry	Indianapolis Power & Light Company	scott.perry@aes.com	X		X		X		X		X		X		X			X	X		X		X	
Jim Sadtler	Indianapolis Power & Light Company	jim.sadtler@aes.com	X		X		X		X		X		X		X		X		X		X		X	
Brad Scott	Indianapolis Power & Light Company	brad.scott@aes.com																	X					
Justin Sufan	Indianapolis Power & Light Company	justin.sufan@aes.com	X		X		X			X	X		X		X		X		X		X		X	
Andrew Wells	Indianapolis Power & Light Company	andrew.wells@aes.com	X		X		X		X		X		X		X		X		X		X		X	
		Total	29	6	28	8	28	8	25	12	25	13	30	9	32	9	27	12	27	13	29	10	28	11

Agenda

INDIANAPOLIS POWER & LIGHT COMPANY | Asset Management & Performance Metrics Initiative
April 22, 2016: 9:00 a.m. to 12:00 p.m.
1230 W Morris Street, Indianapolis - IPL Safety Room

9 a.m. to 9:30 a.m.	**Welcome & Introductions** **Review Agenda**	*Joe Bentley | IPL* *Stewart Ramsay, Facilitator*
9:30 a.m. to 10:15 a.m.	**IPL Update** *State of CBD UG Network* *Overview of AM Program Implementation*	 *Mike Holtsclaw | IPL* *Barry Feldman | IPL*
10:15 a.m. to 10:45 a.m.	**Present Proposed Project Charter** *First Reading* *Open Discussion*	*Stewart Ramsay, Facilitator*
10:45 a.m. to 11:15 a.m.	**Present "Strawman" Collaborative Process** *First Reading* *Open Discussion*	*Stewart Ramsay, Facilitator*
11:15 a.m. to 12:00 p.m.	**Summarize Actions** *Assign Actions / Completion Dates* *Schedule Next Meeting*	*Stewart Ramsay, Facilitator*

Notes:

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Agenda

INDIANAPOLIS POWER & LIGHT COMPANY | Asset Management & Performance Metrics Initiative
May 11, 2016 | 1:00 p.m. to 4:15 p.m.
1230 W Morris Street, Indianapolis - IPL Safety Room

1:00 p.m. to 1:15 p.m.	**Welcome & Introductions** *Review Agenda*	**Stewart Ramsay** *Facilitator*
1:15 p.m. to 2:15 p.m.	**Strawman Oversight Process** *Presentation* *Open Discussion*	**Jack Shearman** *UMS Group*
2:15 p.m. to 2:30 p.m.	**BREAK**	
2:30 p.m. to 3:15 p.m.	**Performance Metrics – O'Neill Perspective** *Presentation* *Open Discussion*	**Dr. Dan O'Neill** *O'Neill Management Consulting Group*
3:15 p.m. to 4:00 p.m.	**Performance Metrics – IPL's Initial Thoughts** *Presentation* *Open Discussion*	**Barry Feldman** *IPL Director, T&D Asset Management*
4:00 p.m. to 4:15 p.m.	**Summarize Actions** *Assign Actions / Completion Dates* *Schedule Next Meeting*	**Stewart Ramsay** *Facilitator*

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Agenda

INDIANAPOLIS POWER & LIGHT COMPANY | Asset Management & Performance Metrics Initiative
May 31, 2016 | 10:00 a.m. to 5:00 p.m.
1230 W Morris Street, Indianapolis - IPL Safety Room

10:00 a.m. to 10:15 a.m.	**Welcome & Outcomes** *Review Agenda* *Agree Outcomes for the Meeting*	**Stewart Ramsay** *Facilitator*
10:15 a.m. to 11:45 a.m.	**Strawman Oversight Process** *Review Draft Process* *Refinement and Agreement on Performance Domains*	**Stewart Ramsay** *Facilitator*
11:45 a.m. to 1:00 p.m.	**Break for Lunch and Caucus**	
1:00 p.m. to 2:30 p.m.	**Discuss Relevant Performance Metrics** *Align Potential Metrics to Performance Domains* *Open Discussion regarding applicability, suitability, completeness of potential metrics*	**Stewart Ramsay** *Facilitator*
2:30 p.m. to 3:00 p.m.	**Break for Discussion** *Presentation* *Open Discussion*	
3:00 p.m. to 4:00 p.m.	**Discuss Relevant Performance Metrics** *Align Potential Metrics to Performance Domains* *Open Discussion regarding applicability, suitability, completeness of potential metrics*	**Stewart Ramsay** *Facilitator*
4:00 p.m. to 4:30 p.m.	**Revisit Strawman Oversight Process** *Refinement and Agreement on Performance Domains and Process*	**Stewart Ramsay** *Facilitator*
4:30 p.m. to 4:45 p.m.	**Summarize Actions** *Assign Actions / Completion Dates* *Schedule Next Meeting*	**Stewart Ramsay** *Facilitator*

Agenda

INDIANAPOLIS POWER & LIGHT COMPANY | Asset Management & Performance Metrics Initiative
June 24, 2016 | 10:00 a.m. to 5:00 p.m.
1230 W Morris Street, Indianapolis - IPL Safety Room

10:00 a.m. to 10:15 a.m.	**Welcome & Introductions** *Review Agenda* *Review Objectives for the day*	**Stewart Ramsay** *Facilitator*
10:15 a.m. to 11:45 a.m.	**Review of Working Group Materials** *Overview and walk through* *Open Discussion*	**Dan O'Neill** **Jeff Cummings** **Barry Feldman**
11:45 a.m. to 12:30 p.m.	**BREAK - Lunch**	
12:30 p.m. to 1:30 p.m.	**Review of Strawman Oversight Process** *Content Review* *Open Discussion*	**Stewart Ramsay** *Facilitator*
1:30 p.m. to 2:00 p.m.	**BREAK - Caucus**	
2:00 p.m. to 3:00 p.m.	**Performance Metrics** *Content Confirmation* *Open Discussion*	**Stewart Ramsay** *Facilitator*
3:00 p.m. to 4:00 p.m.	**July Filing Requirements** *Content Expectations* *Open Discussion*	**Stewart Ramsay** *Facilitator*
4:00 p.m. to 4:35 p.m.	**Summarize Actions** *Assign Actions / Completion Dates* *Schedule Next Meeting*	**Stewart Ramsay** Facilitator

Agenda

INDIANAPOLIS POWER & LIGHT COMPANY | Review of Filing Documents
July 14, 2016 | 9:30 a.m. to 5:00 p.m.
1230 W Morris Street, Indianapolis - IPL Safety Room

9:30 a.m. to 10:00 a.m.	**Welcome & Introductions** *Review Agenda* *Review Objectives for the day*	**Stewart Ramsay** *Facilitator*
10:00 a.m. to 11:30 a.m.	**Review of AM and CBD NUG Materials** *Overview and walk through* *Open Discussion* *Conclusions and Actions*	**Dan O'Neill** **Jeff Cummings** **Barry Feldman**
11:30 a.m. to 12:15 p.m.	**BREAK - Lunch**	
12:15 p.m. to 1:45 p.m.	**Review of Annual Monthly Report** *Content Review* *Open Discussion* *Conclusions and Actions*	**Jeff Cummings** **Barry Feldman**
1:45 p.m. to 2:00 p.m.	**BREAK**	
2:00 p.m. to 3:30 p.m.	**Review of Filing** *Content Confirmation* *Open Discussion* *Conclusions and Actions*	**Andrew Wells** **Tiffany Murray** **Jeremy Comeau**
3:30 p.m. to 3:45 p.m.	**Break**	
3:45 p.m. to 4:30 p.m.	**Summarize Actions** *Assign Actions / Completion Dates* *Schedule Next Meeting*	**Stewart Ramsay** *Facilitator*

Agenda

INDIANAPOLIS POWER & LIGHT COMPANY | Asset Management & Performance Metrics Initiative
Meeting 6
August 3, 2016 | 9:30 a.m. to 5:00 p.m.
1230 W Morris Street, Indianapolis - IPL Safety Room

9:30 a.m. to 10:00 a.m.	**Welcome & Introductions** *Review Agenda* *Review Objectives for the day*	**Stewart Ramsay** *Facilitator*
10:00 a.m. to 10:30 a.m.	**Overview Presentation - CBD Networks** *Overview & General Discussion of Networks*	**Dan O'Neill** **Charlie Fjinvandraat**
10:30 a.m. to 11:15 a.m.	**Update – Duct Line Temperature Monitoring** *Summary of results to date*	**Mike Holtsclaw**
11:15 a.m. to 12 Noon	**Review of Annual Monthly Report** *Updated Content Review Discussion* *Conclusions and Actions*	**Barry Feldman** **Jeff Cummings**
12 Noon to 12:45 p.m.	**BREAK - Lunch**	
12:45 p.m. to 3:45 p.m.	**Deep Dive Presentation – CBD Inspection & Work Order Process** *Content Review* *Open Discussion* *Breaks called during this session as needed*	**Steve Clouse** **Barry Feldman** **Jeff Cummings**
3:45 p.m. to 4:00 p.m.	**Deep Dive Topics** *Lessons Learned from Today* *Topics for next 2 Deep Dives* *Conclusions and Actions*	**Stewart Ramsay** *Facilitator*
4:00 p.m. to 4:30 p.m.	**October Filing Requirements** *Discussion*	**Andrew Wells**
4:30 p.m. to 5:00 p.m.	**Wrap-up & Summarize Actions** *Assign Actions / Completion Dates*	**Stewart Ramsay** *Facilitator*

Agenda

INDIANAPOLIS POWER & LIGHT COMPANY | Asset Management & Performance Metrics Initiative
Meeting 7
September 7, 2016 | 9:30 a.m. to 5:00 p.m.
1230 W Morris Street, Indianapolis - IPL Safety Room

9:30 a.m. to 9:45 a.m.	**Welcome & Emergent Issues** *Review Agenda* *Review Objectives for the day* *Discuss Emergent issues, if any*	**Stewart Ramsay** *Facilitator*
9:45 a.m. to 10:15 a.m.	**CAC Presentation**	**Jennifer Washburn** **Kerwin Olson**
10:15 a.m. to 11:45 a.m.	**Review of Customer Services** *Overview and walk through* *Open Discussion*	**Leah Brown**
11:45 a.m. to 12:30 p.m.	**Break - Lunch**	
12:30 p.m. to 1:30 p.m.	**Tour of Customer Services Center**	**Leah Brown**
1:30 p.m. to 2:00 p.m.	**Review of Customer Services – cont.** *Questions and Wrap-up* *Conclusions and Actions*	**Leah Brown**
2:00 p.m. to 3:30 p.m.	**Review of Capital Project Prioritization** *Overview and walk through* *Open Discussion*	**Barry Feldman** **Jeff Cummings**
3:30 p.m. to 3:45 p.m.	**Break**	
3:45 p.m. to 4:45 p.m.	**Review of Capital Project Prioritization – cont.** *Overview and walk through* *Open Discussion* *Conclusions and Actions*	**Barry Feldman** **Jeff Cummings**
4:45 p.m. to 5:00 p.m.	**Wrap-up & Summarize Actions** *Assign Actions / Completion Dates* *Schedule Next Meeting*	**Stewart Ramsay** *Facilitator*

Agenda

INDIANAPOLIS POWER & LIGHT COMPANY | Asset Management & Performance Metrics Initiative
Meeting 8
October 4, 2016 | 9:30 a.m. to 5:00 p.m.
1230 W Morris Street, Indianapolis - IPL Safety Room

9:30 a.m. to 9:45 a.m.	**Welcome & Emergent Issues** *Review Agenda* *Review Objectives for the day* *Discuss Emergent issues, if any*	**Stewart Ramsay** *Facilitator*
9:45 a.m. to 10:30 a.m.	**Asset Condition Metrics** *Discussion of Draft Metrics* *Open Discussion*	**Steve Clouse**
10:30 a.m. to 10:45 a.m.	**Break**	
10:45 a.m. to 12:30 p.m.	**Asset Life Cycle Plan Deep Dive** *Selected Row/Column Analysis* *Open Discussion*	**Jared Heltsley** **Dan O'Neill** **Jeff Cummings**
12:30 p.m. to 1:15 p.m.	**Break - Lunch**	
1:15 p.m. to 2:45 p.m.	**October Filing Review** *Review draft filing* *Open Discussion* *Comments*	**Andrew Wells** **Tiffany Murray** **Jeremy Comeau**
2:45 p.m. to 3:00 p.m.	**Break**	
3:00 p.m. to 4:30 p.m.	**October Filing Review - continued** *Review draft filing* *Open Discussion* *Comments*	**Andrew Wells** **Tiffany Murray** **Jeremy Comeau**
4:30 p.m. to 5:00 p.m.	**Wrap-up & Summarize Actions** *Assign Actions / Completion Dates* *Schedule Next Meeting* *Agree meeting topics*	**Stewart Ramsay** *Facilitator*

Agenda

INDIANAPOLIS POWER & LIGHT COMPANY | Asset Management & Performance Metrics Initiative
Meeting 9
November 10, 2016 | 9:30 a.m. to 1:00 p.m.
1230 W Morris Street, Indianapolis - IPL Safety Room

9:30 a.m. to 9:45 a.m.	**Welcome & Emergent Issues** *Review Agenda* *Review Objectives for the day* *Discuss Emergent issues, if any*	**Stewart Ramsay** *Facilitator*
9:45 a.m. to 11:15 a.m.	**A&G Expense** *Review of A&G expenses/methodologies* *Open Discussion*	**Jack Shearman** *UMS Group*
11:15 a.m. to 11:30 a.m.	**Public Safety** *Report out from small group* *Open Discussion* *Comments*	**Andrew Wells,** IPL **Tiffany Murray**, OUCC **Jeremy Comeau**, IURC
11:30 a.m.to 12:00 p.m.	**Break – Lunch**	
12:00 p.m. to 12:45 p.m.	**Generation Metrics** *Discussion of Draft Metrics* *Open Discussion*	**Brad Scott** *IPL Senior Vice President, Power Supply*
12:45 p.m. to 1:00 p.m.	**Wrap-up & Summarize Actions** *Assign Actions / Completion Dates* *Schedule Next Meeting* *Agree meeting topics*	**Stewart Ramsay** *Facilitator*

Agenda

INDIANAPOLIS POWER & LIGHT COMPANY | Asset Management & Performance Metrics Initiative
Meeting 10
January 12, 2017 | 9:30 a.m. to 2:00 p.m.
1230 W Morris Street, Indianapolis - IPL Safety Room

9:30 a.m. to 9:45 a.m.	**Welcome & Emergent Issues** *Review Agenda* *Review Objectives for the day* *Discuss Emergent issues, if any*	**Stewart Ramsay** *Facilitator*
9:45 a.m. to 10:30 a.m.	**Public Safety** *Report out from small group* *Stray Voltage report* *Open Discussion* ***Comments***	**Andrew Wells** **Tiffany Murray** **Jeremy Comeau** **Mike Holtsclaw**
10:30 a.m. to 11:00 a.m.	**NPV Working Group Update** *Report out from small group* *Open Discussion* ***Comments***	**Dan O'Neill** **Peter Boerger** **Steve Clouse**
11:00 a.m. to 11:15 a.m.	**Break**	
11:15 a.m. to 12:15 p.m.	**Oversight Plan and January Filing** *Review of oversight plan, Gantt Chart* *Review of Performance Reports* *Open Discussion*	**Andrew Wells** **Steve Clouse** **Barry Feldman**
12:15 p.m. to 12:45 p.m.	**Break - Lunch**	
12:45 p.m. to 1:30 p.m.	**Updates** **Duct Line Temperature** **A&G Analysis - verbal update** *Discussion*	**Mike Holtsclaw** **Barry Feldman** **Jack Shearman**
1:30 p.m. to 1:45 p.m.	**Wrap-up & Summarize Actions** *Assign Actions / Completion Dates* *Schedule Next Meeting* *Agree meeting topics*	**Stewart Ramsay** *Facilitator*

Agenda

INDIANAPOLIS POWER & LIGHT COMPANY | Asset Management & Performance Metrics Initiative
Meeting 11
March 8, 2017 | 9:30 a.m. to 3:00 p.m.
1230 W Morris Street, Indianapolis - IPL Safety Room

9:30 a.m. to 9:45 a.m.	**Welcome & Emergent Issues** *Safety Brief* *Review Agenda* *Review Objectives for the day* *Discuss Emergent issues, if any*	**Stewart Ramsay** *Facilitator*
9:45 a.m. to 10:45 a.m.	**Review of January 18th Event** *Description of Event* *RCA results/findings* *IPL action plans* *Open Discussion* ***Comments***	**Jim Sadtler** **Mike Holtsclaw**
10:45 a.m. to 11:00 a.m.	**Break**	
11:00 a.m. to 11:30 a.m.	**IPL Performance Enhancing Initiatives** *Summary by Dr. O'Neill of initiatives adding value for IPL performance* *Open Discussion* ***Comments***	**Dan O'Neill**
11:30 a.m. to 12:30 p.m.	**March Filing** *Comments on Draft Filing* *Review of Performance Reports* *Review of ALCP Schedule* *Open Discussion* ***Comments***	**Andrew Wells** **Steve Clouse** **Barry Feldman**
12:30 p.m. to 1:00 p.m.	**Break – Lunch**	
1:00 p.m. to 1:30 p.m.	**March Filing - continued** *Comments on Draft Filing* *Review of Performance Reports* *Review of ALCP Schedule* *Open Discussion* ***Comments***	**Andrew Wells** **Steve Clouse** **Barry Feldman**
1:30 p.m. to 1:45 p.m.	**Updates** **Duct Line Temperature**	**Mike Holtsclaw**

Agenda

1:45 p.m. to 2:00 p.m.	**Path Forward** *Process for continued communications* *Discussion*	**Stewart Ramsay** *Facilitator*
2:00 p.m. to 2:45 p.m.	**Close Out Discussion** *Assessments of Value and Waste* *Observations on Learning* *Process Improvement Opportunities* *Closing Assessments*	**Stewart Ramsay** *Facilitator*
2:45 p.m. to 3:00 p.m.	**Wrap-up & Summarize Actions** *Assign Actions / Completion Dates*	**Stewart Ramsay** *Facilitator*

Appendix C – AES Asset Management Policy – US Strategic Business Unit

Asset Management Policy - US Strategic Business Unit

The AES US Strategic Business Unit (SBU) will manage its physical assets with a focus on providing affordable and sustainable energy solutions to our customers. We will accomplish this goal while always adhering to our Shared Values.

We will adopt a comprehensive Asset Management System that is defined by AES Global Asset Management Standards so as to attain operational excellence, sustainable development, and optimization of our resources. Our Asset Management System will support our commitments regarding how we will manage our physical assets. We will:

- Continue to make safety the top priority for our employees, contractors, visitors, and stakeholders;
- Minimize and/or control our impact to the environment, complying will all legal and regulatory requirements;
- Maintain a systematic and sustainable process that considers the interrelated aspects of commercial, environmental, safety, legal, employee, information, financial, community, regulatory, and any other stakeholder needs that influence or affect the management of our physical assets;
- Optimize the availability and performance of our physical assets during their lifecycle through the implementation of operation, maintenance, risk, and investment processes that are considered to be best practices prevailing in the industry;
- Strive for continuous improvement of our processes through innovation, application of new technologies, and best practices using the APEX (AES Performance Excellence) methodology to establish the appropriate metrics to measure, evaluate, and compare our operating businesses;
- Provide a platform to maintain reliable asset identification and technical information as well as criticality criteria, to be used to mitigate risks and pursue market opportunities;
- Maximize our gains through better utilization of our physical assets and proactively manage their lifecycle costs;
- Ensure that our people are trained, motivated, responsible, and accountable for the results of our Asset Management System.
- Make asset management decisions at the local business level, supported by advice and processes provided centrally to allow for fleet-wide optimization.

AES US SBU Leaders will be responsible for communicating, implementing, disseminating, and enforcing this Asset Management Policy and ensuring the establishment and achievement of its objectives and obligations.

All AES US SBU employees and contractors are responsible for understanding and committing to this this Policy.

Andy Horrocks, COO

Appendix D – IPL's Asset Management Program Oversight Report

IPL's Asset Management Program Oversight Report

The following report reflects IPL's assessment of its progress in implementing an Industry-Leading Asset Management Program. Though the reporting formats and attributes used to present this information have been accepted by the Collaborative, the assessment itself reflects IPL's view of progress-to-date, and should not be construed to imply that of the Collaborative.

Asset Management Program Oversight Report

Objective –

Track, report and verify IPL's progress in further improving its Asset Management process.

Implementation –

A multi-faceted approach to assure both the strategic and tactical elements of an effective Asset Management process are in place and that the underlying objectives of increased transparency and improved stakeholder confidence are achieved. Three parallel tracks have been established for this purpose:

- Asset Life Cycle Plan Status, summarizing progress achieved in developing and implementing Asset Life Cycle Plans ("ALCPs") for 18 asset classes (19 if CBD is included) and monitoring and managing the performance of these assets
- Asset Management Program Implementation, summarizing IPL's progress in complying with and continually improving its implementation of an Asset Management process
- Topical Areas for "Deep Dive" Presentations during Periodic Oversight Process Sessions

The following performance metrics, listed in the "Strawman" Oversight Document, will likely replace these tracking mechanisms once the underlying objective of improved stakeholder confidence is achieved.

- Percent of Planned Maintenance Completed
- Renewal Rate (Percent of Assets Replaced)
- Asset Condition Rating (will take some work to develop an actual metric that can be trended)

NOTE: Attachment A provides a description of abbreviations used throughout this document.

Asset Life Cycle Plan Framework

Asset Life Cycle Plan Framework

Attribute[1]	Attribute Description	Asset Class A	Asset Class B	Asset Class C
Asset Criticality	Relative ranking (High-Medium-Low) of how critical the asset class is	High	Medium	Low
ALCP Done/Due	Asset Life Cycle Plan Due Date or Latest Draft Completed Date			
ALCP Content	Breadth and depth of ALCP scope as currently planned or executed			
Asset Inventory	Availability and accuracy of asset-specific information (quantities broken out by age, condition, size, class, type, and manufacturer and other characteristics – as applicable)			
Failure Analysis	How failures are tracked and analyzed for root cause and impact			
Unit Costs	Installation costs (Direct and Loaded) and maintenance costs, so that a budget of X dollars can be translated into how many units it covers, and what percent of the asset population			
Sourcing/Supply Chain	Specifications for new equipment; analysis of vendors and of stores/spares			
Maintenance Plan	Inspection and maintenance scope and frequency (time or condition-based)			
Renewal Plan	Multi-year plan and budget for preventive and corrective replacement or refurbishment, with implications for asset performance over time			
Asset Health/Risk Indexing	Ability to display at a point in time which individual assets entail the most risk, in terms of both probability and impact of failure (where risk = probability x impact)			
Technology and Practice Survey	Comparison of practices with the rest of the industry, with explanation for differences			
Asset Condition and Performance Monitoring	System for tracking asset condition and performance, including specific metrics, analyses, exception reporting, and variance explanations			
Decision Bases	Main reasons driving the business case for key decisions, e.g., safety, reliability, cost			
Special Studies of Emerging Issues	Analysis of a special issue associated with an asset, as applicable, e.g., environmental, new technology, work practices			

Color coding legend:
The color of each block is meant to show the relative level of maturity or development of that attribute for that asset class. As such, it is an indication of the stage in a multi-year and ultimately continuous process. It is not an evaluation of the quality of that activity.

Red: Envisioned, but not yet started.

Yellow: In progress, with substantial content, but some "TBD" parts.

Green: Mature – no near-term plan for further enhancement.

Gray: Not applicable/Other

Asset Classes:
Currently there are 18 asset classes for distribution, and an additional set of 9 classes for the assets in the Central Business District (separate report)

NOTE 1: Attachment B provides definitions and context for each of the Attributes that comprise this Framework

Asset Life Cycle Plan Status

Asset Life Cycle Plan Status

Applying the Attributes, Measures of Effectiveness and the Legend presented in the previous slide, the following summarizes IPL's progress in implementing key elements of Asset Class – specific Asset Management Plans for 18 asset classes. The CBD Network is addressed as a separate document.

Attribute	Pole Top Hardware	Underground Residential Cable (URD)	Distribution Transformers
Asset Criticality	Low	Medium	Low
ALCP Done / Due	Q2 2018	9/3/16	Q3 2017
ALCP Content	Not yet developed	Later versions will have more detail.	Not yet developed
Asset Inventory	Age and type for all pole top hardware installed after 1999	Length, spans and size. Age recorded for installations after 1999. Estimated 4.25 M ft. pre-1991 XPLE cable remaining. All post 1991 is EPR.	95k by OH/UG manufacturer, voltage, size and age (~35 yrs.).
Failure Analysis	Some equipment is turned in by crews for entering into an Access database. Trends are spotted using this database and feedback from Standards meetings. Database populated since 2003. (>600 items/yr.)	Track and monitor failure trends and locations.	Track failures in OMS. ~ 0.2% per year. A sample of equipment is in an Access database. Trends are spotted using this database and feedback from Standards meetings. Database since 2003.
Unit Costs	Average cost tracked on design and as-built based on compatible units. Monitored and adjusted as needed since 1999.	Average cost per foot design and as-built based on compatible units. Monitored and adjusted as needed. Rehab $16/ft. Refurbish $7/ft.	Individual costs tracked by size and type. Estimate installation and removal costs.
Sourcing / Supply Chain	Standards & stores specified	Standards & stores specified	Standards & stores specified
Maintenance Plan	4 year visual and infrared inspection. Separate inspection for NESC compliance on 10 year cycle also includes items like broken insulators, etc.	Refurbish before significant number of cable faults.	OH part of 4 year visual and infrared. URD 10 year external inspection
Renewal Plan	Replaced on an as needed basis (failure, inspection).	Rehab on first failure today. Proactively rejuvenate ~250k feet per year. Replace ~100k feet per year.	Replaced on an as needed basis (failure, inspection).
Asset Health / Risk Indexing	No, but no indications of a need.	Track number of failures in GTECH.	No. Track overall failure trends.
Technology and Practice Survey	Infrared, piloted Partial Discharge, fuse links, switches, polymer material	Cable injection (refurbishment)	Type 1 versus Type 2 pad mount FR3 Review
Asset Condition and Performance Monitoring	SAIFI Trends	URD SAIFI Trends, Count of Abnormal Switching Sheets	Transformer SAIFI Trends
Decision Bases	Safety and Cost-Effectiveness	Safety and Cost-Effectiveness	Safety, Reliability, and Cost-Effectiveness
Special Studies of Emerging Issues	EPRI Grid Resiliency – Project 3002006780	Most UG is loop fed to reduce outage times. CEATI	2016 DOE efficiency standards

Asset Life Cycle Plan Status *(Continued)*

Attribute	Wood Poles	Overhead Distribution Lines	Reclosers and Sectionalizers
Asset Criticality	Medium	Medium	Medium
ALCP Done / Due	12/18/15	3/1/16	Q4 2017
ALCP Content	Comprehensive	Later versions will have more detail.	Not yet developed
Asset Inventory	165k by type and age (35yrs)	All types, lengths and sizes. Age recorded for installations after 1999.	266 Reclosers, 41 Automated Switches 171 2/3 Shot Sectionalizers by location and age for automated equipment.
Failure Analysis	Thorough: low (1.5%) reject rate, by age, species, treatment.	Some equipment is turned in by crews for entering into an Access database. Trends are spotted using this database and feedback from Standards meetings. Database populated since 2003. (>600 items/yr.)	Reclosers monitored through SCADA. Failures tracked in WMIS.
Unit Costs	$3,795 to replace, etc.	Cost per foot design and as-built based on compatible units. Monitored and adjusted as needed.	$50k recloser installation in WMIS. Sectionalizers based on average cost based on compatible units since 1999.
Sourcing / Supply Chain	Standards & stores specified	Standards & stores specified	Standards & stores specified
Maintenance Plan	For non CCA poles over 17 years old. Inspect and ground line treat every 10 years. Replace or reinforce as needed. (by grid map)	4 year line patrol visual inspection plus infrared scan of 4 kV, 13kV and 34 kV lines . 10 year NESC inspection – check for certain clearance and/or access prevention problems governed by the NESC (by circuit)	4 year visual and infrared inspection.
Renewal Plan	Replace or re-enforce rejects.	Replaced on an as needed basis (failure, inspection load growth).	Replacing auto switches with reclosers. Replaced on an as needed basis (failure, inspection).
Asset Risk Indexing	No, but no indications of a need.	No. Monitor worst performing circuits and MAIFI/SAIFI trends.	No, but no indication of a need.
Technology and Practice Survey	Fiberglass, New pole inspection process CCA-ET	Infrared at least every 4 years. Sacrificial arc protective devices for poly wire trial.	Recloser data historized in PI (75 points per recloser)
Asset Condition and Performance Monitoring	Inspection reject rate. 50% of rejects are pole failures above ground (top).	SAIFI Trends by circuit and device.	SAIFI Trends by circuit and device.
Decision Bases	Safety and Cost-Effectiveness	Safety and Cost-Effectiveness	Safety, Reliability, and Cost-Effectiveness
Special Studies of Emerging Issues	Joint use; CCA vs Penta	DRx tool.	Standardized on G&W with SEL relays

Asset Life Cycle Plan Status *(Continued)*

Attribute	Meters	Disconnect Switches	Power Transformers
Asset Criticality	Medium	Medium	High
ALCP Done / Due	Q2 2017	Q2 2018	9/11/2015
ALCP Content	Not yet developed	Not yet developed	Additional development planned
Asset Inventory	(~490k) Type, manufacturer, age, location.	Number (# Subs, # Dist) General types.	Voltage, size, manufacturer, age, type. (Avg 43 years)
Failure Analysis	Tracked with monthly reporting metrics	Formal database for selected distribution failures. Subs are tracked in EMPAC.	Tracked and RCA performed for significant issues. EMPAC tracks corrective issues. (~0.2% failure rate)
Unit Costs	Individual costs tracked by size and type. Estimate installation and removal costs. ($168) for single phase AMI meter including installation	For Dist. average cost per design and as-built based on compatible units. Monitored and adjusted as needed. Subs tracked by project.	Yes, both installation and maintenance. by individual asset.
Sourcing / Supply Chain	Standards & stores specified	Standards & stores specified	Standards & stores specified
Maintenance Plan	Periodic sample test. Use AMR/AMI system and logic for reports on questionable meters	Infrared and visual inspection.	Infrared, Oil DGA and Oil Quality at least yearly. Critical transformers more often. Visual inspect at least quarterly. Power factor test every 5 years.
Renewal Plan	Monitor operation data for replacements.	Replaced on an as needed basis (failure, inspection).	Replacement based on risk evaluation using AHI and criticality calculations.
Asset Health / Risk Indexing	No but monitor reads and check for various abnormalities and trends.	Track number of failures in GTECH.	Yes. Ivara.
Technology and Practice Survey	Moving from AMR to AMI. 35k AMI meters. AMR last gasps, power ups, and automatic meter pings integrated with OMS.	Investigation of new type of in-line distribution disconnect switch	Alarm and load monitoring for transformers and LTC (>10MVA) through SCADA. TOA-4 and Ivara alarms. E-mails on abnormal oil conditions.
Asset Condition and Performance Monitoring	Monitor failure trends	Dist. Infrared an visual anomalies in EMPAC.	AHI in Ivara
Decision Bases	Safety, Reliability, and Cost-Effectiveness	Safety, Reliability, and Cost-Effectiveness	Safety, Reliability, and Cost-Effectiveness
Special Studies of Emerging Issues	AMI Reconnect/Disconnect, AMI temperature monitoring.	Large # of distribution disconnect switches, CEATI information	LTC condition-based maintenance. TOA-4, CEATI information

Asset Life Cycle Plan Status *(Continued)*

Attribute	Circuit Breakers	Capacitors	Relay System Protection
Asset Criticality	High	Medium	High
ALCP Done / Due	12/15/2015	Q4 2017	12/1/2015
ALCP Content	Additional development planned	Not yet developed	Additional development planned
Asset Inventory	Voltage, manufacturer, model, age, type. (Avg. 40 years?)	Type and age for substation. All locations. Age for distribution installed after 1999.	Estimated by group.
Failure Analysis	Tracked (open/close failures) and RCA performed for significant issues. EMPAC tracks corrective issues.	Sub cap banks tracked in EMPAC. Line tracked in WMIS.	Relay correct and incorrect operations tracked since 1983. All relays tested with automated software.
Unit Costs	Yes, both installation and maintenance by individual asset.	Sub depends on size and voltage. Line $12k for new (includes pole and hardware).	No, but not needed at individual relay level. Protections systems are tracked at the project level.
Sourcing / Supply Chain	Standards & stores specified	Standards & stores specified	Standards & stores specified
Maintenance Plan	External Maintenance based on type, use and voltage. Power Factor Test: SF6 - Only on initial placement in service, OCB every 6 years Internals – Condition-based only.	Sub: Yearly infrared and quarterly visual. Line: Monitored and controlled (35? pts.) through RCCS control system. Tied to feeder VAR to verify correct operation.	Transmission 6 year cycle Distribution 14 year
Renewal Plan	Replacement based on risk evaluation using AHI and criticality calculations.	Replacement based on failures, inspections or remote monitoring.	Relay schemes are replaced on past performance and coordinated with other substation equipment upgrades.
Asset Health / Risk Indexing	Yes. Ivara.	No. Track overall operation failure trends.	No. Track overall operation failure trends.
Technology and Practice Survey	Assure operation of 34kv, 138 kV, 345 kV and CBD feeders by exercising by remote control those breakers that have not operated in 6 months. Condition-based internals only	Automatically controlled centrally by RCCS to optimize substation and feeder VAR. Will operate independently on distribution line voltage. Verify operation remotely.	SEL Relays Pilot remote relay interrogation Computer testing Synchro-phasores
Asset Condition and Performance Monitoring	AHI in Ivara	Monitor failures	Incorrect relay operation trends
Decision Bases	Safety, Reliability, and Cost-Effectiveness	Safety, Reliability, and Cost-Effectiveness	Safety, Reliability, and Cost-Effectiveness
Special Studies of Emerging Issues	CEATI Practices, <5% responsible for all close/open issues last 10 years	Conservation Voltage Reduction, CEATI Practices	NERC Standards, IPS Energy

Asset Life Cycle Plan Status *(Continued)*

Attribute	Substation Batteries	Substation CT's and PT's	SCADA
Asset Criticality	High	High	Medium
ALCP Done / Due	9/16/2016	Q4 2017	Q2 2018
ALCP Content	Additional development planned	Not yet developed	Not yet developed
Asset Inventory	Type and age in PowerDB and MS Access databases.	EMPAC. Location, some age and type.	Type and estimated age.
Failure Analysis	No, but not needed.	Tracked and RCA performed for significant issues. EMPAC tracks corrective issues.	No.
Unit Costs	Project specific	Project specific	Project specific
Sourcing / Supply Chain	Standards & stores specified	Standards & stores specified	Standards & stores specified
Maintenance Plan	Inspect substation batteries not in scope of NERC requirements. Three interval definitions (3m, 6m, 1y), each with different levels of detail. This is per IEEE 450 (which says capacity test within first two years and then intervals not to exceed 25% of battery life expectance). Load Test - 5 years. This applies to some batteries not in scope of NERC requirements.	Yearly infrared and quarterly visual.	Monitored
Renewal Plan	Condition and criticality specific. No formal documentation of this risk.	CTs and PTs are replaced on past performance and coordinated with other substation equipment upgrades.	RTUs are replaced on past performance and coordinated with other substation equipment upgrades.
Asset Health / Risk Indexing	In design development	No, track overall failure trends.	No.
Technology and Practice Survey	Load test	Majority of PT secondary voltages monitored through SCADA.	Monitor real-time, DNP, Pilot SEL devices
Asset Condition and Performance Monitoring	Not in Ivara, but Condition Indicators are monitored	Infrared and visual anomalies traced in EMPAC and through limited SCADA monitoring.	SCADA failures are logged in the Energy Control System.
Decision Bases	Safety, Reliability, and Cost-Effectiveness	Safety, Reliability, and Cost-Effectiveness	Safety, Reliability, and Cost-Effectiveness
Special Studies of Emerging Issues	NERC, Replace as needed individual cells., CEATI Practices	CEATI Practices	>97% of customers fed from substations have SCADA

Asset Life Cycle Plan Status *(Continued)*

Attribute	Substation Communications	Transmission Structures	Transmission Lines
Asset Criticality	High	High	High
ALCP Done / Due	Q2 2017	8/18/2016	Draft
ALCP Content	Not yet developed	Additional development planned	Additional development planned
Asset Inventory	Partial (Jmux) 45 locations Age estimates	GTECH - Interconnected lines also. Location and type. Age in TAMIS.	GTECH - Interconnected lines also. Location and type. Age in TAMIS.
Failure Analysis	No.	Inspection data tracked in TAMIS. Follow up work in WMIS.. RCA for significant issues.	Inspection data tracked in TAMIS. Follow up work in WMIS. RCA for significant issues.
Unit Costs	Project specific.	Project specific	Project specific
Sourcing / Supply Chain	Standards & stores specified	Standards & stores specified	Standards & stores specified
Maintenance Plan	Monitored	345 and 138kV (non-urban) helicopter patrol every 1 years - some critical may see 6 months. Walking and thermal every 10 years. Wood poles are part of existing 10 year Osmose inspection/replacement program. Tower painting as-needed.	345 and 138kV (non-urban) helicopter patrol every 1 years - some critical may see 6 months. Walking and thermal every 10 years.
Renewal Plan	Schemes are replaced on past performance and coordinated with other substation equipment upgrades. Existing $3M program to upgrade important substations (~45) to MPLS technology.	Replaced on an as needed basis (failure, inspection).	Replaced on an as needed basis (failure, inspection).
Asset Health / Risk Indexing	No, but no indications of a need.	No. Track overall failure trends.	No. Track overall failure trends.
Technology and Practice Survey	Leased copper lines unavailable.	LIDAR, PLS CAD, CEATI data (Center for Energy Advancement through Technological Innovation)	LIDAR, PLS CAD, CEATI data (Center for Energy Advancement through Technological Innovation)
Asset Condition and Performance Monitoring	Very limited.	TADES, TAMIS (Transmission Asset Management Information System), relay log of all fault operations.	TADES, TAMIS (Transmission Asset Management Information System), relay log of all fault operations.
Decision Bases	Safety, Reliability, and Cost-Effectiveness	Safety, Reliability, and Cost-Effectiveness	Safety, Reliability, and Cost-Effective
Special Studies of Emerging Issues	Moving to fiber, SONET/MPLS technology	CEATI Practices and AHI Calculations, Outside Paint Inspection	CEATI Practices and AHI Calculations

Asset Management Program Implementation

Asset Management Program Implementation

As the previous slides summarize IPL's activities relating to a number of key attributes that define Asset Management on an asset class-specific basis, the following tables address those attributes that assure the asset management program is properly directed and continuing to improve the asset management processes. Viewed in tandem, stakeholders are provided a full view of IPL's progress in implementing its Asset Management process.

Attribute	Definition	Measure of Effectiveness	Current Status	Next Steps
Asset Management ("AM") Program Structure	Alignment of AM Policy, Strategy and Objectives, establishment of KPIs to measure AM process effectiveness, and organizational clarity regarding authorities and accountabilities for the Asset Owner, Asset Manager and Service Provider roles	• Existence of AM Policy, Strategy and Objectives • Charts to clarify authorities, accountabilities and responsibilities • Key Performance Indicators ("KPIs") measure effectiveness of AM process	• AM Policy, Strategy and Objectives established. • Charts outlined in AES Global AM Standards • KPIs in AM monthly report measure AM process effectiveness	Annual review and update of AM Policy, Strategy and Objectives if necessary.
Asset Risk Management	Identification, analysis, evaluation and setting of asset-related risk thresholds	• Comprehensive Risk Register • Effective leading indicators for equipment failures	• Framework for Risk Register established • Risk Register is being populated with data from various sources	Add to Risk Register with additional operational data. (2017)
Information Management and Technology	Clearly defined data needs, with effective quality controls to ensure Data integrity and availability. Effective Asset Management decision support tools and systems.	• Asset performance and condition data identified for all critical asset-related decisions • Data fully analyzed, maintained and translated into meaningful information to support asset-related decisions	• AM Website represents "Best Practice" step in assuring access to critical AM-related data • Significant work remains in developing data architecture and data collection requirements • Expanded use of decision support tools includes Distribution and Transmission reliability	Increase the use of 'push" technology (On-going) Distribution Reliability Tool (DRx) evaluation and enhancement.
Capital Investment and O&M Spending Portfolio Optimization	Identification, prioritization, planning, execution, control and closeout of Capital Expenditure ("CAPEX") projects and Major Operations and Maintenance ("OPEX") Programs; and establishment of appropriate CAPEX and OPEX investment and spending levels	• Optimization of CAPEX and OPEX is aligned with the business' strategic objectives • Actual investment and spending levels reflect trade-offs between economics and required service levels	• Internally developed prioritization tool ("PASE") provides a consistent approach across all Business Areas for prioritization/ selection of CAPEX projects • Budgets established based on historical perspective (as opposed to heavy reliance on risk-based approach)	CapEx process is well defined – move the lessons learned to O&M programs. (2017)
Asset Life Cycle Plan Integration	Annual update of summarized and integrated plan that rolls up and presents the results of strategies and plans across the entire portfolio of T&D assets, (budgets, replacements planned, assumptions, etc.)	• Plan exists that reflects a roll up of individual Asset Life Cycle Plans (risk and criticality), investment levels, and multi-year replacement / refurbishment programs	• ALCPs are partially developed requiring the incorporation of less structured approach	Further develop existing ALCP plans – (annual review) Continue to develop ALCPs according to present ALCP schedule

Asset Management Program Implementation *(Continued)*

Attribute	Definition	Measure of Effectiveness	Current Status	Next Steps
Root Cause Analysis ("RCA") and Special Investigations	Methods and practices for identifying and addressing underlying causes of an incident / non-conformance with the goal of preventing re-occurrence and ultimately improving effectiveness and sustainability of asset performance	• Defined RCA process • "Triggers" based on consequences of failure • Actions to mitigate / prevent reoccurrence • Effective follow up to ensure sustainability of corrective actions	• RCA process is defined • *Reasonably good* application of this process to incidents • Current application lacks *some* rigor in documentation	Increase the number of formal "small" RCA's for lesser incidents.
Asset Management Skills and Resourcing	Recruiting and succession strategy, as well as training and development programs to ensure organizational competence in the full range of Asset Management capabilities - from analyzing risk and likely reliability of a major piece of equipment to making correct repairs and properly documenting work orders	• Succession plan drives recruiting, hiring and training requirements • Field – Asset Management interface effective in assuring collection of critical asset performance and condition data • Established competencies in Operational Analytics	• Succession plan established but lacking formality in documenting training of key personnel • Cooperation between Field and Asset Management in capturing relevant data is exemplary • "Novice" status in demonstrating prowess in Operations Analytics	Improve Operational Analytics using PI-Historian Asset Management Framework (2017) Explore software options for high-level data analysis (2017)
Integrated Disaster Recovery Plans	Plans to address and correct, or mitigate potential major disasters or extreme variances in operational and / or financial performance.	• Plans exist and are practiced / drilled on a regular basis	• Well established process within the Transmission and Transmission organization	
AM Innovation and Continuous Improvement	Structured approach to address Asset Management system related problems, selecting solutions, monitoring progress, and if successful, incorporating them into the formal Asset Management process	• Continuous Improvement Program exists (APEX) • Innovation initiatives are identified in Asset Life Cycle Plans	• APEX process is established, and has been applied to the largest improvement opportunities, but not yet fully implemented, or integrated into daily operations	Continue to explore additional innovations with ideas from vendors, utility trade groups and best practice forums (on-going)
Benchmarking and Best Practice Identification / Evaluation	Formalized process to compare IPL's Asset Management practices and performance with the industry and evaluate relevance and practicality of integrating new "learnings" with the current process.	• Demonstrated comparisons to Industry Standards • Scores from AES Peer Review Process (Best Practice audits by other AES Companies) • Demonstrated comparisons to AES Asset Management Peer Review Protocol	• Active participant in annual Substation Best Practices Forum • Participates in IEEE and JD Powers Surveys • Implementing Transmission and Distribution Reliability Tools • Exploring g starting CBD UG Network Best Practices Forum	The recent addition of members of CEATI has allowed access to a wide range of best practice information. These documents are being reviewed and incorporated in AM processes.

Attachment A – List of Abbreviations

ALCP – Asset Life Cycle Plan

AM – Asset Management

AMI – Advanced Metering Infrastructure

AMR - Automatic Meter Reading

APEX – Internal continuous improvement program

CAPEX – Capital Expenditure

CBD – Central Business District

CEATI – Center for Energy Advancement through Technological Innovation

CT – Current Transformer

DOE – U.S. Department of Energy

EMPAC – Work Management System IPL Uses

ERPI – Electric Power Research Institute

GTECH – Geographic Information System IPL Uses

IEEE – Institute of Electrical and Electronic Engineers

IVARA - Asset Performance Management Systems IPL Uses

KPI – Key Performance Indicators

LIDAR - Light Imaging, Detection, And Ranging

MPLS - Multiprotocol Label Switching

NESC – National Electrical Safety Code

NERC – North American Electric Reliability Corporation

O&M – Operation and Maintenance

OH – Overhead

OMS – Outage Management System

OPEX – Operations and Maintenance Expenditure

PACE – Internally developed prioritization tool

PI – PI Historian for storing data

PM – Preventive Maintenance

PDM – Predictive Maintenance

PT – Potential Transformer

RCA – Root Cause Analysis

SAIFI – System Average Interruption Frequency Index

SCADA – Supervisory Control and Data Acquisition

TADS - Transmission Availability Data System

T&D – Transmission and Distribution

UG – Underground

URD – Underground Residential Distribution

WMIS – Work Management System IPL Uses

Attachment B

Attributes of a Decision-Analytic Approach to Asset Management

Utility Asset Management is an approach to engineering/operational decision-making

- The methods and techniques of utility asset management are designed to aid utility management in making a number of key decisions, usually weighing trade-offs between spending now versus later, or between different types of benefits and costs
- One set of decisions involves the life-cycle of costs associated with an asset, with decisions like:
  - Should we spend more up-front in acquisition and installation costs to avoid higher maintenance costs later?
  - Should we spend more on preventive maintenance to avoid corrective maintenance, i.e. repair?
  - When should we replace rather than continue to repair an asset?
- Another set of decisions involves supply chain options, with decisions like:
  - How many and which vendors should we have for a given asset?
  - How many and where should we store spares and inventory of each type?
  - To what extent should we inspect and insist on the quality of assets upon acquisition (and during manufacture)?
- Ultimately, some decisions will involve "how much is enough?", with respect to:
  - Safety (worker/contractor, and public, including environmental)
  - Reliability, capacity, and power quality
  - Low cost to customers via rates by class
- And, increasingly, new technology presents new decision options like:
  - How much to incorporate new technology in a standard for new assets, and how much to retrofit it to existing assets?
  - How much to invest in data acquisition and information processing to achieve better asset performance?
  - When should an asset that still works being retired for technological obsolescence?

Clearly, utility asset management is needed to guide a host of decisions about tradeoffs in asset cost and performance

These first three attributes represent basic building blocks for asset management…

- **Asset Life-Cycle Plan (ALCP)** – While many of the decisions about assets can and should be laid out in separate memos, analyses, and presentations, a formal asset life-cycle plan is a good place to capture all of the key decisions and their rationales in one place. Also, because the asset management decisions have much in common, and yet have aspects that are unique and specific to each class, comparing ALCP's across assets gives valuable insight into what is common and what is unique for each case. The ALCP's should be updated annually or as significant changes occur.
- **Asset Inventory** – The most basic building block of asset management is an inventory of assets, with details on various key characteristics like age, type, make (manufacturer) and model. Most utilities have a range of assets from brand new to over fifty years old, with manufacturers and technology having created many different types, e.g., for circuit breakers, the insulating medium in the interrupting mechanism has varied from plain air-distance to oil, air-magnetic, sulfur hexafluoride, and vacuum, each with its own characteristics for performance, cost, and maintenance. Surprisingly, some utilities have some difficulty in keeping track of all the right information for all of their assets, so this is an area that deserves attention, and its completeness and relevance can be assessed.
- **Failure Analysis** – While the term "asset performance" can be broadened to include aspects of cost, most associate it with failure. Utility assets have various modes of failure and various causes, with different 'solutions' that may be associated with each. Most commonly in electric utilities, a failure is associated with a fault (phase-to-phase or phase-to-ground), caused by some impairment of the designed-in insulation, whether by an overload, lightning, animal, vegetation, deterioration, etc. It is wasteful and ineffective to expend resources on addressing the wrong cause of failure, so failure analysis, including root cause analysis and ways to mitigate the frequency and impact of failure, is important. It begins with good capture of failure data, including sequestration of materials for forensic analysis, accurate recording of the sequence of events, and a set of known causal chains with which to form hypotheses. Often, utilities collect failure data unsystematically, e.g., in comment fields of corrective maintenance orders, or in memos about an incident. Systematic failure data capture and analysis reflects a higher level of asset management maturity.

These are the first three attributes of utility asset management, with each capable of assessment of degrees of maturity

These next four attributes are key and define the asset management strategy

- **Unit Costs** – When a utility says it is going to spend $1 million on replacement of a certain asset, how do we know if that is enough? One key is to know the typical unit cost of the asset, so that you know if $1 million buys 100, 10, or only 1 replacement. Unit costs figure prominently in computing cost-effectiveness or 'bang per buck'. If the failure rate of an asset is 1 percent per year, and replacement at $10,000 per unit would avoid failure, then the utility would have to replace 100 units, or $1 million, to avoid one failure per year. Knowing the '**bang per buck**' for different assets allows a utility to optimize the best way to avoid failures and outages at the least cost.
- **Sourcing/Supply Chain** – As discussed above, there are many questions about asset performance that involve decisions about the specification ("material standards"), purchase, inspection, commissioning, and storage/sparing of assets. Such decisions should have sound rationales and be reviewed periodically.
- **Maintenance Plan** – Much can be learned about a utility's asset management by asking a few key questions about the maintenance plan. Is it cycle-based or condition-based (or both, like a vehicle's 'six months or 6,000 miles'). How does it combine passive measures (like visual or infrared inspection, or testing for rot in poles or dissolved gases in insulating fluid) with active measures like reconditioning or overhaul? Is it typical of what we see in the industry? If not, why? Does it maintain an asset's condition, or allow it to deteriorate?
- **Renewal Plan** – Renewal is a word that can mean replacement or a substantial overhaul or life-extending procedure, like cable injection, C-trussing a rotted pole, or re-winding a transformer. The rate at which a utility renews its assets is critical – renewing two percent of an asset class each year will tend to result over time in assets that average 50 years old (although growth can substitute somewhat for replacement in maintaining average age). By targeting renewal at the assets in the worst condition, even a low renewal rate can be effective in maintaining asset condition. Utilities need to 'sharpen the pencil' by finding ways to target assets in the worst condition, i.e., those with potentially higher failure rates.

'Bang per buck', material standards, maintenance, and renewal are four key elements of an effective asset management strategy

These additional attributes are the 'icing on the cake' of good asset management

- **Asset Health/Risk indices** – Many utilities did reasonably good asset management for years without asset health/risk indices. They did so by applying good judgment and field knowledge in selecting which assets to renew or overhaul. Increasingly, utilities are applying good data collection and analysis to develop methods of scoring each asset in a systematic way. The indices typically represent asset risk in quadrants along two dimensions: Probability of failure, and impact of failure, with assets in the upper right quadrant (high probability, high impact) being the riskiest, and assets in the lower left being the least risky (Assets in the other two quadrants represent more or less equal risk, but of two very different kinds – everyday problems and rare catastrophes). Progress toward developing systematic asset health/risk indices (based on more than just field personnel scores or asset age) shows maturity in asset management.
- **Special Issues and Studies** – Some assets require a 'deep dive' from time to time on a specific issue. For example, failure analysis (by the utility itself, or by the industry via bulletins) may uncover a trend in a particular asset that needs attention beyond the normal – perhaps requiring data not normally kept, like whether a particular model has an aluminum bus instead of copper, or whether a certain brand and vintage of porcelain cutout is problematic in freeze/thaw cycles, etc. Special studies of such issues show extra maturity in asset management.
- **Technology and Practice Survey** – When evaluating adoption of a new technology, it is often best not to be on the "bleeding edge", i.e., the first to try it before refinements in implementation can be worked out. (Yet, sometimes one or two utilities find they have to be leaders because the issue is especially relevant for them). Surveying the experiences of others in the industry is an excellent way to benefit from technology after it has had a chance to be proven and its implementation refined. This can also be useful in general – to compare all major practices to see if the rest of the industry is doing it the same way, or if not, to understand why.

As asset management at a utility matures, further development in these three attributes is typically observed

The proof of the pudding is found in these last two attributes

- **Asset Condition and Performance Monitoring** – It has often been said that "You can't manage what you don't measure". Asset management is one area where this is typically true, especially since asset condition can be unobservable without an effort, and tempting to ignore if not made visible. A utility can ignore maintenance in an area for a few years or more with no immediate impact at first, yet over time it will become apparent that the system had been allowed to deteriorate as things like overgrown vegetation, pole rot, metal fatigue and corrosion begin to take their toll. Monitoring asset condition and performance in a timely way provides the true test of whether asset management is being effective, and can warn of emerging problems before they become front-page news.
- **Decision Bases** – Every major asset decision demands a cogent business case. Even if the analysis shows that it's a toss-up – six of one, half-dozen of another – that fact itself is worth noting, as opposed to other cases where the decision was a "no-brainer". The main drivers of utility decisions are typically safety, reliability, and cost. Each of those drivers has multiple elements:
  - Worker/contractor and public safety,
  - Reliability for the average customer in non-storm conditions, and also the worst-served customers in storm conditions,
  - Initial cost, maintenance cost, removal/salvage cost, and the cost of restoring service or repairing collateral damage

  As well, sometimes there are issues of compliance with environmental regulations, building codes, OSHA rules, etc. In utility regulatory precedents, prudence in investment is judged on whether the decision was based on "what was known, or should have been known, at the time". Documentation of the decision basis provides a record of why the decision was made, and the information used to make it. Good asset management maturity supports prudent utility investment.

Mature asset management should result in asset condition being maintained (or improved) and investment that is judged prudent

Appendix E – IPL's Central Business District (CBD) Underground (UG) Network

Asset Management Program Oversight Report

IPL's Central Business District (CBD) Underground (UG) Network Asset Management Program Oversight Report

The following report reflects IPL's assessment of its progress in implementing an Asset Management Program for its CBD UG Network. Though the reporting formats and attributes used to present this information have been accepted by the Collaborative, the assessment itself reflects IPL's view of progress-to-date, and should not be construed to imply that of the Collaborative.

CBD UG Network Asset Management Program Oversight Report

Objective –

Track, report and verify IPL's progress in executing the CBD Underground ("UG") Network Asset Life Cycle Plan.

Implementation –

We recommend a multi-faceted approach to assure that the underlying objectives of increased transparency and improved stakeholder confidence are achieved. We plan three parallel tracks for this purpose:

- CBD UG Asset Life Cycle Program Oversight, summarizing the completeness of IPL's CBD UG Life Cycle Plan for 9 asset classes across 13 attributes that define a complete Asset Life Cycle Plan
- Current CBD UG Network Initiatives Tracking Report, providing a listing of all open CBD UG initiatives with scope, objective, next steps (near-term view) and projected completion date)
- Completed / Ongoing CBD UG Initiatives, providing a listing of all CBD UG initiatives that were listed in the CBD UG Asset Life Cycle Plan, deemed completed by IPL. In this context, "ongoing" refers to those initiatives have a continuing aspect to them even after initial completion to satisfy a requirement.

The following performance metrics, listed in the "Strawman" Oversight Document, will likely replace these tracking mechanisms once the underlying objective of improved stakeholder confidence is achieved.

- CBD Underground Network Milestone Schedule and Updated GANTT Chart
- Number of Significant CBD Underground Events per Year
- Total Number of Equipment / Component Failures

Asset Life Cycle Plan Framework

Asset Life Cycle Plan Framework

Attribute	Attribute Description
Asset Criticality	Relative ranking (High-Medium-Low) of how critical the asset class is
ALCP Done/Due	Asset Life Cycle Plan Due Date or Latest Draft Completed Date
ALCP Content	Breadth and depth of ALCP scope as currently planned or executed
Asset Inventory	Availability and accuracy of asset-specific information (quantities broken out by age, condition, size, class, type, and manufacturer and other characteristics – as applicable)
Failure Analysis	How failures are tracked and analyzed for root cause and impact
Unit Costs	Installation costs (Direct and Loaded) and maintenance costs, so that a budget of X dollars can be translated into how many units it covers, and what percent of the asset population
Sourcing/Supply Chain	Specifications for new equipment; analysis of vendors and of stores/spares
Maintenance Plan	Inspection and maintenance scope and frequency (time or condition-based)
Renewal Plan	Multi-year plan and budget for preventive and corrective replacement or refurbishment, with implications for asset performance over time
Asset Health/Risk Indexing	Ability to display at a point in time which individual assets entail the most risk, in terms of both probability and impact of failure (where risk = probability x impact)
Technology and Practice Survey	Comparison of practices with the rest of the industry, with explanation for differences
Asset Condition and Performance Monitoring	System for tracking asset condition and performance, including specific metrics, analyses, exception reporting, and variance explanations
Decision Bases	Main reasons driving the business case for key decisions, e.g., safety, reliability, cost
Special Issues and Studies	Analysis of a special issue associated with an asset, as applicable, e.g., environmental, new technology, work practices

Asset Life Cycle Plan Inventory Framework *(Continued)*

Attribute	Attribute Description	Asset Class A	Asset Class B	Asset Class C
Asset Criticality	Relative ranking (High-Medium-Low) of how critical the asset class is	High	Medium	Low
ALCP Done/Due	Asset Life Cycle Plan Due Date or Latest Draft Completed Date			
ALCP Content	Breadth and depth of ALCP scope as currently planned or executed			
Asset Inventory	Availability and accuracy of asset-specific information (quantities broken out by age, condition, size, class, type, and manufacturer and other characteristics – as applicable)			
Failure Analysis	How failures are tracked and analyzed for root cause and impact			
Unit Costs	Installation costs (Direct and Loaded) and maintenance costs, so that a budget of X dollars can be translated into how many units it covers, and what percent of the asset population			
Sourcing/Supply Chain	Specifications for new equipment; analysis of vendors and of stores/spares			
Maintenance Plan	Inspection and maintenance scope and frequency (time or condition-based)			
Renewal Plan	Multi-year plan and budget for preventive and corrective replacement or refurbishment, with implications for asset performance over time			
Asset Health/Risk Indexing	Ability to display at a point in time which individual assets entail the most risk, in terms of both probability and impact of failure (where risk = probability x impact)			
Technology and Practice Survey	Comparison of practices with the rest of the industry, with explanation for differences			
Asset Condition and Performance Monitoring	System for tracking asset condition and performance, including specific metrics, analyses, exception reporting, and variance explanations			
Decision Bases	Main reasons driving the business case for key decisions, e.g., safety, reliability, cost			
Special Studies of Emerging Issues	Analysis of a special issue associated with an asset, as applicable, e.g., environmental, new technology, work practices			

Color coding legend:
The color of each block is meant to show the relative level of maturity or development of that attribute for that asset class. As such, it is an indication of the stage in a multi-year and ultimately continuous process. It is not an evaluation of the quality of that activity.

Red: Envisioned, but not yet started.

Yellow: In progress, with substantial content, but some "TBD" parts.

Green: Mature – no near-term plan for further enhancement.

Gray: Not applicable/Other

Asset Classes:
Currently there are 18 asset classes for distribution, and an additional set of 9 classes for the assets in the Central Business District.

IPL's Detailed CBD UG Network Asset Life Cycle Plan Status

IPL's CBD UG Network Asset Life Cycle Plan Status

Attribute	Secondary Cable	Primary Cable	Network Protectors
Asset Criticality	High	Medium	Medium
ALCP Done / Due	9/3/2015	9/3/2015	9/3/2015
ALCP Content	Completed	Completed	Completed
Asset Inventory	198,000 feet (37.5 miles) (75% or 28 miles is 350MCM PILC , 5% or 2 miles is 500 MCM PILC) GTECH and AutoCAD systems	367,131 feet (69.5 miles). GTECH and AutoCAD system.	303 total Protectors, 137 ;227/480 volt (58 pre 1985 CM 22) and 166; 120/208 volt class.
Failure Analysis	Track and monitor failure trends and locations . Detail data after 2003. EMPAC tracks corrective issues. RCA performed for significant issues.	Track and monitor failure trends and locations . Detail data after 2003. EMPAC tracks corrective issues. RCA performed for significant issues.	Track and monitor failure trends and locations . Detail data after 2003. EMPAC tracks corrective issues. RCA performed for significant issues.
Unit Costs	Project specific tracked in WMIS. Manhole to Manhole, material plus labor, $70/foot, average length 100 feet..	Project specific tracked in WMIS. Material plus labor, $70/foot, average length 100 feet.	Project specific tracked in WMIS. (~$100k material and labor protector).
Sourcing / Supply Chain	Standards & stores specified	Standards & stores specified	Standards & stores specified
Maintenance Plan	Part of Manhole (3 yr.) and Vault (2 yr.) inspection cycle	Part of Manhole (3 yr.) and Vault (2 yr.) inspection cycle	Every 2 years visual and infrared. Exercised every 6 months.
Renewal Plan	Replacement based on risk evaluation using AHI and criticality calculations. (Target $2.5M/yr.)	Existing program to replace XLPE cable out of Edison substation.	Replacement based on risk evaluation using AHI and criticality calculations.(Target $2.5M/yr.)
Asset Health / Risk Indexing	IVARA Criticality Scoring (based on Maintenance inspection results) Reviewing Steam Monitoring	IVARA Criticality Scoring (based on Maintenance inspection results) Reviewing Steam Monitoring	IVARA Criticality Scoring (based on Maintenance inspection results)
Technology and Practice Survey	Fiber cable temperature pilot (real time monitoring) on selected cable locations with previous steam issues.	Fiber cable temperature pilot (real time monitoring) on selected cable locations with previous steam issue. Continuously monitored with SCADA.	480V protector replacement program for arc flash mitigation. Assure operation of protectors by exercising with SCADA remote control those protectors that have not operated in 6 months.
Decision Basis	Safety, Reliability, and Cost-Effectiveness	Safety, Reliability, and Cost-Effectiveness	Safety, Reliability, and Cost-Effectiveness
Asset Condition and Performance Monitoring	Failures tracked in database.	Failures tracked in database.	Failures tracked in database.
Decision Basis	Safety, Reliability, and Cost-Effectiveness	Safety, Reliability, and Cost-Effectiveness	Safety, Reliability, and Cost-Effectiveness
Special Studies of Emerging Issues	Power Survey Inc. Stray voltage annual survey, Overlay maps of Steam and IPL assets for risk locations. Move to crab and limiter connections.	Purchase Low smoke, high temp cable (Okonite OKOCLEAR-TS). Also SEL fault indicators (for PILC) being used in selected key locations (since 2012)	Future opportunity identified to update Construction Standards (12/2017)

IPL's CBD UG Network Asset Life Cycle Plan Status *(Continued)*

Attribute	SCADA	Network Transformers	Manholes Structure
Asset Criticality	Medium	Medium	Low
ALCP Done / Due	9/3/2015	9/3/2015	9/3/2015
ALCP Content	Completed	Completed	Completed
Asset Inventory	303 protectors monitored	305 total transformers. 137 ;227/480 volt and 166; 120/208 volt class	Manhole locations in GTECH. Contents in Product Center on manhole data sheets.
Failure Analysis	Track and monitor failure trends and locations (detailed data after initial equipment was installed in 2012)	Track and monitor failure trends and locations (detailed data after 2003). RCA performed for significant issues. EMPAC tracks corrective issues.	Tracked and RCA performed for significant issues. EMPAC tracks corrective issues.
Unit Costs	Repair/replace equipment on protector $5k, on collector $10k	Project Specific, work orders tracked in WMIS. (~$100k average per transformer labor and material)	Project Specific, work orders tracked in WMIS. (~$75k average rebuild)
Sourcing / Supply Chain	Standards & stores specified	Standards & stores specified	Standards & stores specified
Maintenance Plan	Monitored real time.	Part of Vault Inspection program every 2 years. Infrared and visual.	3 Year infrared and visual inspection cycle.
Renewal Plan	Adding additional VaultGard and H&L fiber interfaces to increase robustness of the communications.	Replacement based on risk evaluation using AHI and criticality calculations.	Replacement based on risk evaluation using AHI and criticality calculations.
Asset Health / Risk Indexing	No.	IVARA Criticality Scoring (based on Maintenance inspection results)	IVARA Criticality Scoring (based on Maintenance inspection results)
Technology and Practice Survey	100% SCADA.	Continuously monitored with SCADA.	Visual Inspection Program done via Tablets (starting in 2012) Pilot program for flexible racking system.
Asset Condition and Performance Monitoring	Percent of time not communicating is tracked in a PI Historian.	AHI trends tracked.	AHI trends tracked.
Decision Basis	Safety, Reliability, and Cost-Effectiveness	Safety, Reliability, and Cost-Effectiveness	Safety, Reliability, and Cost-Effectiveness
Special Studies of Emerging Issues	SCADA to PI process books.	Termination chamber FR3 retrofit completed in 2013, Debris Shields installed in 2012, New equip spec updated in 2012. Bolted termination connections. No transformer electrical failures (just termination chambers) in >30 years.	Locking Manhole covers (Swiveloc)

IPL's CBD UG Network Asset Life Cycle Plan Status *(Continued)*

Attribute	Vaults Structure	Ducts Structure	Services
Asset Criticality	Low	Low	Low
ALCP Done / Due	9/3/2015	9/3/2015	9/3/2015
ALCP Content	Completed	Completed	Completed
Asset Inventory	Vault location in GTECH. Contents in EMPAC. Many have recorded videos on IT network.	433 miles of duct by type.	
Failure Analysis	Tracked and RCA performed for significant issues. EMPAC tracks corrective issues.	Tar, cellulose based ducts installed in the mid 19xx??	
Unit Costs	Project Specific, work orders tracked in WMIS.		
Sourcing / Supply Chain	Standards & stores specified	Standards & stores specified	Standards & stores specified
Maintenance Plan	2 Year infrared and visual inspection cycle.	Part of Manhole and Vault inspection cycle	Part of Manhole and Vault inspection cycle
Renewal Plan	Replacement based on risk evaluation using AHI and criticality calculations. Civil engineer used to prioritize replacement or refurbishment.	Reviewing using steam line temperature monitoring impact data for duct.	
Asset Health / Risk Indexing	IVARA Criticality Scoring (based on Maintenance inspection results)	IVARA Criticality Scoring (based on Maintenance inspection results)	IVARA Criticality Scoring (based on Maintenance inspection results)
Technology and Practice Survey	Visual Inspection Program done via Tablets (starting in 2012)	Fiber Optic Temperature Monitoring	
Asset Condition and Performance Monitoring	AHI trends tracked		
Decision Basis	Safety, Reliability, and Cost-Effectiveness	Safety, Reliability, and Cost-Effectiveness	Safety, Reliability, and Cost-Effectiveness
Special Studies of Emerging Issues		Fiber Optic Temperature Monitoring	

Current CBD UG Network Initiatives Tracking Report

Current CBD UG Network Initiatives Tracking Report

Initiative	Scope / Objective	Next Steps	Projected Completion Date
Monitor Duct Line Temperatures	Pilot project to determine if fiber cable and OTDR type technology can be used to monitor duct line temperatures. Initial results are promising to the scope of the pilot has been expanded with an additional three routes planned. Most of this work should be done in 2016.	• Complete additional fiber cable installations (12/16) • Monitor performance (8/16 thru 12/16)	Expanded Pilot to 35,000 feet.
Digital Relay Installation	Replace electromechanical feeder relays at Edison and Gardner Lane substations with microprocessor relays and associated substation remote terminal units (RTUs) for SCADA.	• Issue engineering work orders (Done) • Begin construction at Edison (Working) • Begin construction at Gardner Lane (9/16) • Complete construction and in-service checks for all 26 network feeders (12/16)	Complete
Crab and Limiter Connections for new secondary cable installations	Pilot new secondary cable and termination practices. Area of New York, Delaware and Massachusetts is targeted.	• Issue engineering work orders (9/16) • Complete construction (11/16) • Gather feedback to adjust construction standards (11/16)	Complete
Replace 480v Network Protectors	Replace all 480V network protectors	• 62 installed in 2015 • 15 installed in 2016 • 30 scheduled in 2017 • 28 scheduled in 2018	12/31/2018
Update and improve IPL's Construction Standards for CBD Equipment	Update and add additional standard drawings and specifications based on new equipment and installation pilot programs.	• Identify appropriate standards (Done) • Create and update all CBD standard documents (12/17)	12/31/2017
Increase the Robustness of the CBD SCADA	Add additional SCADA VaultGard communication collection points to reduce the amount of single failure communication outages.	• Identify location for additional VaultGard devices (Complete) • Issue engineering work orders (9/16) • Install and commission VaultGards (11/16)	Complete and On-Going
Implement PI Historian Automatic e-mail Notifications	Upgrade PI server and using PI-Notifications send e-mails (texts) for some abnormal conditions (overloads, frequent protector operation, etc.,) Install Asset Framework to facilitate efficient implementation of PI Notifications.	• Upgrade PI server (11/16) • Test PI-Notifications software (11/16) • Identify alarm points and implement notifications (1/17)	Complete

Completed / Ongoing CBD UG Network Initiatives

The following tables summarize the scope, objectives and benefits derived from those initiatives presented in IPL's CBD UG Network, deemed completed by IPL. The rationale for the heading "Completed / Ongoing" signifies the initial completion of an initiative, yet acknowledging that some will require continued attention and actions.

Summary of Completed / Ongoing CBD UG Network Initiatives

Initiative	Scope / Objective	Benefit Provided
Improve coordination with Citizens Energy	Improve communication further for both parties to understand the steam and electric network interaction.	• More visibility into response time and steam/electric related issues.
Enhanced CBD Inspections	Improve the inspection and follow up work process.	• Detailed inspection process documents provide greater consistency. • Documented follow up process for inspection results.
Material Specifications – For Network Transformers	Change IPL transformer specification to bolted elbow connections and replace mineral oil fluid in existing termination chambers with flame retardant FR3 fluid.	• Minimized the combustion of a transformer termination failure.
Network Protector Replacement Program	Inspect protectors for aluminum bus, water ingress, toluene gas.	• All protectors on 2 year inspection process. • All 480V network protectors are scheduled for replacement. • Other issue are monitored and tracked in Ivara database.
Improve the Asset Management Process	Dedicate additional resources to help improve the asset management process.	• Acquired additional resources to further advance asset management processes • More structured documentation and robust data system.
Electronic Capture of Inspection Data	Use tablet computers to improve the inspection process.	• Better documentation of inspection data. • Improved follow up for inspection results.
Downtown SCADA Project	Refocus on the data available from the CBD SCADA project.	• Ensure CBD SCADA data is providing benefits to help operations. • Leverage the full data capability allows better decision making.
Continue Deployment of Technology Initiatives	Use technology to advance the inspection process and fault response times.	• Thermal imagining identifies possible connection and abnormal conditions. • Fault indictors reduces fault location times.
GIS Mapping and Modeling	Continue to develop automated mapping/GIS data and applications for the downtown underground network.	• CBD is modeled in GIS. This allows load flows and fault studies to be conducted. • System weaknesses are identified.
Oil Testing and Fire Retardant Fluid	Evaluate dissolved gas analysis (DGA) for network transformers and fire retardant dielectric fluid for network transformers.	• DGA results showed no conditions of undue concern. • All new transformers have FR3 fluid to reduce the likelihood of fire in the rare case there would be a transformer resulting in a tank rupture.
Swiveloc Manhole Cover Installation	Improve manhole cover safety and increase security of non-IPL personnel entering manholes.	• Reduce the probability of a network incident resulting in a dislodged manhole cover.

Summary of Completed / Ongoing CBD UG Network Initiatives

Initiative	Scope / Objective	Benefit Provided
Document Network Event Response Plan	Formalize the network response plan.	• Provides guidance for notifying key personnel • Improves succession planning with formal procedures to transfer knowledge.
Meet with Indianapolis Fire Department	This ensures IFD and IPL have a coordinated response.	• Annual meeting facilitates continued good relationship.
Develop Network Protector Failure Mitigation Strategy	Review possible strategies to mitigate the likelihood of a similar network protector failure as 26 S. Meridian.	• The ALCP reviewed options and determined the most cost effective approach is to replace Gardner Lane and Edison feeder relays. Single phase VAR reading will be monitored with SCADA to help identify abnormal conditions.
Conduct Review of Gateway Vault Communications	Improve the reliability of the CBD SCADA communications.	• A monthly metric is measured and published to monitor communication status. • A daily e-mail is generated at 7:00 AM for any abnormal condition. Engineering and field crews review this and address issues.
Enhance Network Protector Inspection Process	Inspect all remaining 53 Westinghouse pre-1985 CM-22 protectors for issues with the “gray spool insulator”.	• Inspection forms were modified and all protectors inspected. No issues found.
Continue to Participate in Industry Forums	Send representatives to Eaton and Northeast Underground Committee meetings. Participate in Network e-mail group.	• This objective helps IPL personnel stay abreast of trends in the industry.
Implement Periodic Auditing of Inspection Data	Ensure inspection and work order data is complete.	• An audit of inspection and work order data was conducted in January 2016 and some minor issues were found and corrected. • Additional procedures were put in place to help ensure data quality. • This process minimizes the chance of data gaps.
Primary Cable Specification	Identify cable with better heat capability and less smoke generation.	• More robust cable to withstand higher jacket temperatures from external sources. • Less likely to generate explosive gasses during failure.
Secondary Cable Specification	Identify cable with better heat capability and less smoke generation.	• More robust cable to withstand higher jacket temperatures from external sources. • Less likely to generate explosive gasses during failure.
Network Feeder “Drop” Test	This exercises feeder breakers and network protectors to help ensure correct operation.	• Helps prevent “freeze up” of mechanical components in breakers and protectors. • Gives a “real world” test for network protectors.
Conducted Stray Voltage Survey	Used a stray voltage survey to identify secondary and street light cable insulation failure.	• Identified one secondary neutral “open” and repairs were made. • Found some street light, traffic light issues.

IPL's Snapshot View of their Progress in Implementing the CBD UG Network Asset Life Cycle Plan

CBD UG Network Asset Management Program Oversight

In responding to the Commission's concern about "Aspirational" vs. "Operational", IPL has indicated that most of the information requested in the CBD Asset Management "Oversight" framework was already part of the CBD asset management plan dated August 31, 2015 and submitted into testimony by Mr. Feldman in September, 2015.

Attribute	Secondary Cable	Primary Cable	Network Protectors	SCADA	Network Transformers	Manholes Structure	Vaults Structure	Ducts Structure	Services
Asset Criticality	High	Medium	Medium	Medium	Medium	Low	Low	Low	Low
ALCP Done / Due									
ALCP Content									
Asset Inventory									
Failure Analysis									
Unit Costs									
Sourcing / Supply Chain									
Maintenance Plan									
Renewal Plan									
Asset Risk Indexing									
Special Issues and Studies									
Technology and Practice Survey									
Asset Condition and Performance Monitoring									
Decision Basis									

Of the remaining information requested in the "Oversight" framework, about 4% appear to be new ideas with significant merit, which will be evaluated and as appropriate, incorporated into the updated AM Plan. Approximately 11% of the requested information is currently not thought by IPL to warrant inclusion in the CBD ALCP.

Legend

- Fully included in AM Plan
- Partially included in AM Plan
- New Idea – Exploring merit of including
- Not considered relevant to the AM Plan

3/31/2017

Appendix F – CBD Underground Network GANTT Chart

IPL Downtown Network Commitment Gantt Chart Narrative Summary
Updated as of March 29, 2017

Indianapolis Power & Light Company (IPL) prepared a Gantt chart in 2011 which has been used to track the status of various commitments made to the Indiana Utility Regulatory Commission regarding its Downtown Network system. IPL further provides the Commission with updates to the Gantt chart on an annual basis. As new commitments were made, they were added to the Gantt chart for tracking purposes.

Below is a narrative of the commitments and their respective status. IPL has previously provided the Commission with detailed reports on completed commitments. For items that remain open, additional detail is provided in this update to reflect progress through March 29, 2017.

1. **2011 O'Neill Downtown Network Assessment Recommendations**
   All Items are complete

2. **Center Substation Event**
   All items are complete

3. **150 E Market Street Event**
   All items are complete

4. **26 S. Meridian Street Event**
   a. Recurring Items
      i. Provide Annual Progress Reports through 2018 – *On Track*
      ii. 480 Volt Network Protector Replacements, scheduled 2018 completion – *On Track*
      iii. Quarterly Reporting to the Commission through 2018 – *On track*
      iv. Meet Annually with Indianapolis Fire Department – *On Track*
   b. All Other Items are complete

5. **327 E New York Street Event**
   a. No specific action items from this event

6. **428 Massachusetts Avenue Event**
   a. Install digital relays on Edison and Gardner Lane Underground Network feeders
      i. All work is complete as of December 30, 2016.
      ii. Relay change outs at Edison substation are complete.
      iii. Relay change outs at Gardner Lane substation are complete.

7. **North Street Event**

a. All Items are complete

8. Other Initiatives

a. Monitor Duct Line Temperature Pilot - *Ongoing*

In 2016, IPL began a pilot project to use fiber optic cable to provide real-time temperature monitoring in the duct lines and manholes adjacent to or crossing Citizens Energy steam lines. This system provides temperature readings for every meter along the fiber cable route and provides alarming capabilities. Initially, 6,800 feet of fiber cable was installed for the pilot. Results to date continue to be very promising on use of this cutting edge application of technology. The pilot was able to detect a steam anomaly as it developed. This allowed IPL to work with Citizens Energy to mitigate the anomaly quickly to limit risk and potential damage to IPL power cables and duct system. IPL provided a detailed presentation of the Digital Temperature Sensing (DTS) pilot at the August 2016 Collaborative meeting, which included IURC Staff, the OUCC, and other IPL stakeholders. Periodic updates have also been provided at subsequent Collaborative meetings.

In the 4th quarter of 2016, IPL installed an additional 30,000 feet of fiber optic cable to expand the area being monitored. Three additional fiber circuits were added along with an additional digital monitoring device to increase the redundancy of the system. The three new circuits cover areas east and north of Monument Circle, and additional areas around the Convention Center and the State Capitol buildings. Calibration of the new circuits took place in January and February 2017. The new circuits were placed in-service in February 2017.

b. Use of Crabs and Cable Limiters for new secondary cable installations – *Complete*

This initiative involves the use of a modular splice (crab), new cable limiters, and a modular racking system in new manholes to reduce congestion. This change is being made in conjunction with the change in secondary cable standards to use a low smoke, low halogen jacketed cable with Ethylene Propylene Rubber (EPR) insulation. IPL will install cable limiters in each manhole on the new secondary cables, again as part of the change in secondary cable specifications. The first location for installation of the new secondary cable and the use of crabs and cable limiters has been completed. The new modular racking system will be installed in new manholes going forward.

The left picture below shows the installation of crabs and cable limiters. The right picture shows a close up of the new cable limiters.


c. Update IPL Construction Standards for CBD Equipment - *Open*

This initiative involves updating:

- existing CBD construction standards drawings and creating new construction standards drawings for the changes being made to cable specifications,
- changes in how cables will be terminated, the use of cable limiters in manholes,
- use of crabs and the new racking system in manholes.

IPL Standards Engineering has begun working on the new and revised construction standards. Meetings with subject matter experts have been held to identify current standards that will need to be changed and to identify new standards drawings that need to be created. The process involves modifying existing standards drawings, creating new standard drawings, reviews by subject matter experts, and finally approval by the Construction Standards Committee to make the entire changes official. The schedule is to complete all new standards, drawings, and revise existing drawings by December 2017.

d. Increase robustness of the CBD SCADA system – *Open*

This initiative involves adding two additional Gateway Vaultgards to reduce the number of vaults connected to a single Gateway Vault Relay. Both new Gateway Vaultgards were installed in conjunction with a new spot network vault. This work will split two of the existing SCADA circuits into four circuits. The schedule for completion of one the Gateway Vaultgard has been pushed back to February 2017 in coordination with customer work involving a new 480-volt vault. The customer's work is behind schedule and this has delayed IPL's ability to complete the work. The second new Gateway Vaultgard was installed in January 2017 to coordinate the fiber cable splicing with the new DTS circuits being added. Fiber Cable from the DTS Pilot is being used for the additional Gateway Vault Relay.

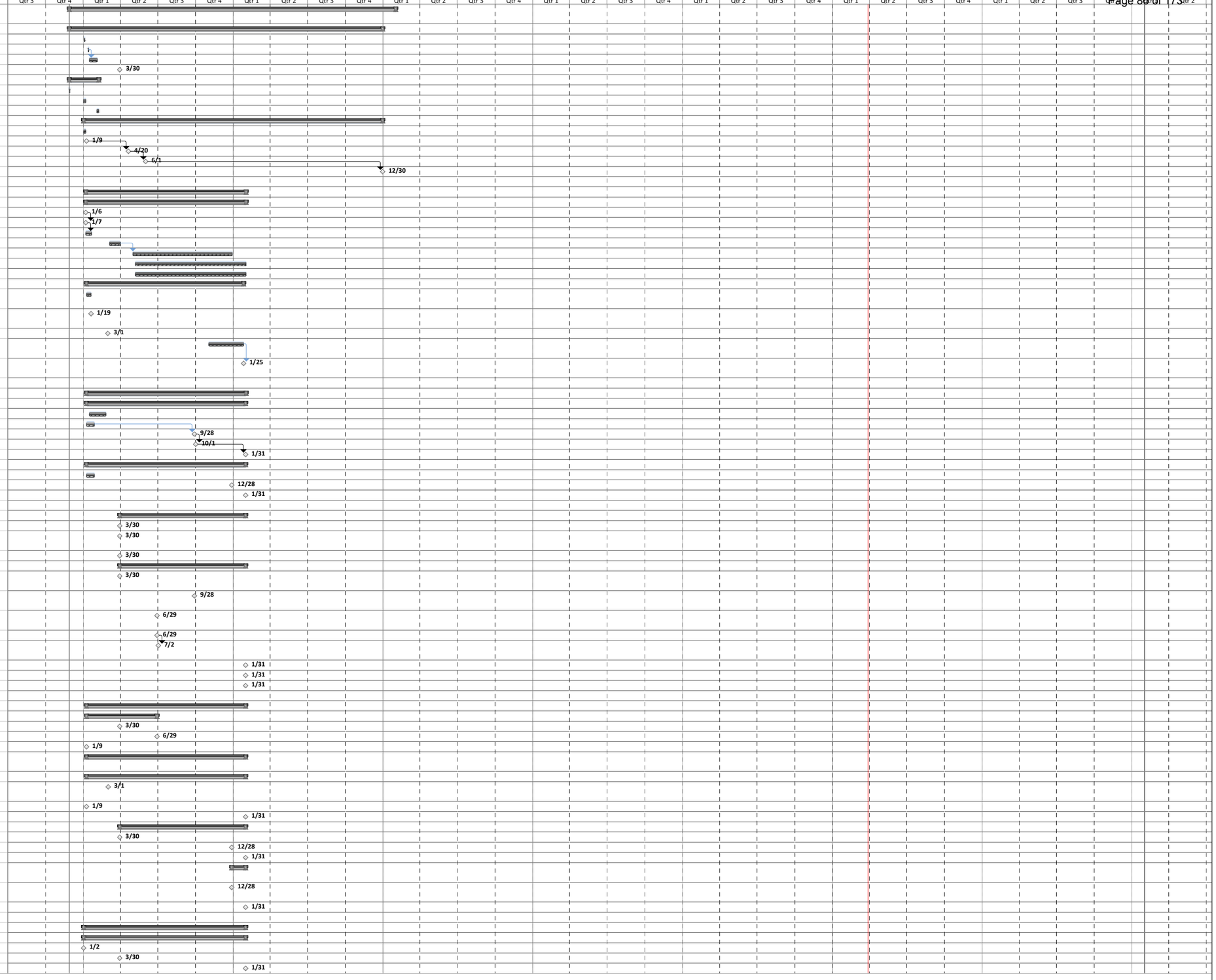
e. Implement PI Historian automatic e-mail notifications – *Complete*

This initiative involves implementing automatic email notifications from the PI Historian that is used to store status and analog data from the Network SCADA system and from the Transmission & Distribution SCADA system. This will provide the capability to send email notifications when certain criteria are met, such as an excessive number of operations of a network protector operation over a three hour period. At the beginning of the software installation, IPL learned that other software on the Pi server would need to be upgraded before the notification software could be installed and implemented. All needed software has been purchased and the upgrades were completed by the end of December 2016 as planned. Testing and implementation were also completed in December 2016, earlier than planned, and the enhanced email notifications are now functional.

f. Implement Asset Life Cycle Plans

The status of the various Asset Life Cycle Plans has been added to the Gantt Chart for tracking purposes. There are 19 Asset Life Cycle Plans that are being tracked. Ten of the plans are complete and have been implemented. An additional six plans are in progress and are scheduled for completion in 2017. The remaining three plans are scheduled for completion in 2018.

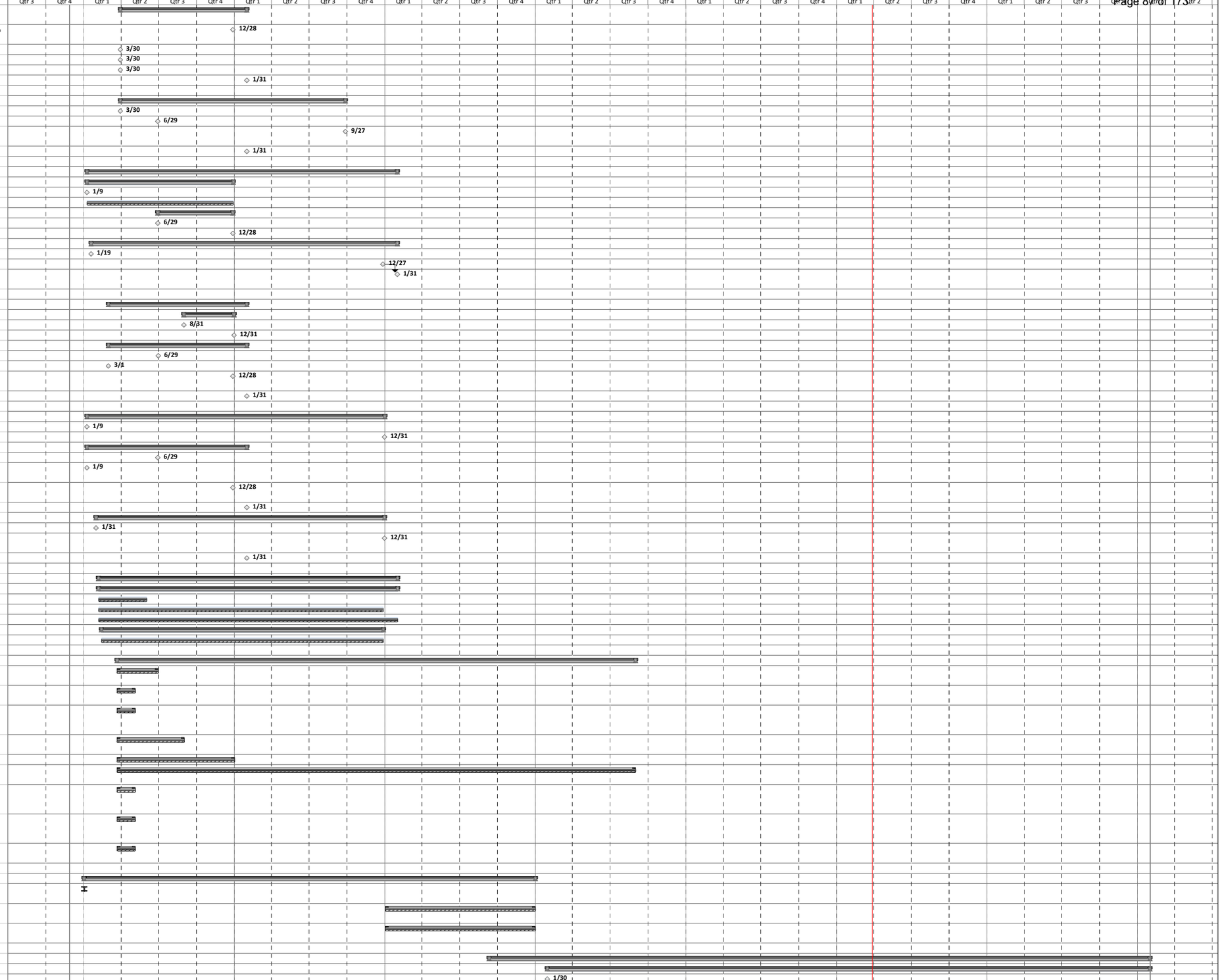
ID		Task Name	% Complete	Start	Finish	Comments
1		**O'Neill Indepenent Assessment of DnTn UG Network**	**100%**	**11/28/11**	**1/31/14**	
2		**Rec. 1 - Coordination w/CTE**	**100%**	**11/28/11**	**12/30/13**	
3		Meeting Between IPL & Citizens	100%	1/4/12	1/4/12	
4		Citizens Provide Thermal Survey Data	100%	1/13/12	1/13/12	
5		Create New GIS Map	100%	1/16/12	2/3/12	
6		Citizen to Provide 2012 Survey Data	100%	3/30/12	3/30/12	
7		**1A & B-Identify Hot Manholes**	**100%**	**11/28/11**	**2/7/12**	
8		Identify Hot Manholes	100%	11/28/11	11/28/11	
9		Inspect Hot Manholes After CTE Repairs	100%	1/2/12	1/6/12	
10		Monthly Citizens Report	100%	2/3/12	2/7/12	
11		**1C - Laboratory Analysis**	**100%**	**1/2/12**	**12/30/13**	
12		Collect Samples	100%	1/2/12	1/6/12	
13		Send Samples to lab	100%	1/9/12	1/9/12	
14		Receive Lab Results	100%	4/20/12	4/20/12	
15		Determine Criteria for Replacing Cables	100%	6/1/12	6/1/12	
16		Replace cables as warranted	100%	12/30/13	12/30/13	
17						
18		**Rec. 2 - Enhanced Inspections**	**100%**	**1/6/12**	**1/31/13**	
19		**2A - Improved Inspection Process**	**100%**	**1/6/12**	**1/31/13**	
20		New Inspection Form	100%	1/6/12	1/6/12	
21		Train Field Crews on New Form	100%	1/7/12	1/7/12	
22		Begin Inspections w/New Form	100%	1/7/12	1/20/12	
23		Tablet Computers for Field Trial	100%	3/5/12	3/30/12	
24		2012 Inspection under New Process	100%	5/1/12	12/28/12	
25		IPL Quality Inspection Audits	100%	5/7/12	1/31/13	
26		Third Party Quality Inspection Audits	100%	5/7/12	1/31/13	
27		**2B - Repairs Identified from Inspections**	**100%**	**1/9/12**	**1/25/13**	
28		Schedule Repairs - Off Cycle January Inspection	100%	1/9/12	1/19/12	
29		Complete Repairs - Off Cycle January Inspection	100%	1/19/12	1/19/12	
30		Implement Service Level Indicators	100%	3/1/12	3/1/12	
31		Schedule Repairs - 2012 Inspection Program	100%	11/2/12	1/25/13	
32		Complete Repairs - 2012 Inspection Program	100%	1/25/13	1/25/13	
33						
34		**Rec. 3 - Material Standards**	100%	**1/9/12**	**1/31/13**	
35		**3A - Termination Chamber Change to Elbows**	**100%**	**1/9/12**	**1/30/13**	
36		Revise Network Transformer Specification	100%	1/16/12	2/24/12	
37		Revised Construction Standards Drawings	100%	1/9/12	1/27/12	
38		Modify existing stock units	100%	9/28/12	9/28/12	
39		Modified units available for installation	100%	10/1/12	10/1/12	
40		Report on Installation of Modified Units	100%	1/31/13	1/31/13	
41		**3B - Install Deflector Shield**	**100%**	**1/9/12**	**1/30/13**	
42		Revised Construction Standards	100%	1/9/12	1/27/12	
43		Install Additional Locations for Installation	100%	12/28/12	12/28/12	
44		Report on Installation of Progress	100%	1/31/13	1/31/13	
45						
46		**Rec. 4 - Network Protectors & Transformers**	**100%**	**3/30/12**	**1/31/13**	
47		**4A - Protectors with Aluminum Bus**	**100%**	**3/30/12**	**3/30/12**	
48		Finalize Potential Locations of Protectors with AL Bus	100%	3/30/12	3/30/12	
49		Sample 33% of Possible Units with AL Bus	100%	3/30/12	3/30/12	
50		**4B - Protectors with Water Ingress**	**100%**	**3/30/12**	**1/31/13**	
51		Begin Inspecting & Pressure Test Protectors with AL Bus	100%	3/30/12	3/30/12	
52		Complete Toluene Gas Testing of Network Protectors	100%	9/28/12	9/28/12	
53		Develop Repair Plan from Inspection Results	100%	6/29/12	6/29/12	
54		Revised Protector Venting Practice	100%	6/29/12	6/29/12	
55		Begin Repair/Replace Protectors based on New Criteria	100%	7/2/12	7/2/12	
56		Report on Progress	100%	1/31/13	1/31/13	
57		**4C - Transformer & Protector Replacements**	**100%**	**1/31/13**	**1/31/13**	
58		Continue Current Practice & Report Progress	100%	1/31/13	1/31/13	
59						
60		**Rec. 5 - Asset Management Procedures**	**100%**	**1/9/12**	**1/31/13**	
61		**5A - Failure Analysis Process**	**100%**	**1/9/12**	**6/29/12**	
62		Load Jan.-July 2011 Data into DB	100%	3/30/12	3/30/12	
63		Update RCA Procedures	100%	6/29/12	6/29/12	
64		Notify IURC of Reportable Events	100%	1/9/12	1/9/12	
65		**5B - Resource Planning for Maint. & Equip.. Replacement**	**100%**	**1/9/12**	**1/31/13**	
66		**5A - Asset Management Staffing**	**100%**	**1/9/12**	**1/31/13**	
67		Hire New Asset Mgmt. Engineer (In Progress)	100%	3/1/12	3/1/12	
68		Continue use of Consultant	100%	1/9/12	1/9/12	
69		Report Progress	100%	1/31/13	1/31/13	
70		**5B - Fault Analysis Process**	**100%**	**3/30/12**	**1/31/13**	
71		Add JAN-AUG 2011 Data to the Database	100%	3/30/12	3/30/12	
72		Integrate with Ivara Asset Mgmt System	100%	12/28/12	12/28/12	
73		Report Progress	100%	1/31/13	1/31/13	
74		**5C -Condition Based Equipment Replacement Process**	**100%**	**12/28/12**	**1/31/13**	
75		Complete Development of Criteria and Process	100%	12/28/12	12/28/12	
76		Report Progress	100%	1/31/13	1/31/13	
77						
78		**Rec. 6 - Technology Improvements**	100%	**1/2/12**	**1/31/13**	
79		**6A - Tablet Computers**	**100%**	**1/2/12**	**1/31/13**	
80		Purchase Devices	100%	1/2/12	1/2/12	
81		Program Device & Begin Field Trials	100%	3/30/12	3/30/12	
82		Report on Progress	100%	1/31/13	1/31/13	



Project: 2014 Action Plan Schedul
Date: 3/29/17

Task | Split | Milestone | Summary | Project Summary | External Tasks | External Milestone | Inactive Task | Inactive Milestone | Inactive Summary | Manual Task | Duration-only | Manual Summary Rollup | Manual Summary | Start-only | Finish-only | Deadline | Baseline | Baseline Milestone | Baseline Summary | Progress

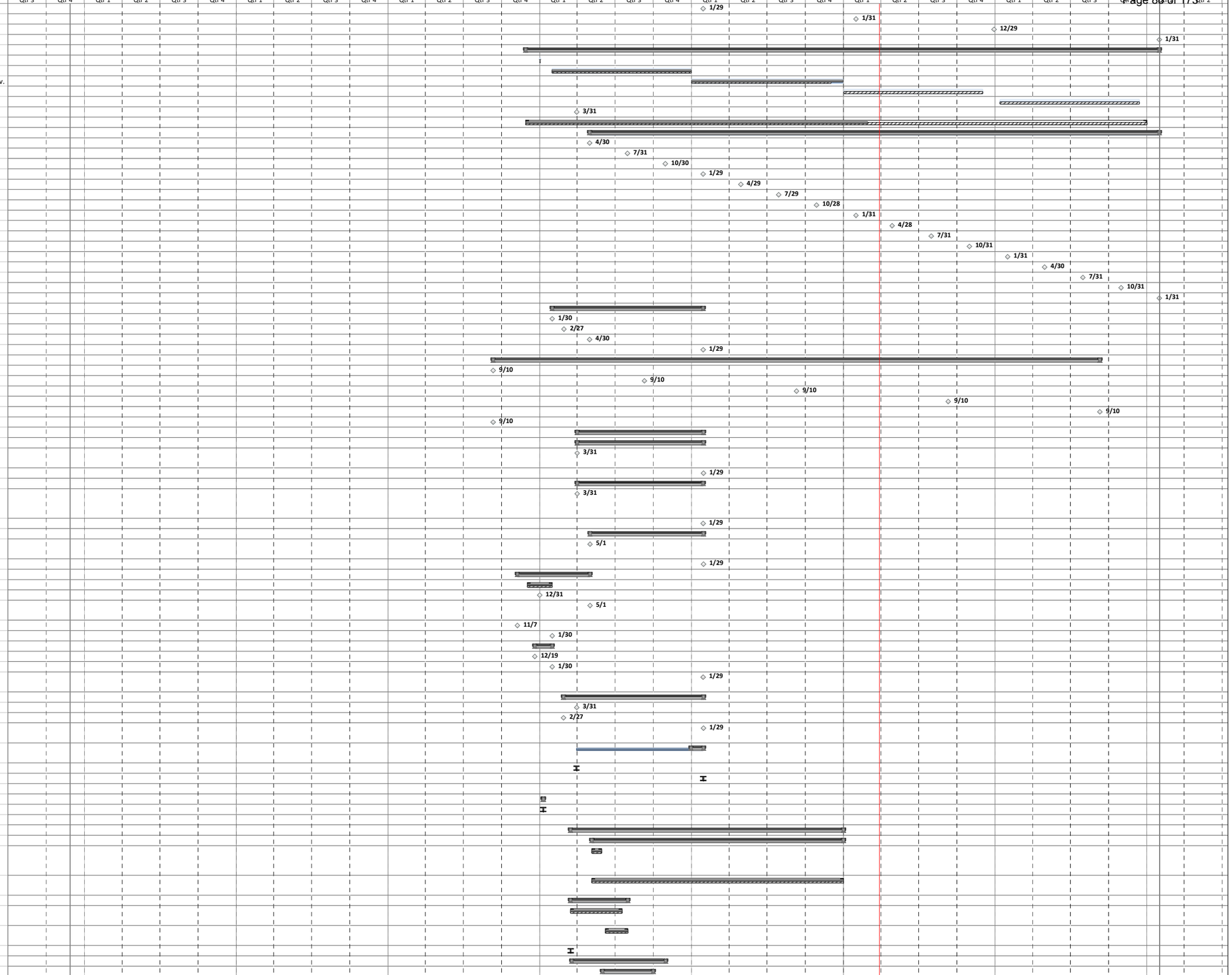
ID		Task Name	% Complete	Start	Finish	Comments
83	✓	**6B - Integrate Tablet Computers with Rec. 1, 2, and 5**	**100%**	**3/30/12**	**1/31/13**	
84	✓	Make GIS data available on Tablet	100%	12/28/12	12/28/12	Not feasible on tablet, deploying laptop with maps by end of 2016
85	✓	Rec. 1 Integration Plan	100%	3/30/12	3/30/12	
86	✓	Rec. 2 Integration Plan	100%	3/30/12	3/30/12	
87	✓	Rec. 5 Integration Plan	100%	3/30/12	3/30/12	
88	✓	Report on Progress	100%	1/31/13	1/31/13	
89						
90	✓	**Rec. 7 - SCADA Project**	100%	**3/30/12**	**9/27/13**	
91	✓	Complete Update of Deployment Plan	100%	3/30/12	3/30/12	
92	✓	Complete Identification of Users	100%	6/29/12	6/29/12	
93	✓	Complete User Training & Final Business Practices	100%	9/27/13	9/27/13	
94	✓	Report on Progress	100%	1/31/13	1/31/13	
95						
96	✓	**Rec. 8 - Small scale Technology**	100%	**1/9/12**	**1/31/14**	
97	✓	**8A - Thermal Imaging**	**100%**	**1/9/12**	**12/28/12**	
98	✓	Acquire Additional Cameras	100%	1/9/12	1/9/12	
99	✓	Use for with 2012 Inspections	100%	1/9/12	12/28/12	
100	✓	**8B - Fault Direction Indicators**	**100%**	**6/29/12**	**12/28/12**	
101	✓	Issue Purchase Order	100%	6/29/12	6/29/12	
102	✓	Install Indicators	100%	12/28/12	12/28/12	
103	✓	**8C - Swiveloc Manhole Covers**	**100%**	**1/19/12**	**1/31/14**	
104	✓	Complete Initial Installations	100%	1/19/12	1/19/12	
105	✓	Complete Evaluation of Effectiveness	100%	12/27/13	12/27/13	
106	✓	Issue Recommendation for Additional Covers	100%	1/31/14	1/31/14	
107						
108	✓	**Rec. 9 - GIS Mapping & Network Modeling**	100%	**3/1/12**	**1/31/13**	
109	✓	**9A - Develop Mapping Products**	**100%**	**8/31/12**	**12/31/12**	
110	✓	GIS Secondary Network Model	100%	8/31/12	8/31/12	
111	✓	Verify Data	100%	12/31/12	12/31/12	
112	✓	**9B - Develop CYME Models**	**100%**	**3/1/12**	**1/31/13**	
113	✓	Complete Creation of Network Models	100%	6/29/12	6/29/12	
114	✓	Contact Other CYME Users	100%	3/1/12	3/1/12	
115	✓	Complete Analysis of the Secondary Network with CYME	100%	12/28/12	12/28/12	
116	✓	Report on Progress	100%	1/31/13	1/31/13	
117						
118	✓	**Rec. 10 - DGA & Flame Retardant Fluid**	100%	**1/9/12**	**12/31/13**	
119	✓	Rec. 10 - DGA & Flame Retardant Fluid	100%	1/9/12	1/9/12	
120	✓	Rec. 10 - DGA & Flame Retardant Fluid	100%	12/31/13	12/31/13	
121	✓	**10A - Re-Evaluate DGA Testing**	**100%**	**1/9/12**	**1/31/13**	
122	✓	Incorporate into Asset Mgmt Process	100%	6/29/12	6/29/12	
123	✓	Begin DGA Testing of Network Transformers	100%	1/9/12	1/9/12	
124	✓	Modify Re-Test Cycle based on Test Results	100%	12/28/12	12/28/12	
125	✓	Report on Progress	100%	1/31/13	1/31/13	
126	✓	**10B - Fire Retardant Fluids**	**100%**	**1/31/12**	**12/31/13**	
127	✓	Purchase FR3 Fluid	100%	1/31/12	1/31/12	
128	✓	Complete Retro-Fill of Termination Chambers with FR3	100%	12/31/13	12/31/13	
129	✓	Report on Progress	100%	1/31/13	1/31/13	
130						
131	✓	**O'Neill Management Consulting Oversight**	100%	**2/6/12**	**1/31/14**	
132	✓	**Progress Meetings**	**100%**	**2/6/12**	**1/31/14**	
133	✓	Weekly Conference Calls	100%	2/6/12	6/1/12	
134	✓	Monthly Review of Progress	100%	2/6/12	12/27/13	
135	✓	Annual Review of Progress	100%	2/6/12	1/31/14	
136	✓	**Technical Discussions**	**100%**	**2/13/12**	**12/27/13**	
137	✓	Schedule as Needed	100%	2/13/12	12/27/13	
138						
139	✓	**CENTER SUB EVENT**	100%	**3/22/12**	**8/31/15**	**RCA 3-22-15, Response 5-4-12**
140	✓	Establish formal infrared and ductor criteria to trigger maint. Priorities	100%	3/22/12	6/29/12	
141	✓	Improve readability of circuit bkr monthly operation spreadsheet	100%	3/22/12	5/4/12	
142	✓	Create review process to ck for outstanding maint before issuing maint cycling order to Sys Ops	100%	3/22/12	5/4/12	
143	✓	Develop plan to return primary relaying to normal operations	100%	3/22/12	8/31/12	
144	✓	Improve documentation of Sub maint records	100%	3/22/12	12/31/12	
145	✓	Fully utilize automated asset mgmt tools specifically designed for substation maint.	100%	3/22/12	8/31/15	
146	✓	Allocate resources and implement tools to assure that sub maint activity is adequately tracked and prioritized efficiently	100%	3/22/12	5/4/12	
147	✓	Implement a procedure to track all work sched. Delays and ordering of parts to avoid delays in req. maint of equip.	100%	3/22/12	5/4/12	
148	✓	Document process for field data review and subsequent work flows	100%	3/22/12	5/4/12	
149						
150	✓	**150 E. MARKET EVENT**	**100%**	**1/2/12**	**12/31/14**	
151	✓	Continue MH inspections noting condition of cable jacket	100%	1/2/12	1/2/12	
152	✓	Continue installation and review of Swiveloc MH Covers	100%	1/2/14	12/31/14	
153	✓	Install Swiveloc locking MH covers on Mkt St from the Circle to Alabama St	100%	1/2/14	12/31/14	
154						
155		**26 S. MERIDIAN ST. EVENT - OCT 2014**		**9/10/14**	**1/31/19**	
156		**Annual Progress Report**		**1/30/15**	**1/31/19**	
157	✓	2014	100%	1/30/15	1/30/15	



Project: 2014 Action Plan Schedul
Date: 3/29/17

Task | Split | Milestone | Summary | Project Summary | External Tasks | External Milestone | Inactive Task | Inactive Milestone | Inactive Summary | Manual Task | Duration-only | Manual Summary Rollup | Manual Summary | Start-only | Finish-only | Deadline | Baseline | Baseline Milestone | Baseline Summary | Progress

ID		Task Name	% Complete	Start	Finish	Comments
158	✓	2015	100%	1/29/16	1/29/16	
159	✓	2016	100%	1/31/17	1/31/17	
160		2017		12/29/17	12/29/17	
161		2018		1/31/19	1/31/19	
162		**Rec. 1 - Replace 480 Volt NWP**	**56%**	**11/28/14**	**1/31/19**	**78 of 137 replaced**
163	✓	2014 Replacements (2)	100%	12/31/14	1/1/15	1 unit replaced
164	✓	2015 Replacements (35)	155%	1/30/15	12/31/15	62 units replaced
165	✓	2016 Replacements (35)	100%	1/1/16	12/30/16	14 Installed March/April, 1 installed Nov.
166		2017 Replacements (35)	0%	1/2/17	12/1/17	Contractor to Start Mar. 15, 2017
167		2018 Replacements (30)		1/12/18	12/13/18	
168	✓	Customer Meetings	100%	3/31/15	3/31/15	
169		Monthly Schedule Review	55	11/28/14	12/31/18	
170		**Quarterly Update Report to Commission**		**4/30/15**	**1/31/19**	
171	✓	1Q/2015	100%	4/30/15	4/30/15	
172	✓	2Q/2015	100%	7/31/15	7/31/15	
173	✓	3Q/2015	100%	10/30/15	10/30/15	
174	✓	4Q/2015	100%	1/29/16	1/29/16	
175	✓	1Q/2016	100%	4/29/16	4/29/16	
176	✓	2Q/2016	100%	7/29/16	7/29/16	
177	✓	3Q/2016	100%	10/28/16	10/28/16	
178	✓	4Q/2016	100%	1/31/17	1/31/17	
179		1Q/2017		4/28/17	4/28/17	
180		2Q/2017		7/31/17	7/31/17	
181		3Q/2017		10/31/17	10/31/17	
182		4Q/2017		1/31/18	1/31/18	
183		1Q/2018		4/30/18	4/30/18	
184		2Q/2018		7/31/18	7/31/18	
185		3Q/2018		10/31/18	10/31/18	
186		4Q/2018		1/31/19	1/31/19	
187	✓	**Rec. 2: - Network Event Response Plan**	**100%**	**1/30/15**	**1/29/16**	
188	✓	Written Draft Plan	100%	1/30/15	1/30/15	
189	✓	Final Plan	100%	2/27/15	2/27/15	
190	✓	Tabletop Drill	100%	4/30/15	4/30/15	
191	✓	Recap Tabletop Drill - Report to Commission	100%	1/29/16	1/29/16	
192		**Rec. 3 - Meeting with IFD**		**9/10/14**	**9/10/18**	
193	✓	2014 Annual Meeting	100%	9/10/14	9/10/14	
194	✓	2015 Annual Meeting	100%	9/10/15	9/10/15	
195	✓	2016 Annual Meeting	100%	9/10/16	9/10/16	Holtsclaw and Sadtler met 2Q/2016
196		2017 Annual Meeting		9/10/17	9/10/17	
197		2018 Annual Meeting		9/10/18	9/10/18	
198	✓	Assign On-Scene Incident Commander	100%	9/10/14	9/10/14	
199	✓	**Rec. 4 - Mitigation Strategy**	**100%**	**3/31/15**	**1/29/16**	
200	✓	**Network Feeder Breaker Relay**	**100%**	**3/31/15**	**1/29/16**	
201	✓	Study Relay Settings for fault detection improvements and develop action plan	100%	3/31/15	3/31/15	
202	✓	Include Status in 2016 Annual Report	100%	1/29/16	1/29/16	
203	✓	**Fire Detection System**		**3/31/15**	**1/29/16**	
204	✓	Review options and issue recommendation report to IPL Management	100%	3/31/15	3/31/15	
205	✓	Include Status in 2016 Annual Report	100%	1/29/16	1/29/16	
206	✓	**FR3 Insulating Fluid (Main Transformer)**		**5/1/15**	**1/29/16**	
207	✓	Review benefits and issue recommendation to IPL Management	100%	5/1/15	5/1/15	
208	✓	Include Status in 2016 Annual Report	100%	1/29/16	1/29/16	
209	✓	**Rec. 5 - Gateway Vault Comm Review**	**100%**	**11/7/14**	**5/1/15**	
210	✓	Daily Telemetry Error Report	100%	12/1/14	1/30/15	
211	✓	Operating Procedure for Telemetry Errors	100%	12/31/14	12/31/14	
212	✓	Report to IPL Mgmt on Alt. Routing of SCADA Wiring for Heat Protection	100%	5/1/15	5/1/15	
213	✓	Network SCADA Information Metric	100%	11/7/14	11/7/14	
214	✓	Report Annual Availability Metric	100%	1/30/15	1/30/15	
215	✓	**Rec. 6 - Enhanced NWP Inspections**	**100%**	**12/19/14**	**1/30/15**	
216	✓	Inspect pre-1985 West. CM-22 Units	100%	12/19/14	12/19/14	
217	✓	Issue Inspection Summary Report	100%	1/30/15	1/30/15	
218	✓	**Rec. 7 - Succession Plan Summary Update in Annual Report**	100%	1/29/16	1/29/16	
219	✓	**Rec. 8 - Training**	**100%**	**2/27/15**	**1/29/16**	
220	✓	Attend EATON Electrical Network Sys. Conf.	100%	3/31/15	3/31/15	
221	✓	Attend EATON NWP Maint. Training	100%	2/27/15	2/27/15	
222	✓	Include Summary of Conf. Attended in Status Report	100%	1/29/16	1/29/16	
223	✓	**Rec. 9 - Report on Inspecton and Work Order Audit**		**12/31/15**	**1/29/16**	
224	✓	Audit WO	100%	3/30/15	3/30/15	
225	✓	Issue Report to Commission	100%	1/29/16	1/29/16	
226						
227	✓	**327 E. NY EVENT**	**100%**	**1/9/15**	**1/9/15**	
228	✓	No specific Action items	100%	1/9/15	1/9/15	
229						
230	✓	**428 MASS. AVE. EVENT**		**3/16/15**	**12/31/16**	
231	✓	**Edison and Gardner Lane Subs**		**5/6/15**	**12/31/16**	
232	✓	Investigate engineering methods which will result in a reduction of the primary phase to ground fault current	100%	5/6/15	5/29/15	
233	✓	Install digital relay protection on the Edison and Gardner Lane Underground feeders	100%	5/6/15	12/31/16	
234	✓	**Other**		**3/16/15**	**7/31/15**	
235	✓	Perform lab test to determine cause of elect. flashover	100%	3/16/15	7/17/15	
236	✓	Corrective actions resulting from lab test results	100%	6/8/15	7/31/15	
237	✓			3/16/15	3/16/15	
238	✓	**NORTH STREET EVENT**		**3/19/15**	**10/30/15**	
239	✓	**Tier 1**		**6/1/15**	**9/30/15**	



Project: 2014 Action Plan Schedul
Date: 3/29/17

Task · Split · Milestone · Summary · Project Summary · External Tasks · External Milestone · Inactive Task · Inactive Milestone · Inactive Summary · Manual Task · Duration-only · Manual Summary Rollup · Manual Summary · Start-only · Finish-only · Deadline · Baseline · Baseline Milestone · Baseline Summary · Progress

ID		Task Name	% Complete	Start	Finish	Comments
240	✓	Evaluate available high temp jacket material for primary and secondary cables & change IPL cable spec as appropriate	100%	6/1/15	9/30/15	
241	✓	Review downtown network sys for other locations where elect duct banks with a large cross section of cables cross or run parallel in close prox of steam lines	100%	6/1/15	9/30/15	
242	✓	Perform duct bank temp surveys at steam crossings and where running parallel to IPL facilities	100%	6/1/15	9/30/15	
243	✓	Tier 2	100%	6/1/15	10/30/15	
244	✓	**Remove cable for exam of thermal damage from ducts where elevated temp found or historically observed**		**6/1/15**	**10/30/15**	
245	✓	Replace cables as warranted	100%	6/1/15	10/30/15	
246	✓	Based on temp survey findings and cable exam develop Asset Mgmy strategy	100%	6/1/15	10/30/15	
247	✓	Remove and analyze bus support insulators from collector bus at 114 W North St vault to determine if damaged	100%	6/1/15	10/30/15	
248	✓	Develop prgm to inspect integrity of bus support insulators during routine vault inspections	100%	6/1/15	10/30/15	
249						
250		**OTHER INITIATIVES**		**9/11/14**	**6/30/18**	
251	✓	**Monitor Duct Line Temperature Pilot**		**9/14/15**	**12/30/16**	
252	✓	Complete fiber cable installation	100%	9/14/15	7/29/16	
253	✓	Install head end monitoring equipment and calibrate locations (8/16)	100%	9/14/15	8/31/16	
254	✓	Monitor performance	100%	9/14/15	12/30/16	
255	✓	**Crab and Limiter Connections for new secondary cable installations**		**8/10/15**	**12/30/16**	
256	✓	Issue engineering work orders (7/16)	100%	8/10/15	10/31/16	
257	✓	Complete construction (8/16)	100%	8/10/15	11/30/16	
258	✓	Gather feedback to adjust construction standards (8/16)	100%	8/10/15	12/30/16	
259		**Update and improve IPL's Construction Standards for CBD Equipment**		**9/7/15**	**12/29/17**	
260	✓	Identify appropriate standards	100%	9/7/15	11/30/16	
261		Create and update all CBD standard document	15%	9/7/15	12/29/17	
262		**Increase the Robustness of the CBD SCADA**		**1/18/16**	**3/30/17**	
263	✓	Identify location for additional VaultGard devices (Complete)	100%	1/18/16	6/1/16	
264	✓	Issue engineering work orders	100%	1/18/16	10/31/16	
265		Install and commission VaultGards	80%	1/18/16	3/30/17	Customer Delay & DTS work
266	✓	**Implement PI Historian Automatic e-mail Notifications**		**9/14/15**	**3/31/17**	
267	✓	Upgrade PI server	100%	9/14/15	12/30/16	
268	✓	Test PI-Notifications software	100%	1/2/17	1/26/17	
269	✓	Identify alarm points and implement notifications (10/16)	100%	1/27/17	3/31/17	
270						
271		**Implement Asset Life Cycle Plan**		**9/11/14**	**6/30/18**	
272	✓	Wood Poles	100%	1/18/15	12/18/15	
273	✓	Relay System Protection	100%	1/1/15	12/1/15	
274	✓	Circuit Breakers	100%	1/15/15	12/15/15	
275	✓	Power Transformers	100%	9/11/14	9/11/15	
276	✓	Downtown Network	100%	12/28/14	12/28/15	
277	✓	Underground Residential Cable (URD)	100%	9/30/14	9/30/15	
278	✓	Overhead Distribution Lines	100%	3/1/15	3/1/16	
279	✓	Transmission Structures	100%	8/18/15	8/18/16	
280	✓	Substation Batteries	100%	9/16/15	9/16/16	
281	✓	Transmission Lines	100%	2/17/16	2/17/17	
282		Meters	40%	6/30/16	6/30/17	
283		Substation Communications	15%	6/30/16	6/30/17	
284		Distribution Transformers	10%	9/30/16	9/29/17	
285		Capacitor Banks	5%	12/30/16	12/30/17	
286		Reclosers & Sectionalizers	5%	12/30/16	12/30/17	
287		Substation CTs and PTs	5%	12/30/16	12/30/17	
288		System Control and Data	0%	6/30/17	6/30/18	
289		Disconnect Switches	0%	6/30/17	6/30/18	
290		Pole Top Hardware	0%	6/30/17	6/30/18	

Project: 2014 Action Plan Schedul
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Appendix G – 2016 Annual Performance Metrics Report

December 31, 2016

Indianapolis Power & Light Company

2016 Annual Performance Report

results through 12/31/2016

IPL T&D

Table of Contents

IPL and Public Safety

Indianapolis Power & Light Company ("IPL") strives to provide a safe working environment for its employees and contractors, and safe and reliable service to the public at large. Considered a fundamental value of the Company through indoctrination, continual training and actual practice, IPL emphasizes that all leaders are:

* Accountable for establishing safety requirements, providing a means to monitor these expectations, and holding their personnel accountable to meeting these requirements via positive reinforcement, coaching, and/or corrective action as appropriate, and
* Responsible for assuring that all personnel assigned under their purview are provided the resources necessary to comply with the safety requirements.

Similarly, all IPL employees and contractors are duly expected to, as a condition of employment:

* Comply with all established safety rules, regulations and procedures, and
* Stop work if an unsafe condition could potentially expose its workers, or the public, to a hazard, injury or death.

Description of Metrics

Lost Time Incident Rate, a metric reported to the Federal Occupation and Health Administration (OSHA) and the State of Indiana, is a standard metric used across the industry. Intended to be a rate per 100 full time employees ("FTEs"), it is calculated by multiplying the number of lost time cases by 200,000 (100 FTEs x 2,000 hours per year) and dividing that result by the total number of employees labor hours worked. In this manner, both full and part-time employees are included in the statistic.

One way to monitor public safety is to review the number of tickets from Indiana 811 to locate underground facilities in 2 working days. This "Call before you dig" process helps to protect the public from accidental contact with energized equipment.

Section 114 Notices submitted to the IURC will be reported to indicate the number of incidents where the public was injured by IPL equipment (segregating events where IPL was not at fault)

Another metric for public safety is to report on the process of looking for contact voltage in the Central Business District (CBD). This annual survey is a proactive measure to look for potential hazards to the public and remediate as necessary.

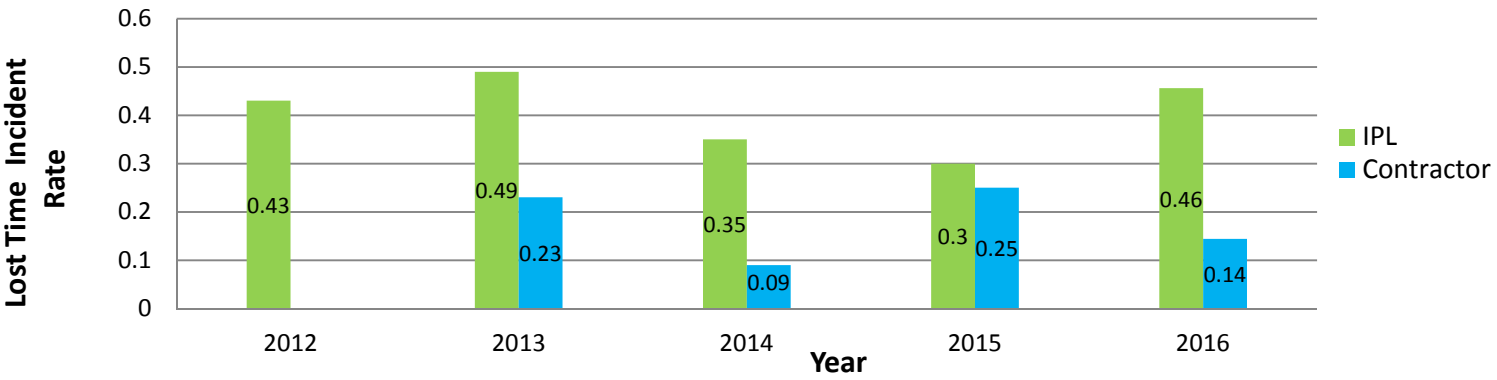
IPL and Public Safety

Lost Time Incident Rate (Tier 1 Metric)

Number of lost time cases relative to the total number of hours worked. The chart below shows both IPL employees and contractors.

$$\text{LTI Rate} = \frac{\#\ lost\ time\ cases \times 100\ Full\ Time\ Employees \times 2{,}000\ hours\ per\ year}{\#\ hours\ worked\ for\ the\ year}$$

Figure 1. Annual Lost Time Incident Rates (LTI)

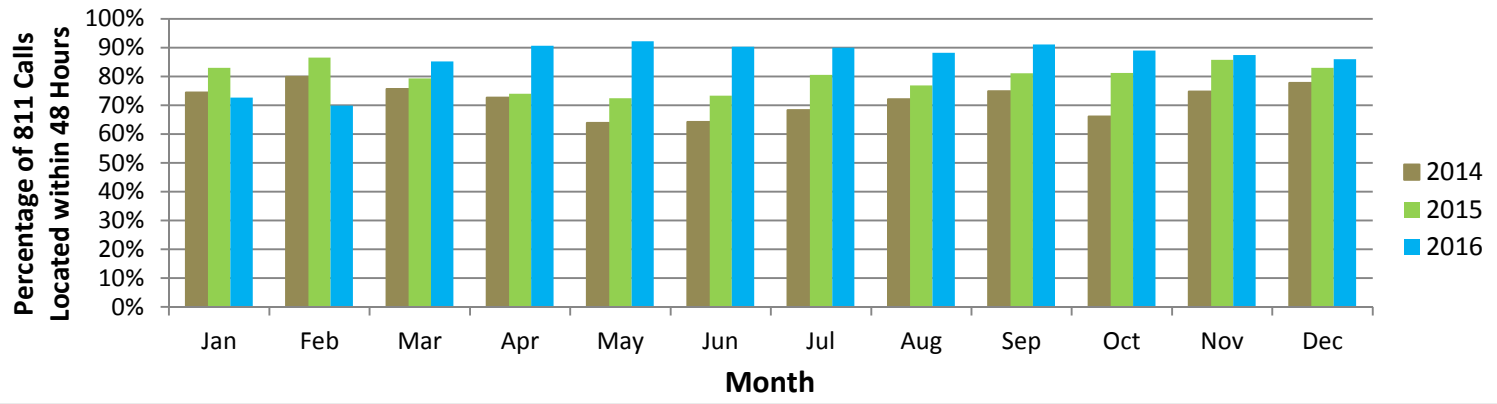


Prior to 2013, IPL did not track contractor LTI cases on a rate basis. The LTI rate is equivalent to the OSHA defined, " Lost Workday Case Rate". In 2015, the industry average was 1.3.

Underground 811 Locating Performance (Tier 1 Metric)

The chart below shows the percentage of 811 calls that are located within 48 hours for IPL.

Figure 2. Underground 811 Locating Performance



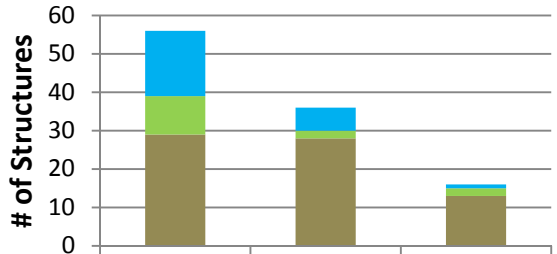
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2014	5,045	5,240	9,209	10,288	12,138	11,738	11,285	10,837	11,115	11,038	8,078	7,911	113,922
2015	6,670	6,181	10,951	12,722	13,176	12,340	11,783	11,630	11,407	11,043	8,605	7,856	124,364
2016	6,510	7,274	11,062	12,428	11,741	12,786	11,291	9,179	11,608	12,122	11,911	7,268	125,180

This table displays the total number of 811 calls by month for IPL. The average number of tickets throughout this timeframe was 10,096.

2015 CBD Contact Voltage Inspection Results (Tier 1 Metric)

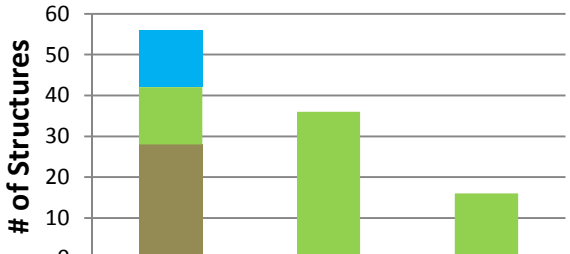
Results of 2015 survey performed in the downtown area looking for abnormal voltages. Equipment used can detect voltage differences over 1 Volt.

Figure 3. 2015 Survey Locations Identified



	1.0 to 4.9 V	5.0 to 24.9 V	over 25 V
Non-Utility	17	6	1
Underground	10	2	2
Street Lights / Traffic Signals	29	28	13

Figure 4. 2015 Survey Locations Corrected



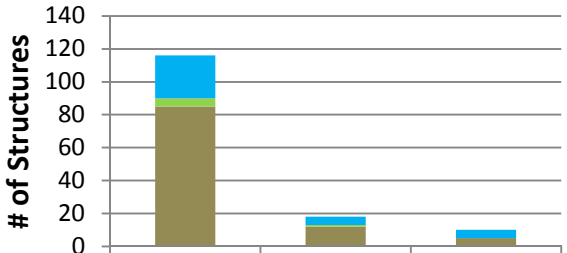
	1.0 to 4.9 V	5.0 to 24.9 V	over 25 V
Non-IPL facility	14		
Repaired	14	36	16
No repair needed	28		

All items over 5 Volts were repaired. Items under 5 Volts may exist based on adhering to electric codes. The Non-IPL facilities were locations to be corrected by DPW or other equipment owners.

2016 CBD Contact Voltage Inspection Results (Tier 1 Metric)

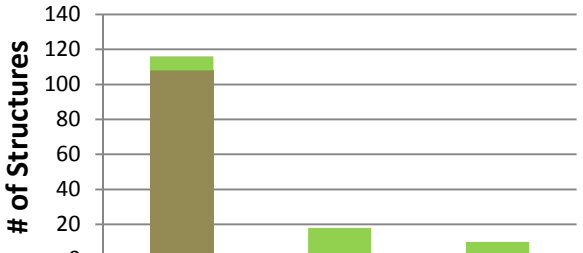
Results of 2016 survey performed in the downtown area looking for abnormal voltages. Equipment used can detect voltage differences over 1 Volt.

Figure 5. 2016 Survey Locations Identified



	1.0 to 4.9 V	5.0 to 24.9 V	over 25 V
Non-Utility	26	5	5
Underground	5	1	0
Street Lights / Traffic Signals	85	12	5

Figure 6. 2016 Survey Locations Corrected



	1.0 to 4.9 V	5.0 to 24.9 V	over 25 V
Non-IPL facility			
Repaired	8	18	10
No repair needed	108		

All items over 5 Volts were repaired. Items under 5 Volts may exist based on adhering to electric codes.

Section 114 Notices Submitted to the IURC (Tier 1 Metric)

Number of incidents where public was injured by IPL equipment (shown in a way that accounts for events where IPL was not at fault)

Figure 7. Number of Section 114 Notices Submitted to the IURC

Pursuant to Indiana Code § 8-1-2-114

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Reliability

Providing safe and reliable service to its customers is a primary cornerstone to IPL's performance management system. The following metrics strive to present IPL's system reliability performance from two perspectives:

* That to which IPL can be held accountable and appropriately compared and evaluated against other electric utilities (excluding Major Event Days), and
* That which is representative of the full customer experience (including Major Event Days).

Through these two lenses, the metrics included in this section address both the frequency and duration of sustained customer outages (i.e.; those lasting longer than five minutes), and independent of this distinction, the frequency of momentary service interruptions.

Description of Metrics

IPL follows IEEE Standard 1366 in calculating distribution reliability indices. This process identifies data that can be classified as a Major Event Day (MED) to find days where the distribution system experienced stresses beyond what is normally expected. These MEDs should be analyzed separately as they can distort the trends of daily operation.

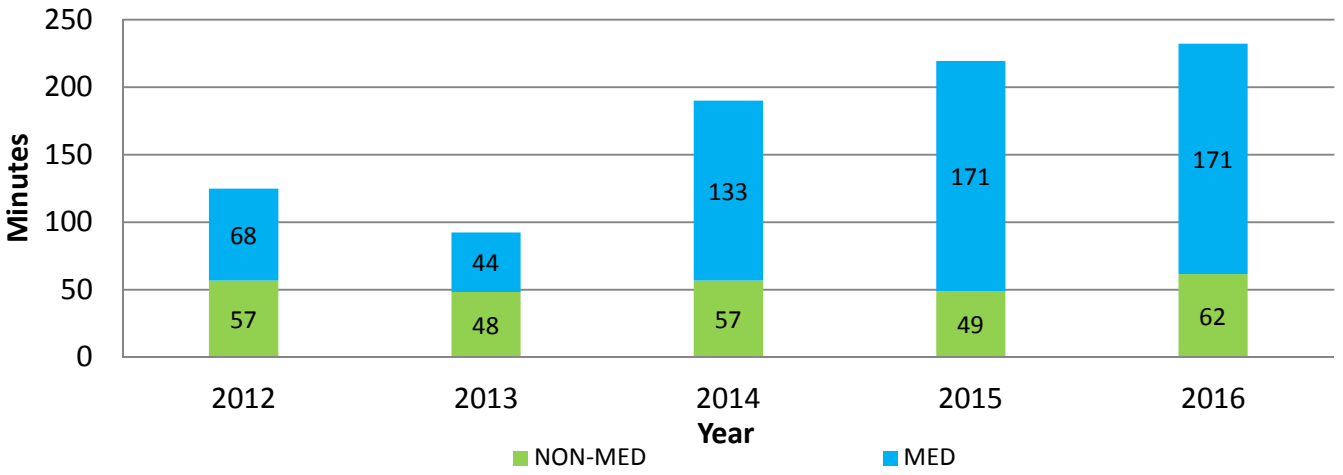
* System Average Interruption Duration Index (SAIDI) and System Average Interruption Frequency Index (SAIFI) measure the experience of the average customer (system-wide) in terms of electrical power interruption duration and frequency.
* Customer Average Interruption Duration Index (CAIDI) provides a measure of the average outage duration for a customer.
* Momentary Average Interruption Frequency Index (MAIFI) accounts for the fact that the previous SAIDI and SAIFI metrics exclude service interruptions with a duration of five minutes or less. These types of outages can cause frustration among both residential (inconvenience of resetting older digital devices) and commercial / industrial (costly impact in the form of lost productivity) customers.
* T-MED (or T_{MED}) is the Major Event Day (MED) threshold value calculated annually in accordance with IEEE Standard 1366. This value is used to identify days in which SAIDI is large enough to distort the trends of daily operation. Daily SAIDI and SAIFI will be provided for each MED to help indicate the severity of the service interruptions.

Reliability

SAIDI - Major Event Day (MED) and Non-Major Event Day (Tier 1 Metric)

Sum of customer minutes of interruption duration divided by total number of customers served. An outage is defined as an interruption lasting more than 5 minutes.

Figure 8. SAIDI - Major Event Day and Non-Major Event Day

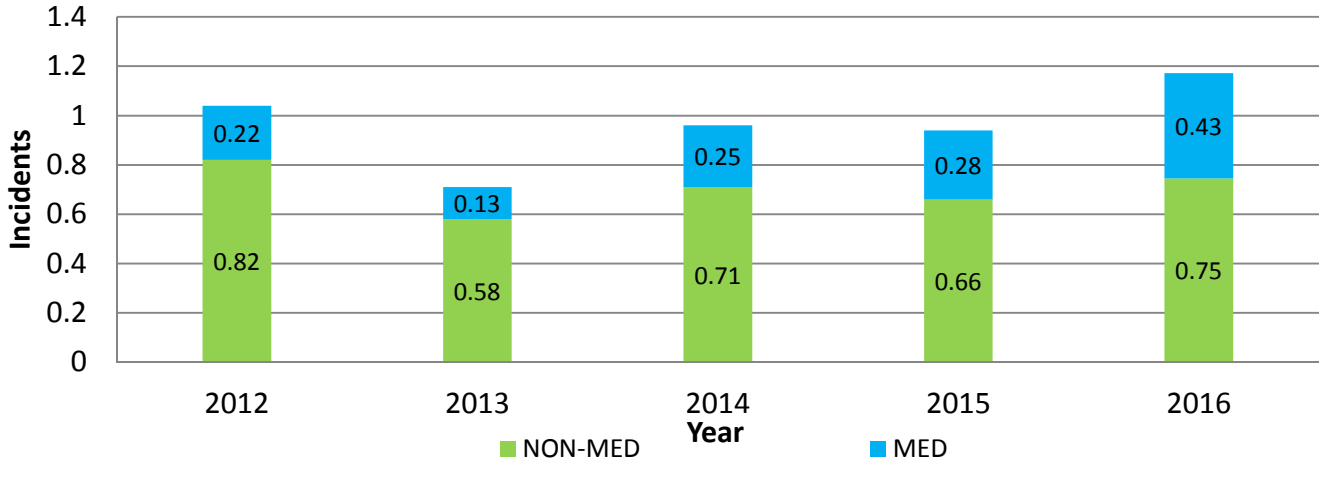


2013 was a very low storm year. This helps to reduce job durations as there are fewer jobs in total and less opportunity to have more jobs than crews available.

SAIFI - Major Event Day and Non-Major Event Day (Tier 1 Metric)

Sum of total number of customers interrupted divided by total number of customers served. An outage is defined as an interruption lasting more than 5 minutes.

Figure 9. SAIFI - Major Event Day and Non-Major Event Day

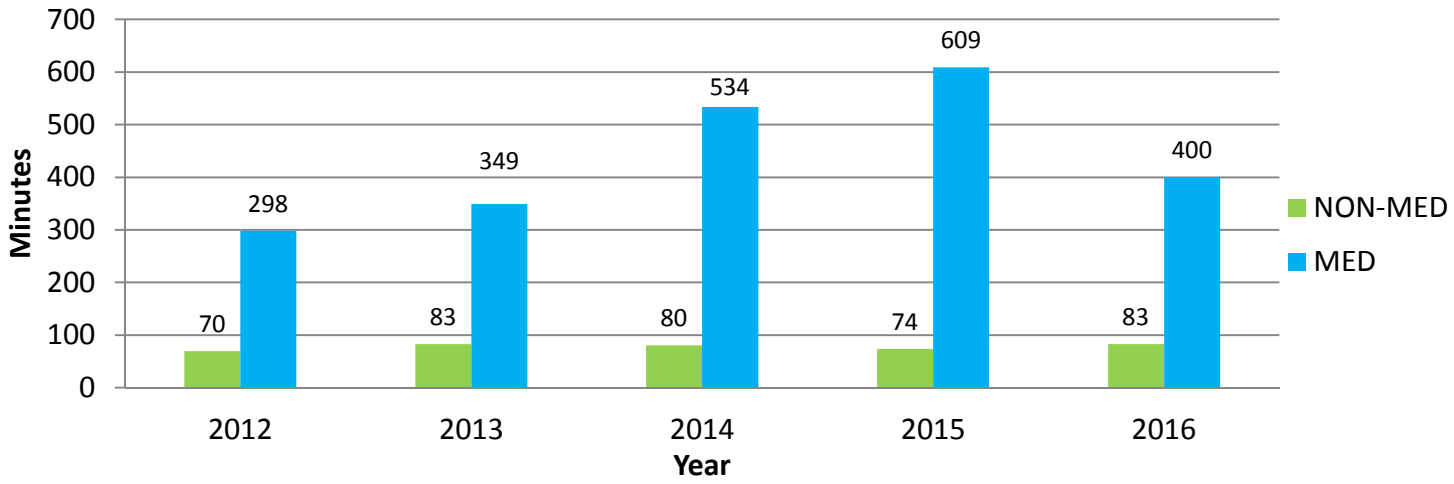


2013 was a mild weather year in both temperatures and storm activity, leading to fewer total interruptions.

CAIDI-Major Event Day and Non-Major Event Day (Tier 1 Metric)

Sum of total customer minutes of interruption divided by total number of customers interrupted. An outage is defined as an interruption lasting more than 5 minutes.

Figure 10. CAIDI-Major Event Day and Non-Major Event Day

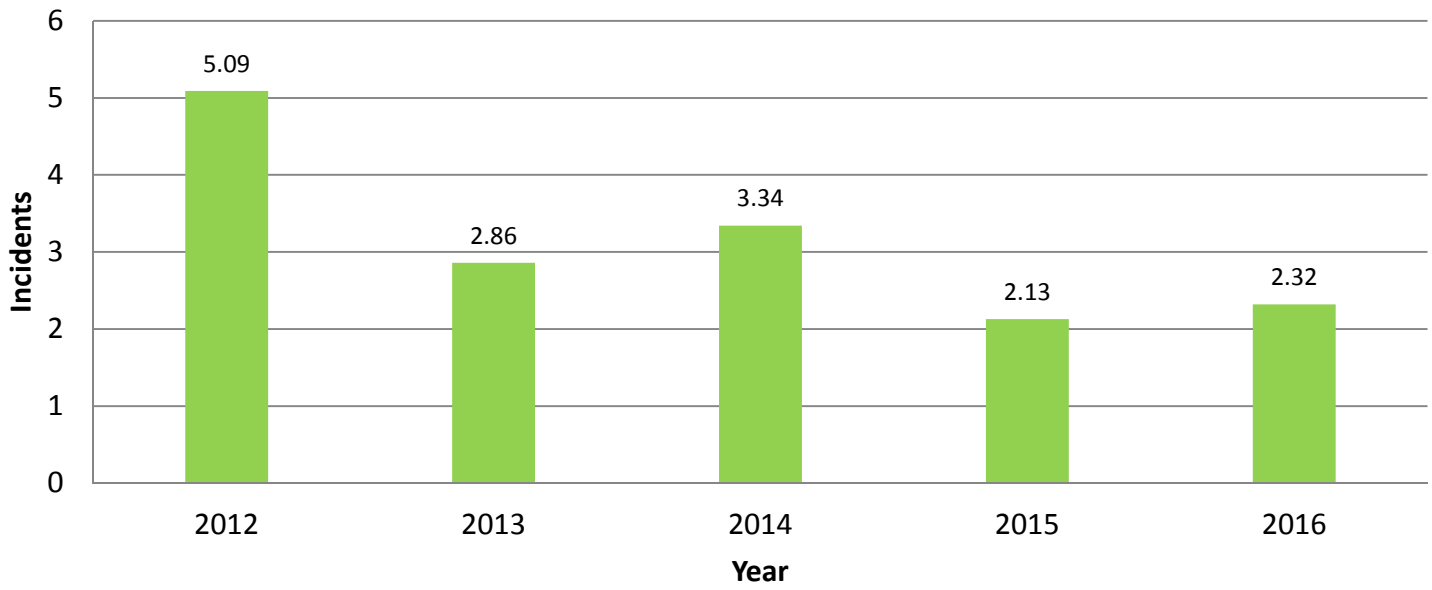


CAIDI for non-MED has been fairly consistent. CAIDI for MED is very dependent on the type of event. Storms with significant damage from trees will have a higher MED CAIDI.

MAIFI (Tier 1 Metric)

Sum of customer momentary interruptions excluding momentary interruptions during an MED divided by total number of customers served. Momentary interruption is an interruption lasting 5 minutes or less.

Figure 11. MAIFI

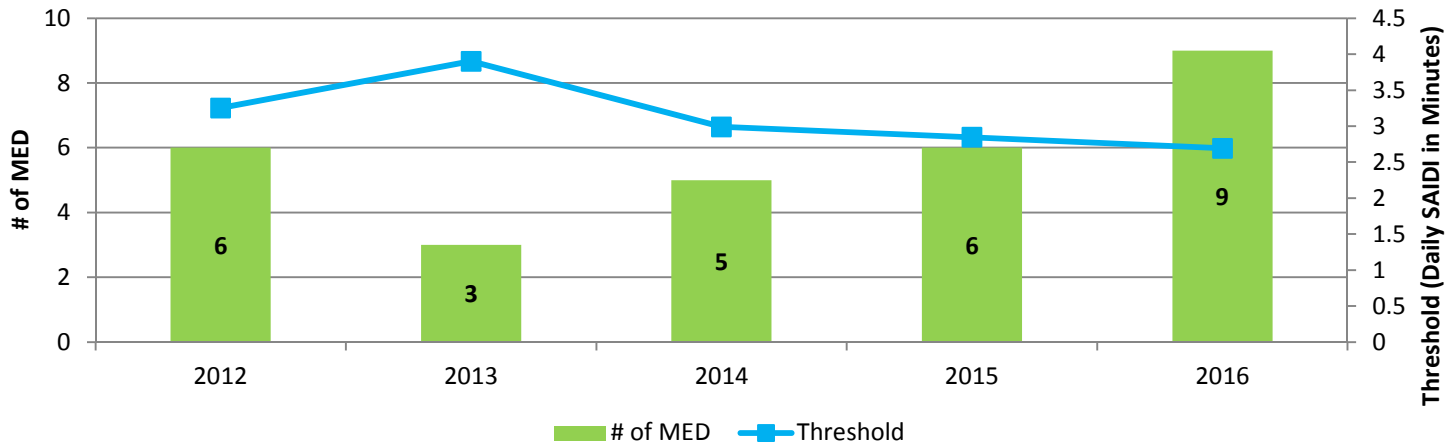


This metric is tracking the substation breaker operations. In January 2017, IPL will start tracking line recloser momentaries in addition to substation breaker operations.

Major Event Day (Tier 1 Metric)

The red bars indicate the number of MED IPL experienced (y-axis on left) and the blue line indicates the MED Threshold number (y-axis on right).

Figure 12. MED Summary



In 2013, the number of MED was 3 due to a low storm year. The MED threshold (which is based on the last 5 years of reliability data) was the highest in 2013.

Date	Daily SAIFI	Daily SAIDI	Date	Daily SAIFI	Daily SAIDI
6/29/12	0.058	18.55	4/2/16	0.053	28.13
6/30/12	0.019	3.53	6/15/16	0.077	42.92
8/5/12	0.089	35.59	6/23/16	0.064	17.82
9/7/12	0.026	3.93	7/13/16	0.053	12.46
9/8/12	0.011	3.28	7/27/16	0.034	3.45
9/21/12	0.026	3.86	8/24/16	0.034	4.48
5/21/13	0.027	6.61	8/26/16	0.088	54.82
10/31/13	0.049	18.74	8/27/16	0.006	3.68
11/17/13	0.050	18.66	9/16/16	0.016	2.81
1/5/14	0.088	89.73			
1/6/14	0.046	14.25			
1/7/14	0.006	3.26			
6/23/14	0.044	7.42			
7/1/14	0.068	19.44			
6/21/15	0.022	5.83			
7/13/15	0.130	106.99			
7/14/15	0.065	45.05			
7/15/15	0.012	4.50			
7/17/15	0.034	5.54			
9/19/15	0.018	2.85			

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Operational Efficiency

Viewed in concert with Reliability and Asset Management, this section presents Capital Investment and O&M Spending levels in a way that facilitates (1) comparisons with other electric utilities, and (2) correlations with noted changes in system performance or the age and/or condition of critical assets. The goal is to assess the extent to which IPL establishes an investment and spending level that optimizes across the critical performance domains of Reliability and Asset Management, while maintaining customer rates at comparatively low levels.

Description of Metric

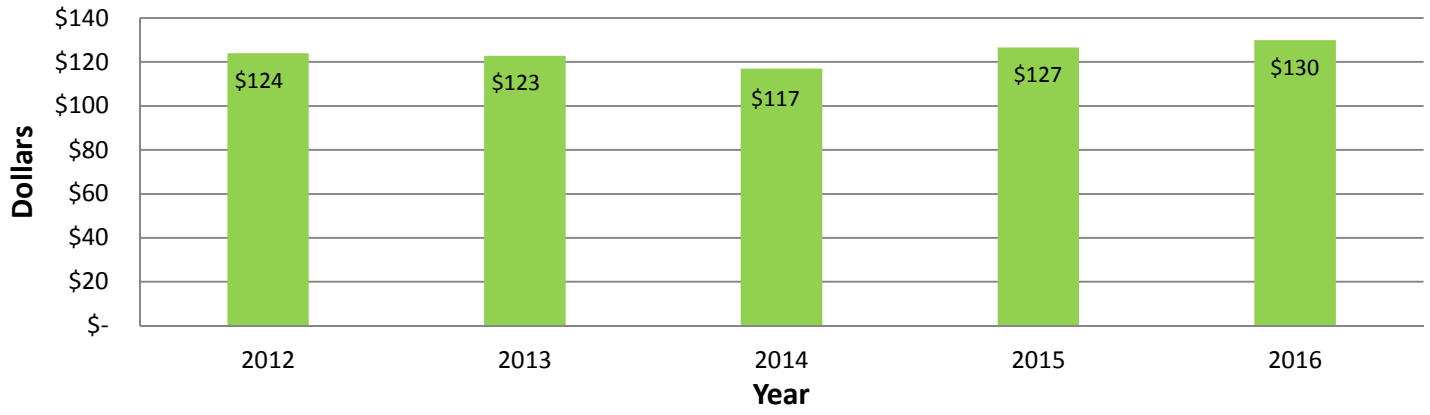
Metrics will compare the amount of money spent on Transmission and Distribution (T&D) infrastructure on a per customer basis.

Operational Efficiency - T&D

Operation and Maintenance (O&M) Spending per Customer - T&D (Tier 1 Metric)

This metric shows the T&D annual O&M spending per customer. The industry median (FERC Form 1) over 3 years for utilities with between 200,000 and 1,000,000 customers is $204 per customer.

Figure 13. Annual O&M Spending per Customer - T&D

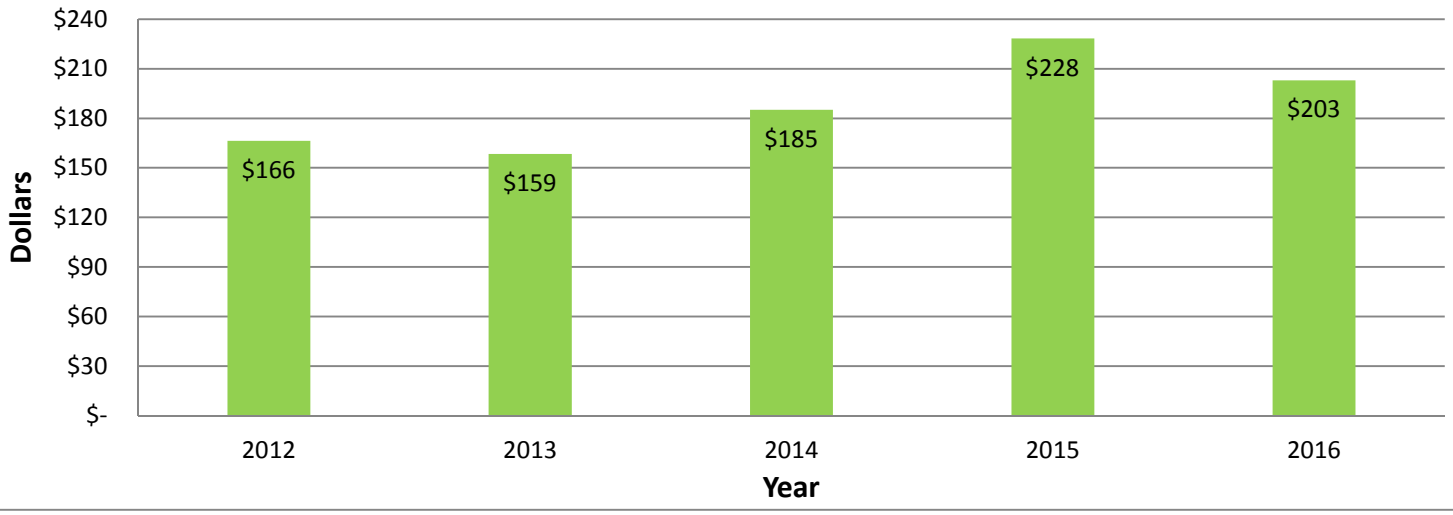


The average O&M spending per customer is approximately $124 per year. This covers operation and maintenance associated with both transmission and distribution equipment.

Capital Expenditure (CAPEX) per Customer - T&D (Tier 1 Metric)

This metric shows the T&D annual capital spending per customer. The industry median (FERC Form 1) over 3 years for utilities with between 200,000 and 1,000,000 customers is $204 per customer.

Figure 14. Annual CAPEX per Customer - T&D



The total T&D capital spending has been increasing the last few years as IPL upgrades the system transmission import capability, added a static VAR compensator and upgraded network protectors in the CBD.

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Customer Satisfaction

IPL is committed to continuous improvement in the area of customer satisfaction, acknowledging that many of the metrics presented in the other domains (e.g.; Reliability, Operational Efficiency, and Affordability) are as important to customer satisfaction as they are to the domains they serve. With that in mind, this section addresses the metrics that focus on those activities primarily attributed to customer service (e.g.; minimizing wait times on the phone, limiting the number of times a customer needs to call on a specific issue, and the process/policy leading to disconnecting service to a specific customer).

Description of Metrics

* First Call Resolution takes data from a third party survey where the customer indicated their issue was resolved on the first contact and/or there is no further outstanding action necessary by IPL.

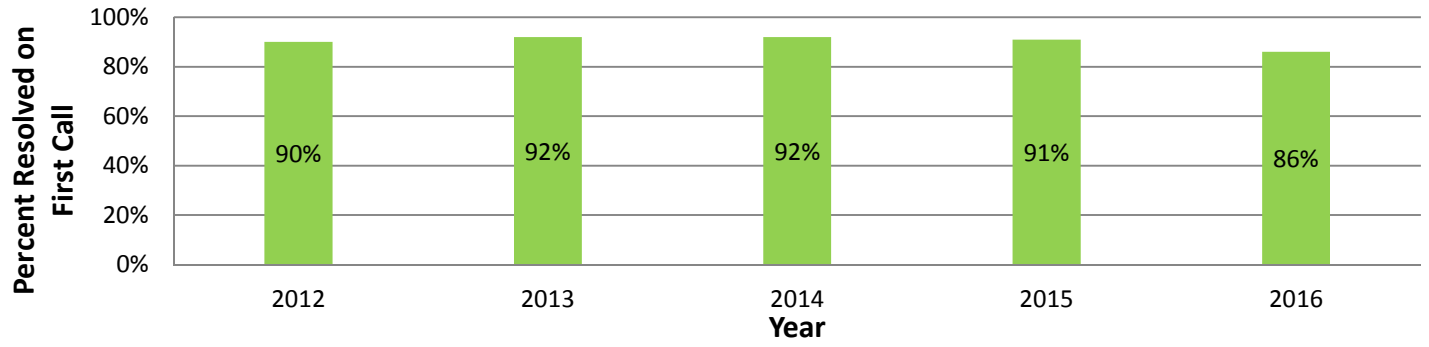
* Service Level is defined as the percentage of calls answered under 60 seconds. Speedy answering of a call is a factor in satisfying a customer, particularly given that many calls start with a dissatisfied individual or challenging situation.

Customer Satisfaction

First Call Resolution (Tier 1 Metric)

First call resolution (FCR) is the percentage of calls where the customer indicated their issue was resolved on the first contact and/or there is no further outstanding action necessary by IPL.

Figure 15. First Call Resolution

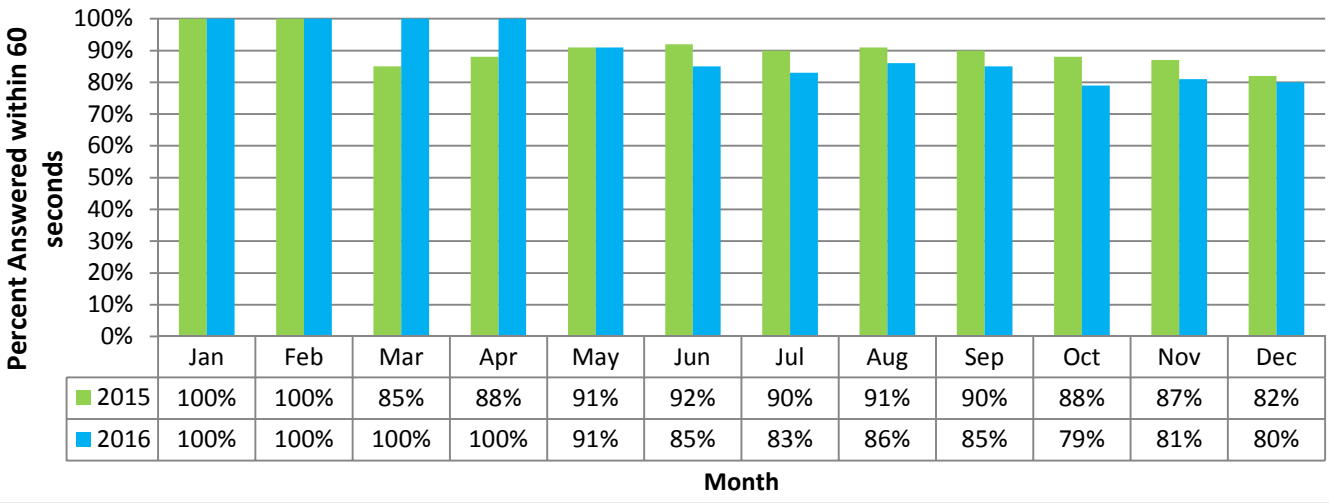


From 2012-2014, the survey to gather this data was conducted via a third party 1-2 days after the contact was made. In 2015, this was changed to an immediate automated after call survey to better reflect the customer's experience. After the change in process, IPL determined there was an error in the calculation and the 2015 data above was likely inflated. In 2016, an adjustment was made to the calculation to ensure accuracy. IPL anticipates by making the change in timing of the survey, up to a 10% decrease and/or increase from prior results could be seen based on information given by a third party due to the difference in how the data is obtained from the customer.

Service Level (Tier 1 Metric)

Service Level is the percentage of calls answered within 60 seconds. The higher the percentage, the lower the wait time customers experienced. This is a weekly target, the chart below shows the % of weeks the company goal of calls answered within 60 seconds was met.

Figure 16. Service Level



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	100%	100%	85%	88%	91%	92%	90%	91%	90%	88%	87%	82%
2016	100%	100%	100%	100%	91%	85%	83%	86%	85%	79%	81%	80%

This is a new metric IPL started tracking in 2015 as a more accurate representation of its customers' wait time experience. By tracking this as a percentage of calls answered within 60 seconds, IPL is able to better manage volatility and avoid masking any anomalies unintentionally by tracking with an average statistic.

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Affordability

Recognized as a critical component in assuring customer satisfaction, notwithstanding IPL's mandate to provide safe and reliable service, IPL is committed to maintaining its position as a low cost provider, both in Indiana and across the U.S. Industry. Presented in the form of dollars per 1,000 kWh, IPL will annually present its costs in comparison to the other Indiana electric utilities and 20 of the largest cities served by Investor-Owned Utilities (IOUs).

Description of Metrics

* In comparing IPL's Residential Bill to other state IOUs and across the U.S. Industry, a constant usage amount of 1,000 kWh is used for all companies to remove any distortion from actual usage of customers in the different areas.

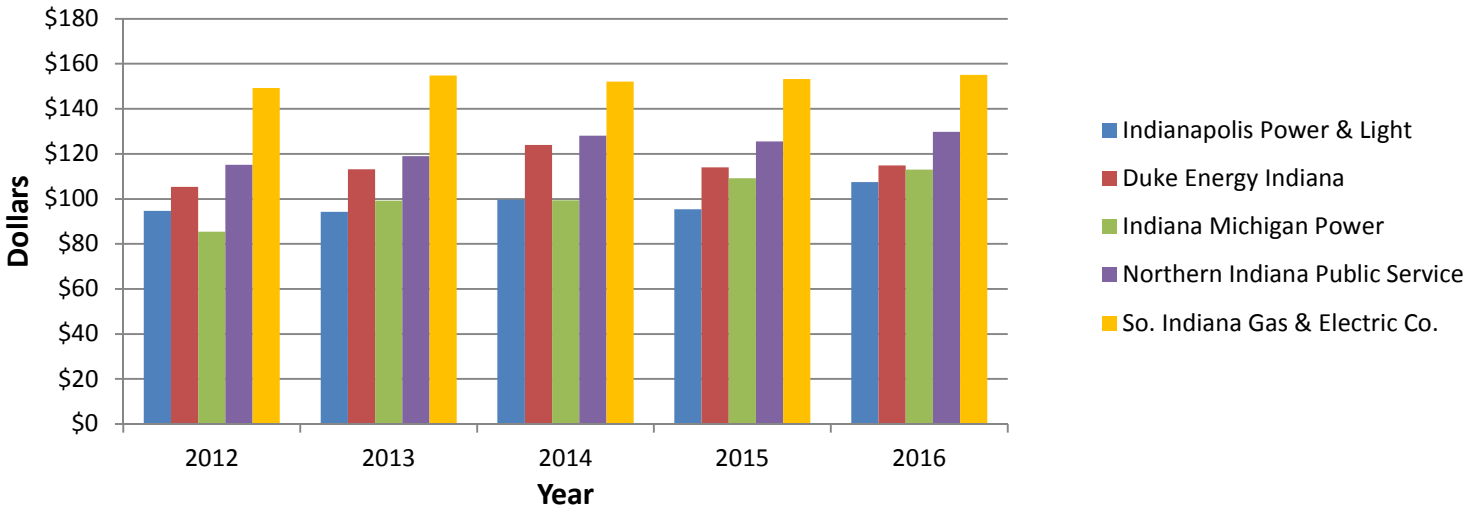
* Residential Service Disconnections for Non-Payment can inform stakeholders of any trends that are developing and prompt dialogue and response. It is not likely to be an indicator of electric utility performance.

Affordability

IPL Residential Bill per 1000 kWh vs. other state IOUs (Tier 1 Metric)

Compares IPL's Residential Bill per 1000 kWh with other investor owned utilities (IOUs) in the State of Indiana.

Figure 17. IPL Residential Bill per 1000 kWh vs. Other State IOUs

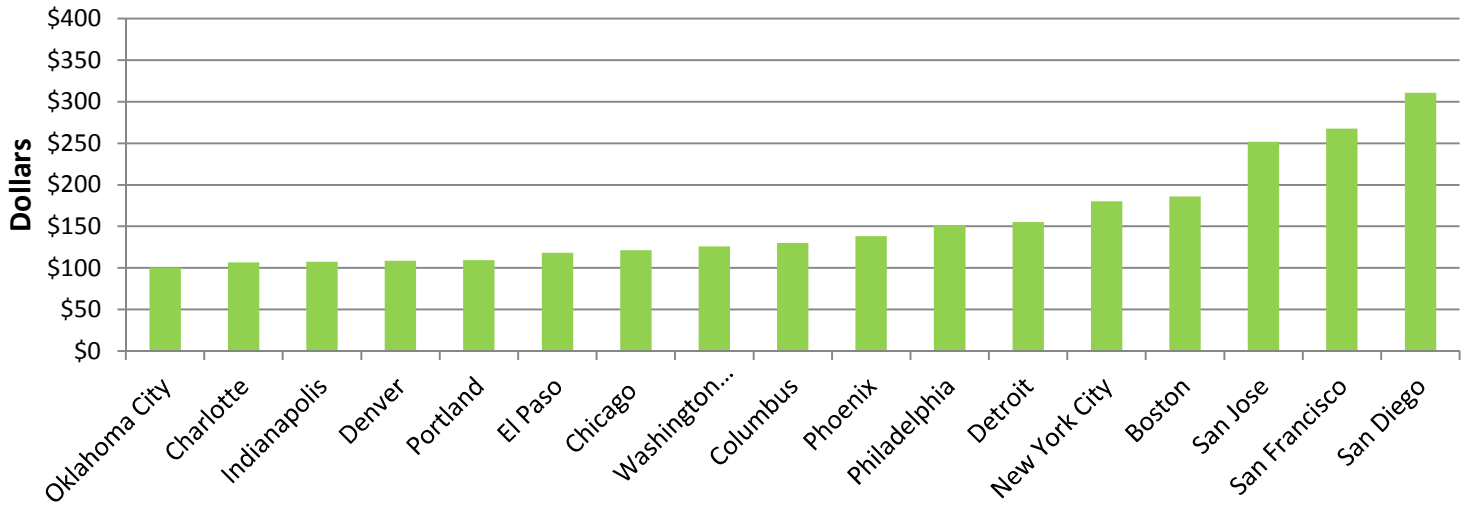


IPL is consistently one of the lowest cost electric IOUs in Indiana.

IPL Residential Bill per 1000 kWh vs. 20 Largest Cities Served by IOUs (Tier 1 Metric)

Compares IPL Residential Bills to the 20 Largest U.S. cities with investor-owned utilities using 1,000 kWh per month for residential service using the rates in effect July 1, 2016.

Figure 18. IPL Residential Bill per 1000 kWh vs. 20 Largest Cities Served by IOUs for 2016

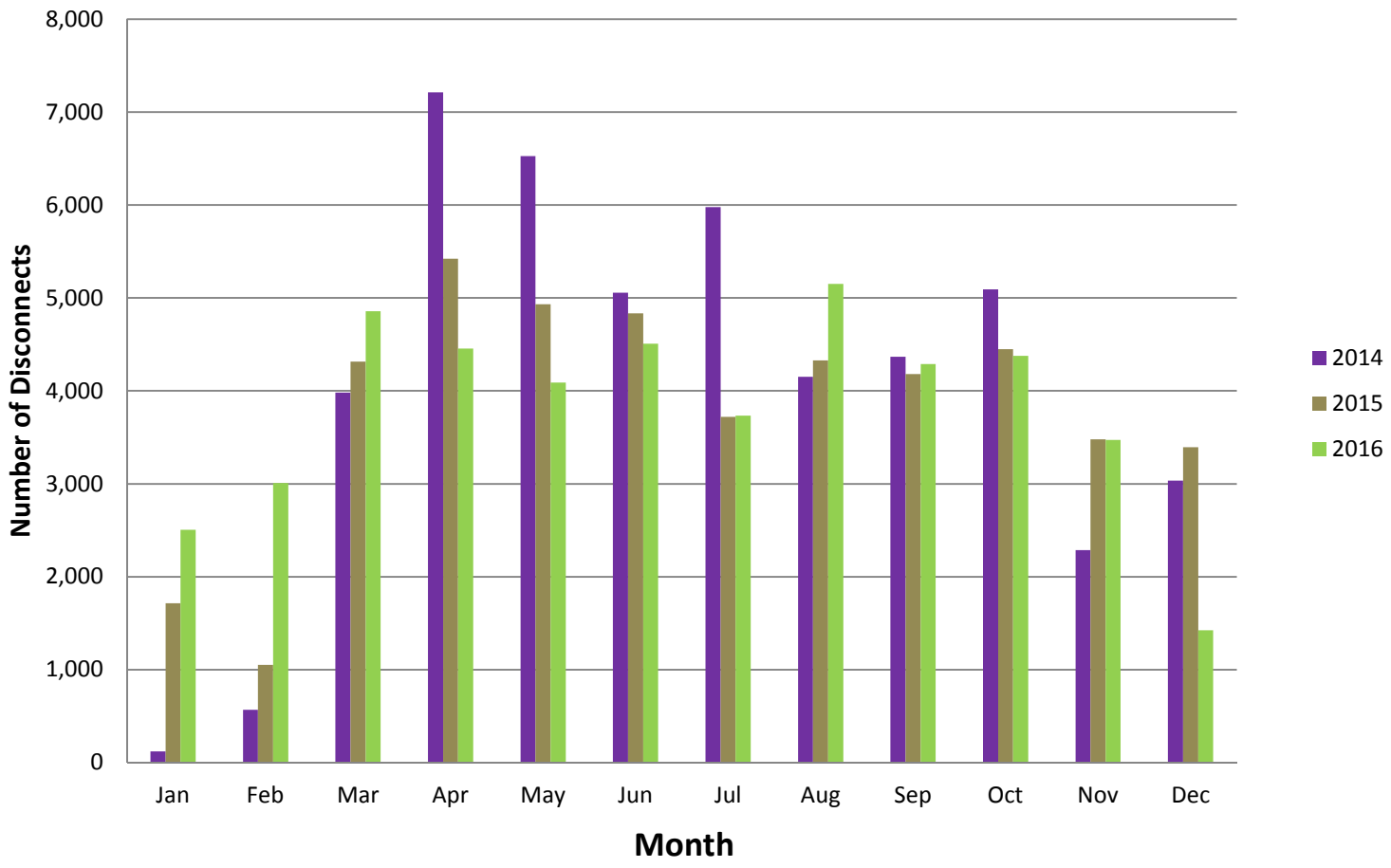


IPL's bills are among the lowest of the 20 largest cities served by an IOU.

Disconnects Due to Non-Payment (Tier 1 Metric)

The chart below shows the total number of disconnects due to customer non-payment for each month starting in 2014.

Figure 19. Disconnects Due to Non-Payment



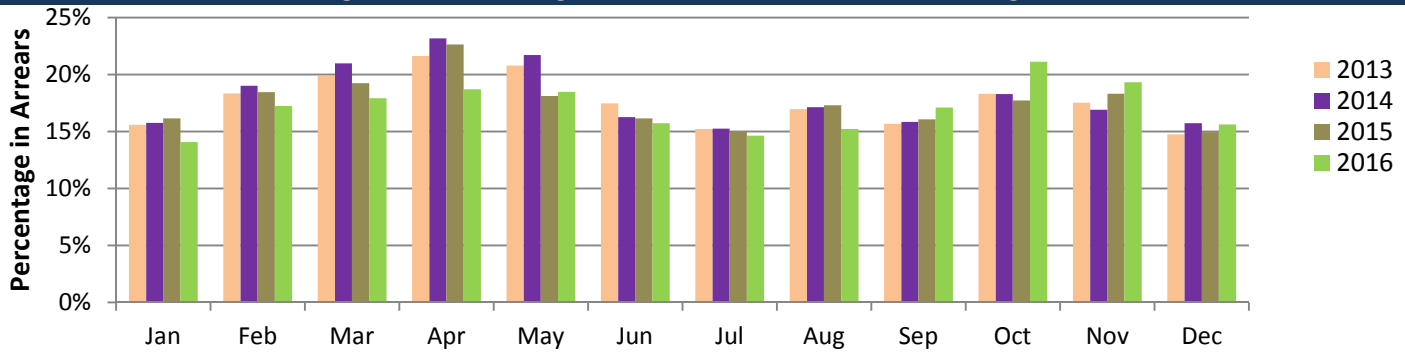
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2012	1,775	3,077	5,389	5,956	6,368	5,842	4,101	6,812	5,343	6,651	5,768	2,966	60,048
2013	1,489	1,554	3,189	5,935	5,998	6,243	5,847	6,620	5,129	5,438	3,841	839	52,122
2014	120	568	3,981	7,212	6,528	5,055	5,979	4,151	4,368	5,094	2,285	3,035	48,376
2015	1,714	1,052	4,316	5,424	4,934	4,834	3,719	4,328	4,182	4,448	3,480	3,395	45,826
2016	2,504	3,010	4,856	4,454	4,089	4,508	3,732	5,151	4,289	4,378	3,471	1,425	45,867

The number of customers disconnected for non-payment during the winter is significantly less than other months. This is due to the winter moratorium (Indiana Code § 8-1-2-121) reducing the number of disconnects during weather extremes.

Percentage of Accounts Receivable in Arrearages (Tier 1 Metric)

This chart shows the percentage of accounts receivable in arrearages.

Figure 20. Percentage of Accounts Receivable in Arrearages



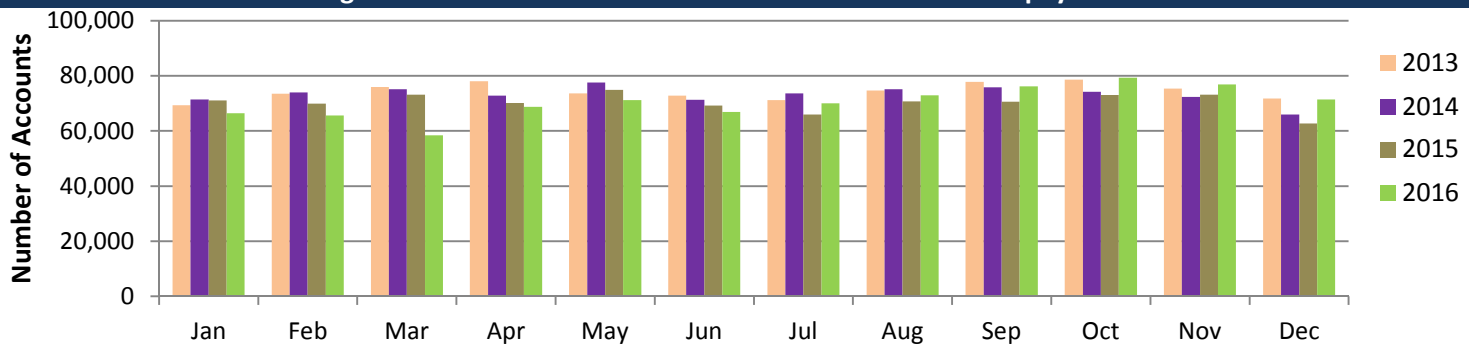
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	15.58%	18.33%	19.87%	21.60%	20.77%	17.45%	15.21%	16.95%	15.66%	18.31%	17.51%	14.74%
2014	15.73%	19.00%	20.98%	23.16%	21.70%	16.24%	15.23%	17.12%	15.83%	18.26%	16.90%	15.71%
2015	16.13%	18.45%	19.23%	22.62%	18.11%	16.15%	14.96%	17.30%	16.05%	17.71%	18.30%	14.92%
2016	14.05%	17.23%	17.91%	18.69%	18.47%	15.72%	14.61%	15.20%	17.10%	21.10%	19.30%	15.60%

Accounts are considered to be in arrears after 30 days past due. This percentage is skewed by budget billing shortfalls, extensions granted, and deposit commitments that are not complete.

Accounts Sent Notice of Disconnection for Non-payment (Tier 1 Metric)

This chart illustrates the number of IPL accounts sent notices for disconnection by month and year. Notices are sent for bills past 30 days due or greater.

Figure 21. Accounts Sent Notice of Disconnection for Non-payment



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2012	71,051	68,597	72,429	78,736	69,621	72,242	74,391	76,764	79,978	82,790	75,237	78,247
2013	69,252	73,501	75,940	77,965	73,596	72,748	71,191	74,616	77,829	78,577	75,287	71,792
2014	71,420	73,964	75,075	72,805	77,540	71,316	73,601	75,153	75,835	74,199	72,279	65,944
2015	71,015	69,834	73,165	70,143	74,920	69,140	65,965	70,708	70,528	73,068	73,089	62,682
2016	66,458	65,574	58,402	68,686	71,183	66,842	70,053	72,950	76,121	79,278	76,796	71,352

This chart illustrates the number of accounts sent notices for disconnection by month and year. Notices are sent for bills 30 days past due or greater.

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Financial

Analyzed in conjunction with other performance measures (particularly Reliability, Asset Management, the CBD UG Network and Operational Efficiency), IPL's actual investment (CAPEX) and spending (O&M) levels provide a comprehensive synopsis of how expenditures affect critical metrics contributing to both effectiveness and efficiency. As a collective, the trends represented by these metrics can be used to identify areas where a potential threat may exist and where remedial actions can either limit or avoid the impact (or consequence) of said threat.

Description of Metric

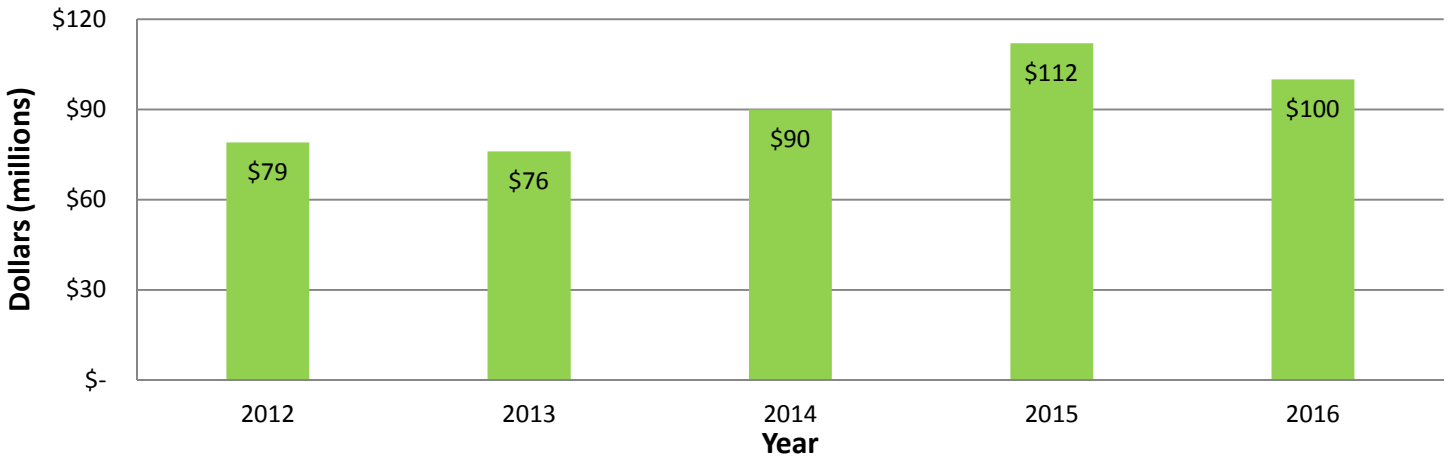
Metrics will compare the amount of money spent on Transmission and Distribution (T&D) infrastructure on an annual basis.

Financial - T&D

T&D Current vs. Historic Spending-CAPEX (Tier 1 Metric)

This chart shows IPL's historical and 12 month rolling Transmission and Distribution spending on capital projects and programs. This includes new customer work and system improvements.

Figure 22. T&D Capital Spending (in millions)

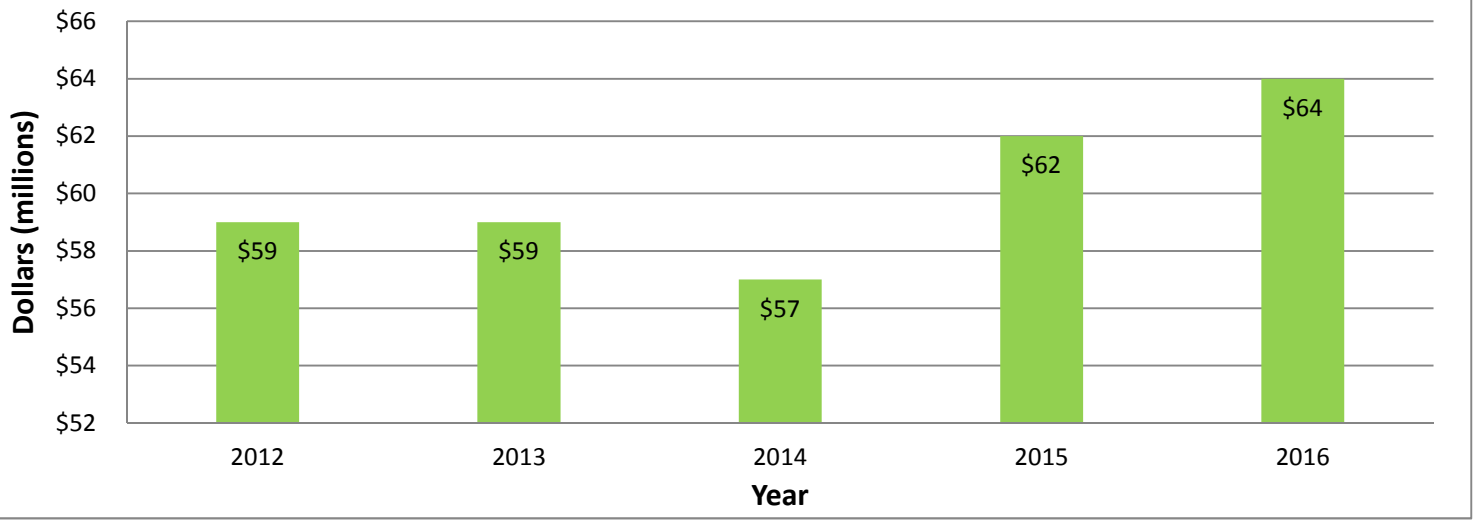


The total T&D capital spending has been increasing the last few years as IPL upgrades the system transmission import capability, added a static VAR compensator and upgraded network protectors in the CBD.

T&D Current vs. Historic Spending-O&M (Tier 1 Metric)

This chart shows IPL's historical and 12 month rolling Transmission and Distribution spending on operations and maintenance expenses.

Figure 23. T&D O&M Spending (in millions)



Total T&D operations and maintenance expense has been slightly increasing over the last few years.

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Asset Management

Viewed in tandem with the Asset Management Program Oversight Report, the metrics reported in this section illustrate, at a high level, the effectiveness of IPL's approach in maintaining and replacing critical assets. Key areas monitored include adherence to test and inspection programs, the replacement of aging electric system infrastructure and the overall condition of installed assets.

Description of Metrics

* Percent of Planned Maintenance Completed takes the number of planned maintenance activities completed during the year divided by the total number of activities scheduled for the year. A value of 100% indicates that all of the planned work was completed.

* Renewal Rate measures the number of assets that were refurbished or replaced compared to the total number of similar assets on the system.

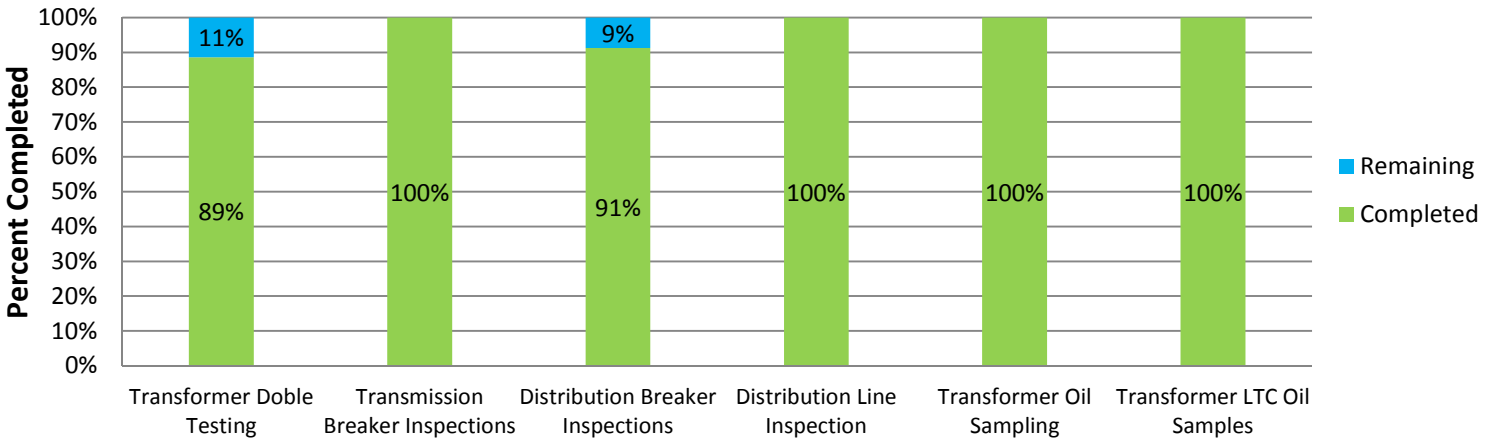
* Asset Condition Rating is used to determine the health of individual assets and to identify the risk of an asset failure by scaling the health of an asset by the consequence of failure for that asset. The health of an asset indicates how the asset compares to the desired condition. Assets are prioritized for remediation by the risk of asset failure.

Asset Management

Percent of Planned Maintenance Completed During 2016 (Tier 1 Metric)

Amount of maintenance completed vs. what was committed for year to date in the scheduled maintenance plan.

Figure 24. Percent of Planned Maintenance Completed

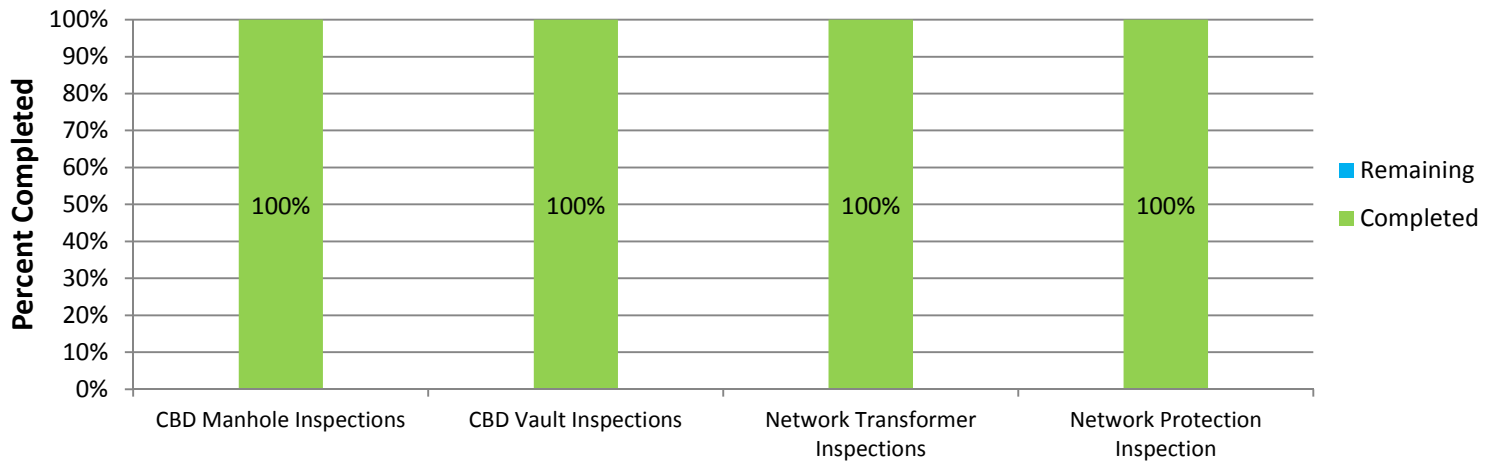


Transformer Doble (power factor) testing and distribution breaker maintenance are less than the 100% target at year end. These tests/maintenance are prioritized based on asset criticality and past test results.

Percent of Planned Maintenance Completed During 2016 - Downtown Network (Tier 1 Metric)

Amount of maintenance completed on CBD assets vs. what was the scheduled maintenance plan.

Figure 25. Percent of Planned Maintenance Completed (Downtown Network)

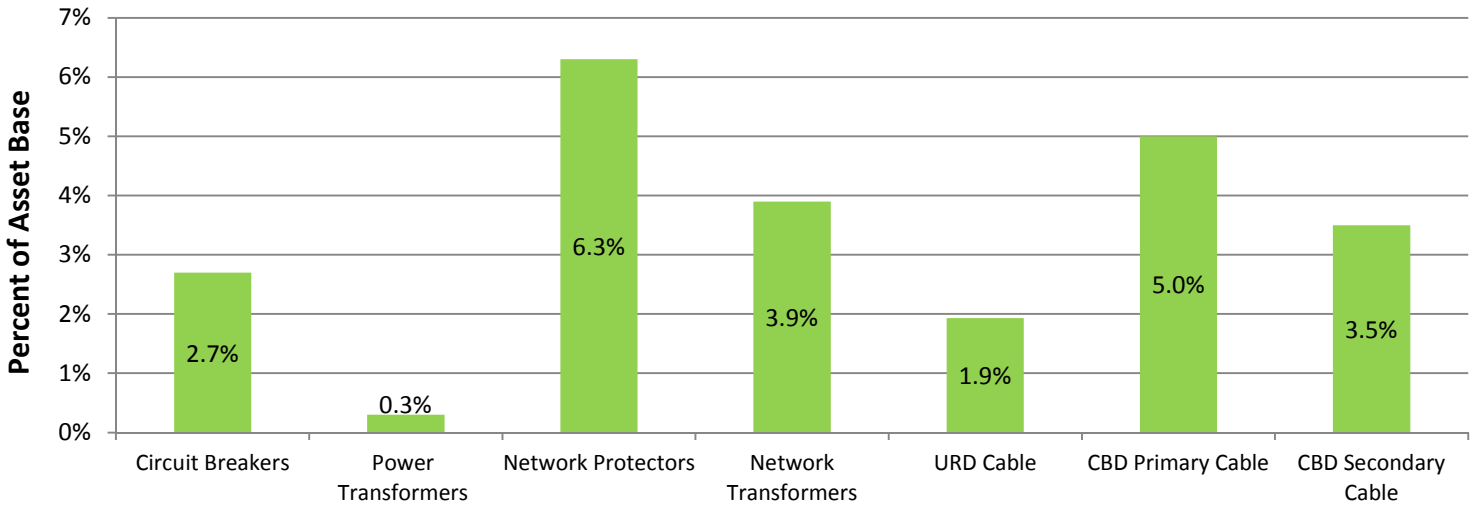


IPL's inspection plan for the CBD in 2016 is based on optimum work management efficiency. The inspection cycle commitments were completed last year.

Renewal Rates (Tier 1 Metric)

This is a 5 year average annualized percentage of new assets being installed for some critical asset classes. The time frame reviewed is from 2011 through 2015 inclusive.

Figure 26. Renewal Rates



New and replacement of substation transformer installations has been very low the last few years. IPL has an existing "watch" list and replaces transformers only when a combination of criticality and condition deems it necessary. Some transformers have been retired and not replaced.

Asset Condition Rating (Tier 1 Metric)

An asset condition rating or asset health index if monitored over time can indicate an overall decrease or increase in the asset health of a particular asset or asset class.

Figure 27. Manhole Health

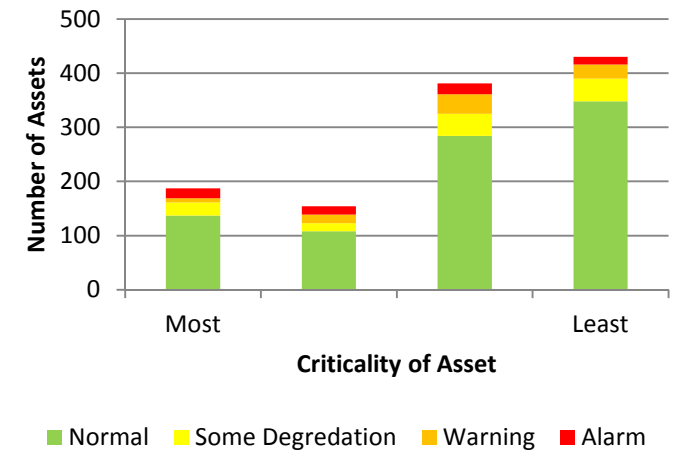
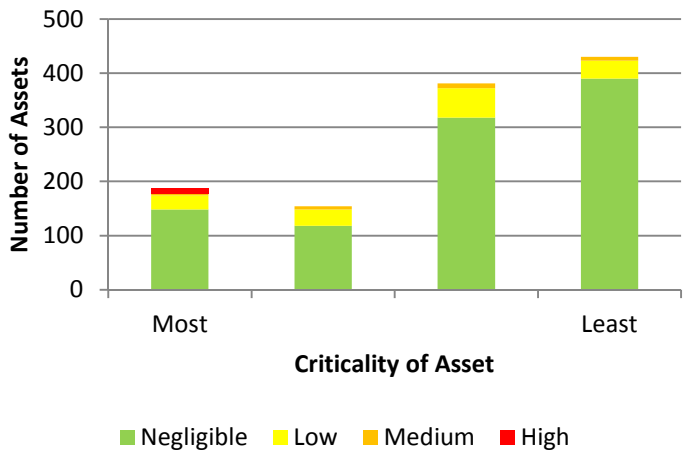


Figure 28. Manhole Risk



Work Orders to drive corrective action are initiated for any manhole that has a risk score higher than "Low" and are prioritized on the amount of risk.

Asset Condition Rating (Tier 1 Metric)

An asset condition rating or asset health index if monitored over time can indicate an overall decrease or increase in the asset health of a particular asset or asset class.

Figure 29. Network Protector Health

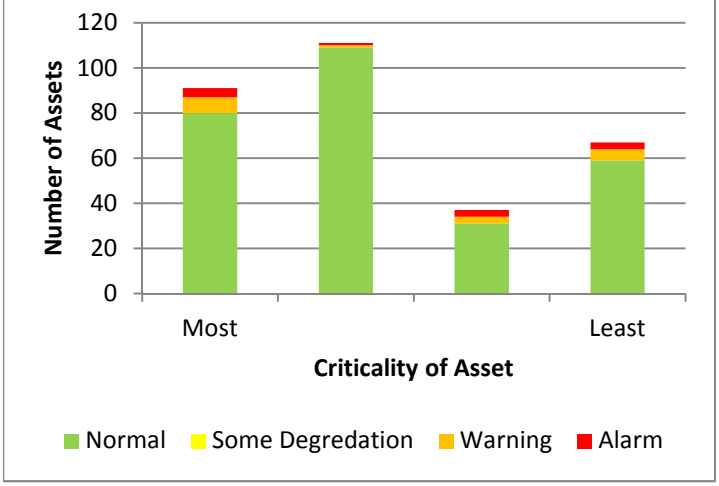
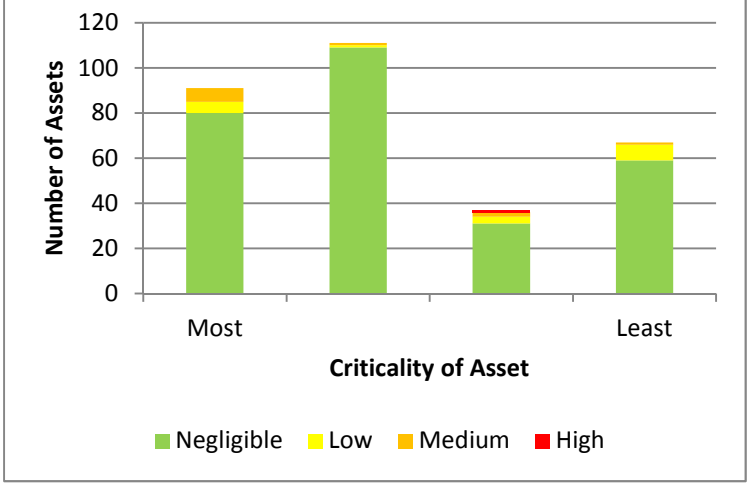


Figure 30. Network Protector Risk



Work Orders to drive corrective action are initiated for any network protector that has a risk score higher than "Low" and are prioritized on the amount of risk.

Asset Condition Rating (Tier 1 Metric)

An asset condition rating or asset health index if monitored over time can indicate an overall decrease or increase in the asset health of a particular asset or asset class.

Figure 31. Network Transformer Health

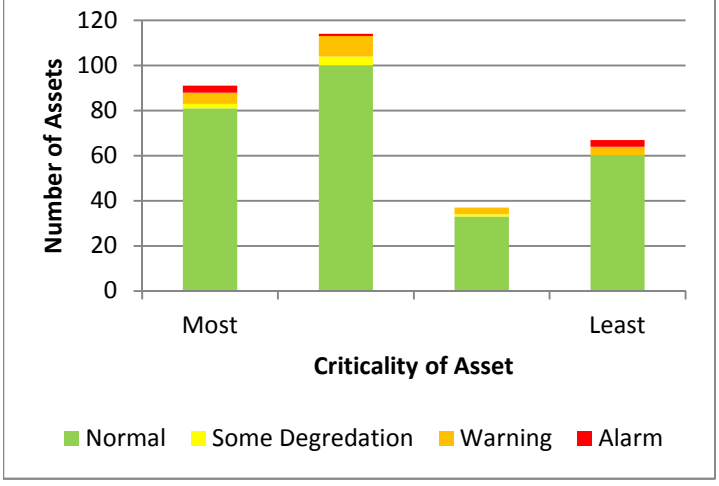
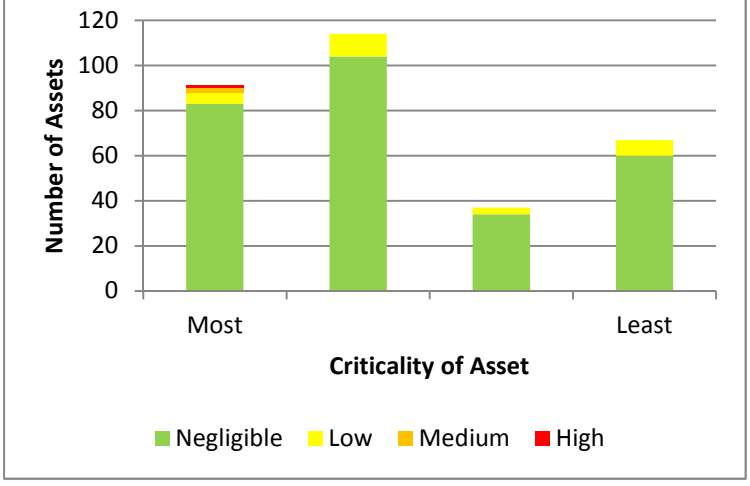


Figure 32. Network Transformer Risk



Work Orders to drive corrective action are initiated for any network transformer that has a risk score higher than "Low" and are prioritized on the amount of risk.

Asset Condition Rating (Tier 1 Metric)

An asset condition rating or asset health index if monitored over time can indicate an overall decrease or increase in the asset health of a particular asset or asset class.

Figure 33. Vault Health

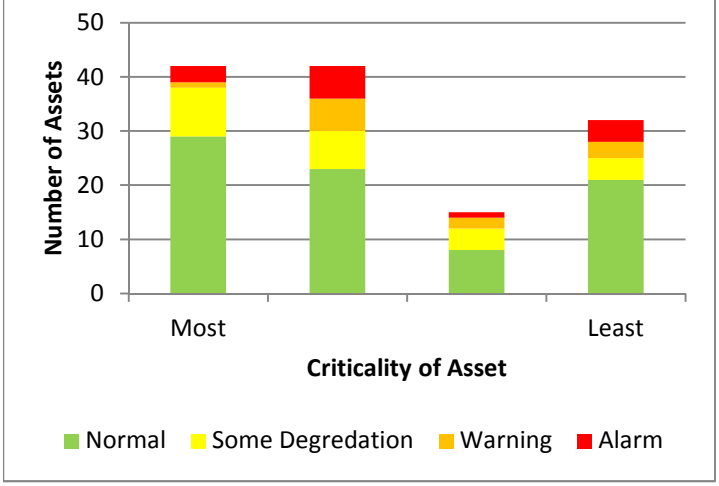
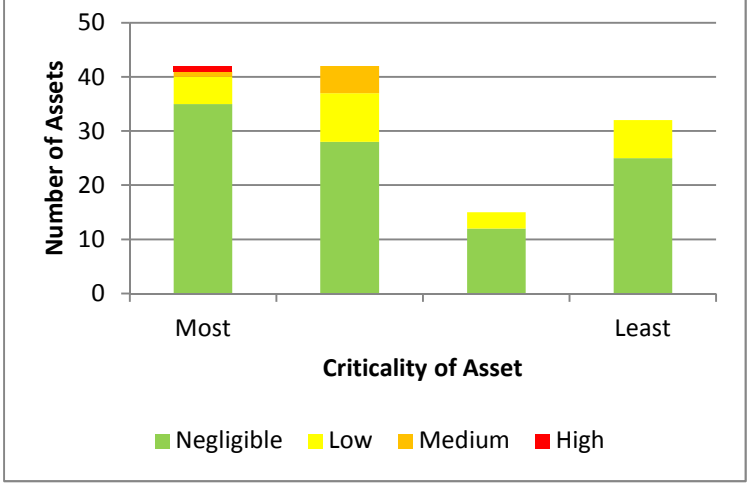


Figure 34. Vault Risk



Work Orders to drive corrective action are initiated for any vault that has a risk score higher than "Low" and are prioritized on the amount of risk.

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CBD Underground Network

Consistent with the CBD UG Network Life Cycle Plan and the Oversight Report, the following metrics report on the extent to which IPL's efforts to maintain and operate a highly complex underground network have reduced the number of significant events; and the number of equipment / component failures. IPL's progress in this area (and ultimate improvement in these metrics) will be reflective of its execution of the remaining initiatives listed in the Life Cycle Plan, an overall effective approach in maintaining / replacing its assets, and well-directed and appropriate investment and spending levels.

Description of Metrics

* Reportable CBD Underground Events helps to quantify the number of defined events that occur and to identify the type of equipment determined to be the most likely cause of the event.

* The number of customers that experienced sustained outages from Reportable CBD Underground Events are tracked as well. Not all Reportable Events will have customer outage.

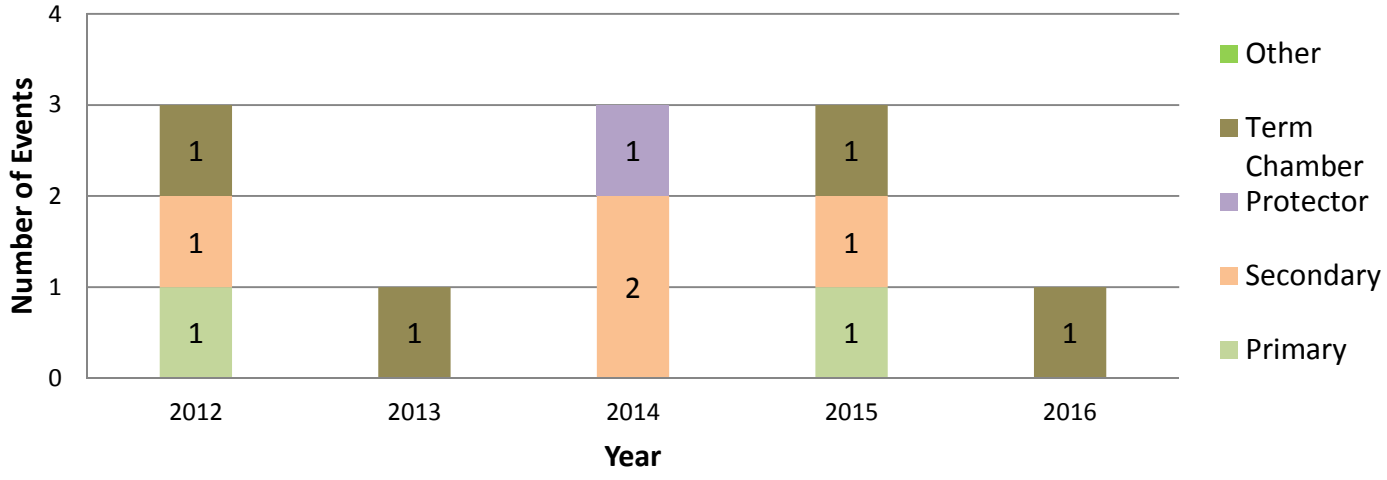
* IPL CBD Network Failures tracks the total number of components that failed while serving customers in the CBD by equipment type.

CBD Underground Network

Reportable CBD Underground Events (Tier 1 Metric)

Total number of Reportable CBD Underground Events for prior 5 years of history by the failure of the type of equipment.

Figure 35. IPL Reportable CBD Underground Events

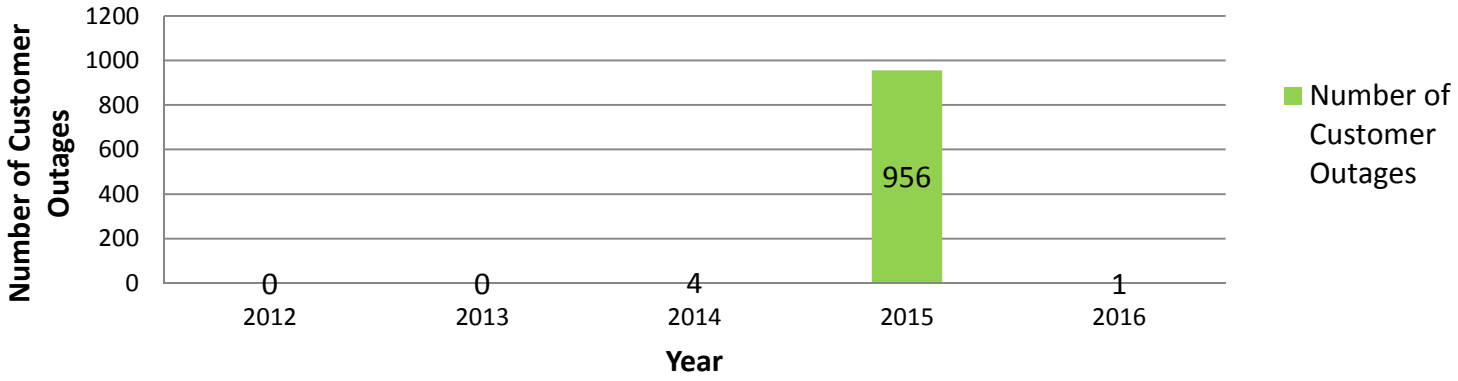


A Reportable CBD Network Event is one in which sustained fire or smoke emanates from a manhole or through the grate of a transformer vault and may involve a response from Indianapolis Fire Department ("IFD"). Not all reportable events are significant or due to IPL facilities. Additionally, a response by IFD is not dispositive of a significant event.

Customer Outages associated with Reportable CBD Underground Events (Tier 1 Metric)

This chart shows the total number of customers that experienced an outage from a Reportable CBD Underground Event.

Figure 36. Number of customer outages associated with Reportable CBD Underground Events

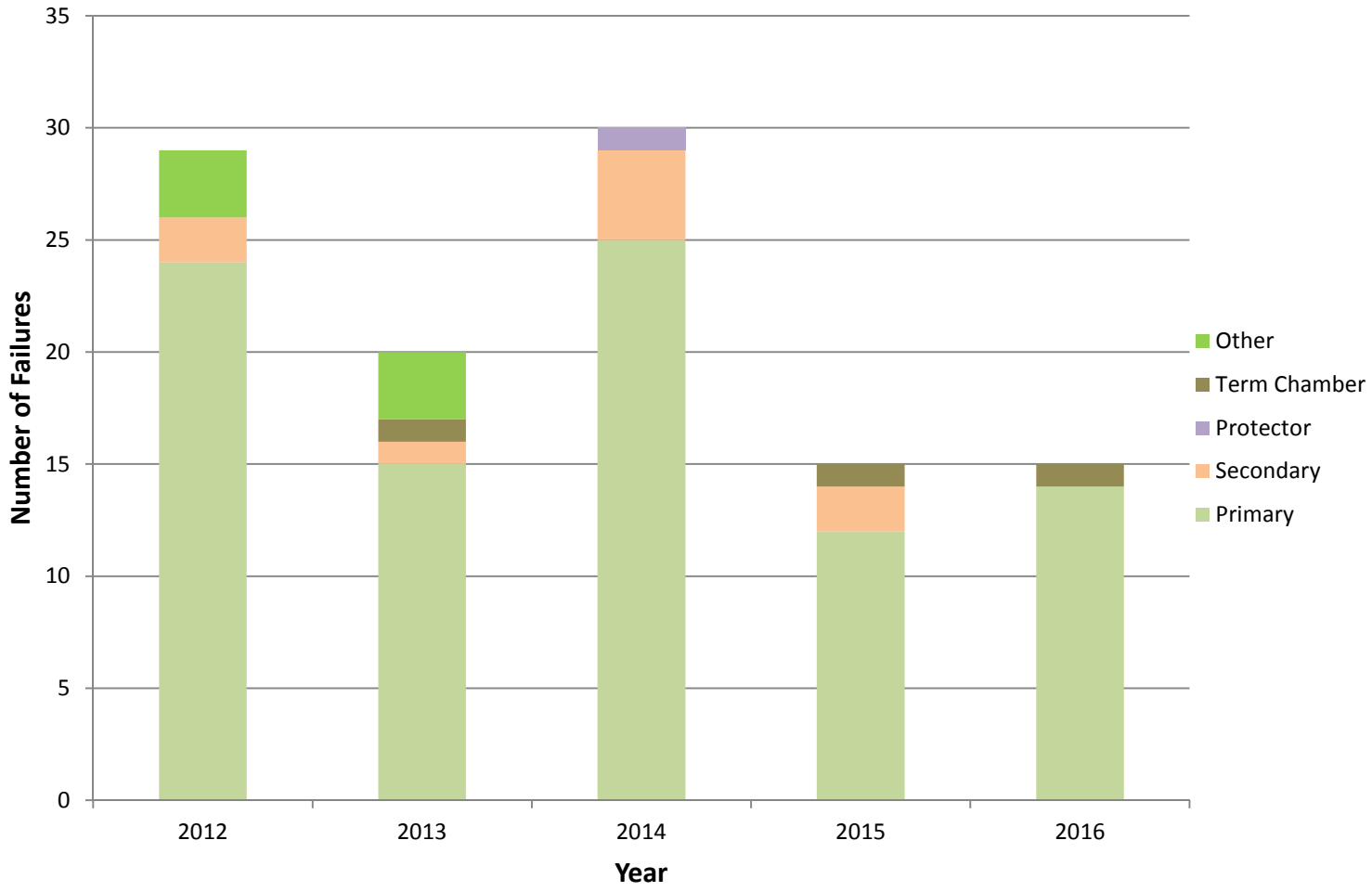


The only reportable incidents with customer outages were:
2014 - 26 S. Meridian Network Protector (4 Customers)
2015 - North Street Secondary Network Fire (956 Customers)
2016 - Termination Chamber at 22 E. Wabash (1 Customer)

Equipment/Component Failures (Tier 1 Metric)

Number of failed components serving customers in the CBD by equipment type. This includes network transformers, protectors, cable systems and infrastructure.

Figure 37. IPL CBD Network Failures



The two most recent annual numbers illustrate significant improvement in reducing CBD component failures.

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Staffing

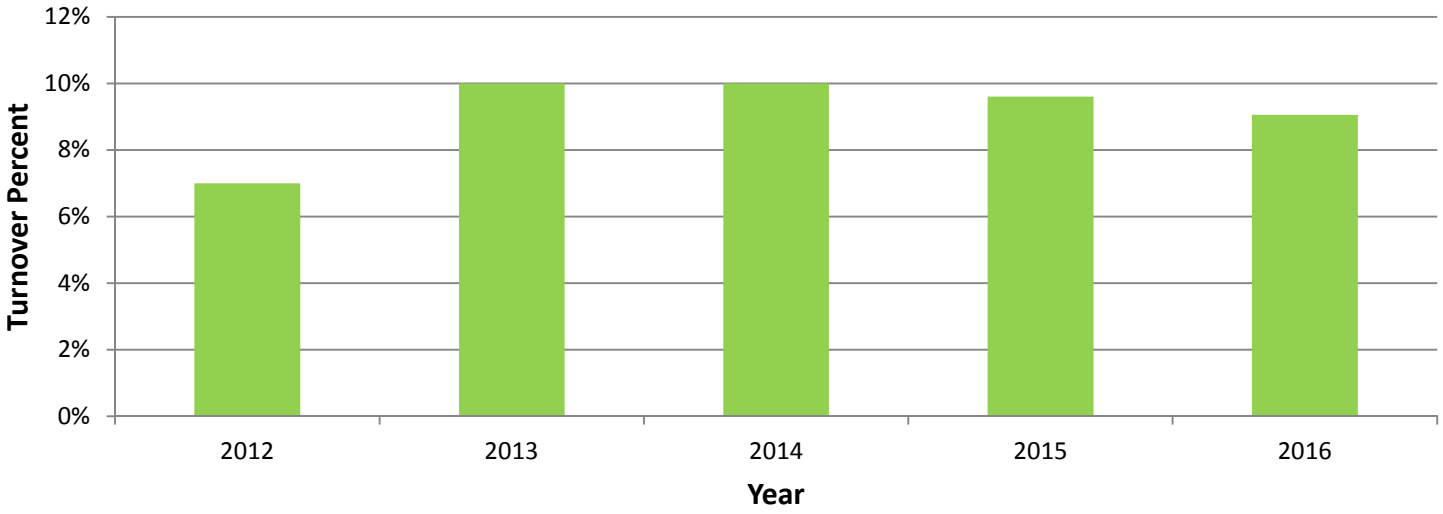
In reporting on employee turnover rate (the ratio of terminations, resignations and retirements to total number of employees in IPL's Transmission and Distribution organization), this section addresses the sustainability of the business from a staffing perspective. Acknowledging the advent of an aging work force, increased pressures being placed on the current work force, continually tightened operating budgets and increased customer expectations regarding reliability, IPL is committed to assuring a well-managed transformation of its organization. This will require well-executed staffing strategies and contingencies that anticipate and account for higher than previously experienced employee turnover; and this metric (employee turnover rate) will provide sufficient transparency to prompt such discussions.

Staffing

Employee Turnover Rate (Tier 1 Metric)

Percentage of IPL employees that resigned, terminated or retired during each year.

Figure 38. Turnover Percentage



Percentage of IPL employees that resigned, terminated or retired during each year.

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Generation

The goal is to have the generation assets available as much as possible on a long term basis. By planning the correct amount of scheduled outage to reduce forced outage, this helps to achieve an optimal balance to maximize the availablity of the assets.

Description of Metrics

* Equivalent Forced Outage Factor (EFOF) is the percent of time that a unit was unavailable (derate or full outage) because of a forced event.

* Equivalent Availability Factor (EAF) is the percent of time that a unit was available to run.

* Equivalent Scheduled Outage Factor (ESOF) is the percent of time a unit was unavailable from a scheduled event (derate or full outage) that is either planned or to perform maintenance.

* Net Capacity Factor (NCF) is the ratio of the actual realized generation to a unit's rated net maximum capacity and is expressed as a percent of a period of time.

* Data for the Harding Street Station (HSS) is for units 5, 6, and 7 only

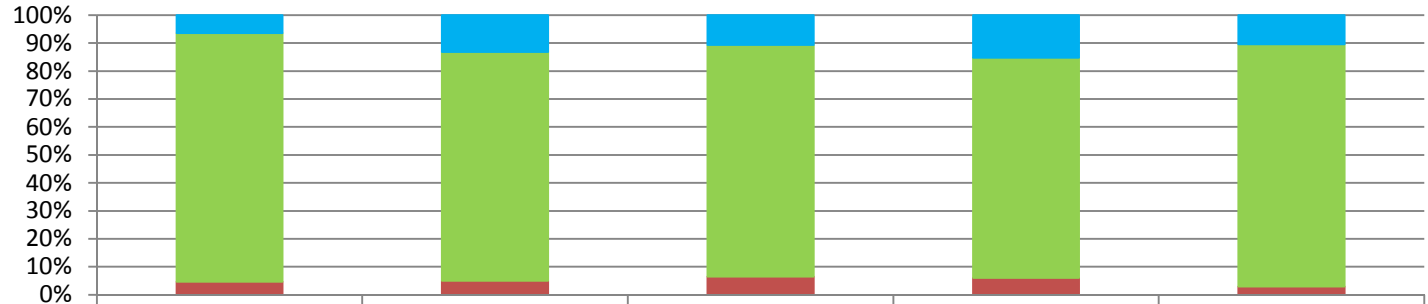
Petersburg Generation Performance (Tier 1 Metric)

$$\text{Equivalent Forced Outage Factor (EFOF)} = \frac{\textit{Forced Outage Hours} + \textit{Equivalent Forced Derated Hours}}{\textit{Period Hours}} \times 100\%$$

$$\text{Equivalent Availability Factor (EAF)} = \frac{\textit{Available Hours} - \textit{Equivalent Planned Derated Hours} - \textit{Equivalent Forced Derated Hours} - \textit{Equivalent Maintenance Derated Hours} - \textit{Equivalent Seasonal Derated Hours}}{\textit{Period Hours}} \times 100\%$$

$$\text{Equivalent Scheduled Outage Factor (ESOF)} = \frac{\textit{Maintenance Outage Hours} + \textit{Planned Outage Hours} + \textit{Equivalent Maintenance Derated Hours} + \textit{Equivalent Planned Derated Hours}}{\textit{Period Hours}} \times 100\%$$

Figure 39. Petersburg Generation Performance

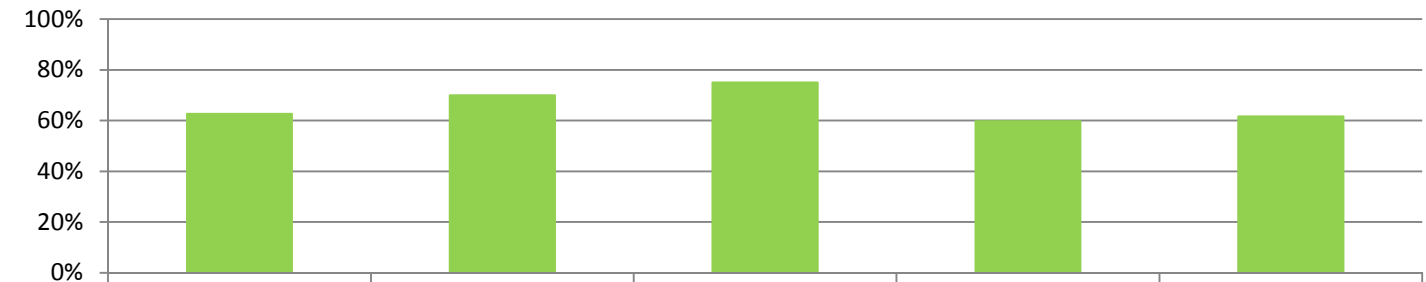


	2012	2013	2014	2015	2016
ESOF	6.42%	13.22%	10.69%	15.24%	10.37%
EAF	88.99%	81.74%	82.78%	78.70%	86.71%
EFOF	4.60%	5.05%	6.53%	6.06%	2.92%

Petersburg Net Capacity Factor (Tier 1 Metric)

$$\text{Net Capacity Factor (NCF)} = \frac{\textit{Net Actual Generation}}{\textit{Period Hours x Net Maximum Capacity}} \times 100\%$$

Figure 40. Petersburg Net Capacity Factor



	2012	2013	2014	2015	2016
Actual	62.65%	69.93%	74.99%	59.82%	61.59%

Petersburg NCF varies annually based on natural gas prices, market energy prices, weather, planned maintenance schedules, and unplanned outages.

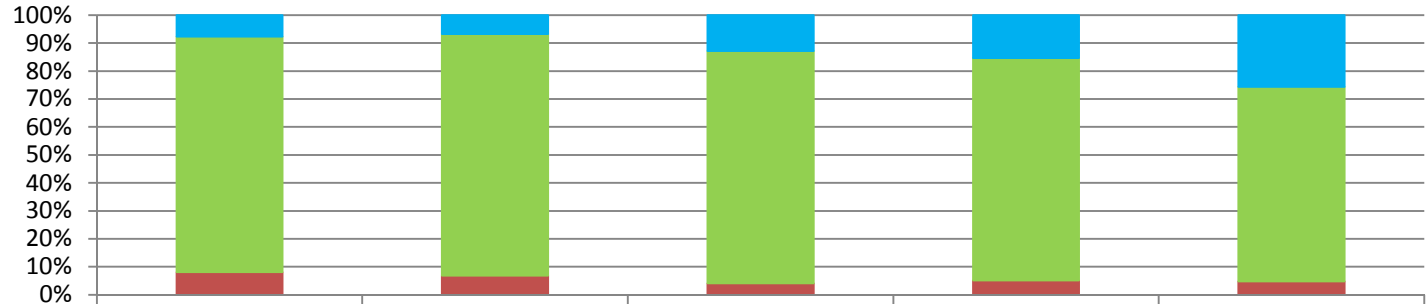
Harding Street Station Generation Performance (Tier 1 Metric)

$$\text{Equivalent Forced Outage Factor (EFOF)} = \frac{\text{Forced Outage Hours} + \text{Equivalent Forced Derated Hours}}{\text{Period Hours}} \times 100\%$$

$$\text{Equivalent Availability Factor (EAF)} = \frac{\text{Available Hours} - \text{Equivalent Planned Derated Hours} - \text{Equivalent Forced Derated Hours} - \text{Equivalent Maintenance Derated Hours} - \text{Equivalent Seasonal Derated Hours}}{\text{Period Hours}} \times 100\%$$

$$\text{Equivalent Scheduled Outage Factor (ESOF)} = \frac{\text{Maintenance Outage Hours} + \text{Planned Outage Hours} + \text{Equivalent Maintenance Derated Hours} + \text{Equivalent Planned Derated Hours}}{\text{Period Hours}} \times 100\%$$

Figure 41. Harding Street Station Generation Performance - Units 5, 6, and 7



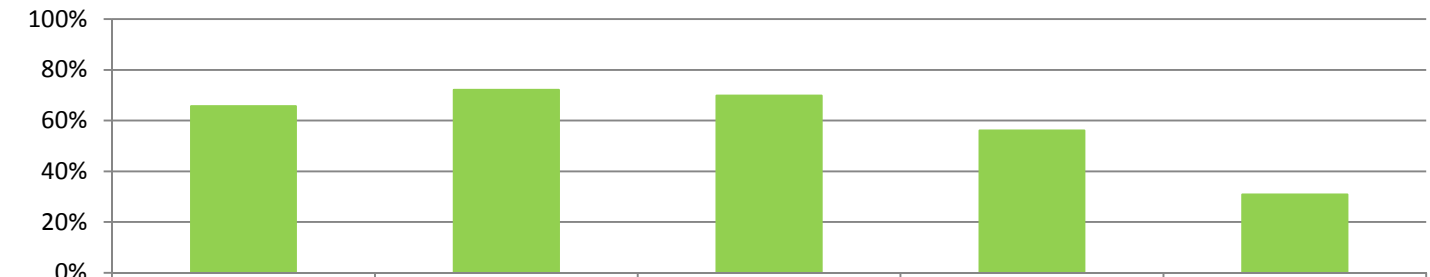
	2012	2013	2014	2015	2016
ESOF	7.66%	6.75%	12.80%	15.35%	25.68%
EAF	84.28%	86.38%	83.12%	79.57%	69.53%
EFOF	8.06%	6.87%	4.08%	5.08%	4.79%

Harding Street Station ESOF increased in 2015 and 2016 with the conversion to gas fired generation.

Harding Street Station Net Capacity Factor (Tier 1 Metric)

$$\text{Net Capacity Factor (NCF)} = \frac{\text{Net Actual Generation}}{\text{Period Hours x Net Maximum Capacity}} \times 100\%$$

Figure 42. Harding Street Station Net Capacity Factor - Units 5, 6, and 7



	2012	2013	2014	2015	2016
Actual	65.64%	72.16%	69.88%	56.05%	30.91%

Harding Street Station NCF decreased in 2015 and 2016 with the conversion to gas fired generation.

Appendix H – IPL Asset Management Self-Assessment

IPL Asset Management Self-Assessment

March 31, 2017

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Executive Summary

In response to the Order of the Indiana Utility Regulatory Commission (IURC) in Cause Nos. 44576 44602 dated March 16, 2016, Indianapolis Power & Light Company (IPL) submits this self-assessment of its Asset Management Program, from both an overall program implementation perspective, and with respect to the role an effective Asset Management Program can play in managing IPL's Central Business District (CBD) Underground (UG) Network. This self-assessment, relying on specific findings and observations, addresses the extent to which IPL's asset management function serves to address the performance of the system and the risk levels within which IPL operates the system.

Before delving into the details of this self-assessment, it is appropriate to set context for this report:

- The Collaborative[1] has reviewed the information contained in this self-assessment and conducted reasonableness tests of IPL's self-assessments on an extremely selective basis, but has not performed a comprehensive review of the self-assessment to confirm or validate the current state as presented by IPL. However, the Collaborative received a series of "Deep Dive" presentations as part of the Oversight Process, and in doing so; the participant's derived additional insight into IPL's operating processes and progress towards full implementation of Asset Management. Among a number of objectives, these presentations (and ensuing discussions) established a basis, from which confidence in this self-assessment (and others to be conducted) can be built. IPL thanks the Collaborative participants for their questions and comments regarding IPL's asset management. Their participation has improved the level of communication and has fostered improved stakeholder relationships.
- In select instances throughout this Self-Assessment, IPL has provided general examples of how it compares to industry norms or standards in a given area of performance related to asset management. The Commission's Order contemplated that the Oversight Process will define a set of metrics to measure IPL's performance over time and facilitate comparisons to other utilities to better drive continual improvements. The Collaborative has been reviewing detailed information related to comparing IPL's performance across many of the initially proposed performance metrics and a high level benchmarking analysis related to industry norms and standards within asset management.

[1] Participating Stakeholders include the IURC Staff, OUCC, Citizens Action Coalition ("CAC") and the City of Indianapolis.

- The "aspirational" aspects of IPL's Asset Management Program (in contrast to "operational") has been extensively discussed. In fact, the IURC Order calls for the Collaborative to define "what part of the process is mature and solid versus what is aspirational." Though the language could be understood to imply that having an aspirational aspect is a "mistake," (a bridge too far, so to speak), the IURC's consultants (Daniel O'Neill and Charles Fijnvandraat of O'Neill Management Consulting, LLC) have said something quite different; namely, that IPL has a laudably high aspiration for its asset management process, and that such aspirations form a credible roadmap for future development. That said, these consultants did point to the need for clearer, more complete communication from IPL as to what was operational. Therefore, acknowledging that any program of the magnitude and scope of Asset Management should always have an "aspirational" element to it, and that any major transformation effort includes continuous improvement, the focus of this self-assessment is to (1) convey the extent to which IPL's Asset Management Program has substance and is producing results, and (2) highlight next steps in further realizing the benefits of effective Asset Management. For a snapshot of the current state of specific aspects of IPL's Program, see the matrix developed as part of the Collaborative Process in Appendix A.

It is IPL's view that it has successfully implemented many of the elements that define an effective Asset Management Program. The Program continues to mature, whether compared to established industry standards (e.g.; PAS 55 and ISO 55000), or the AES Global Asset Management Standards (that have previously been adjudged comparable to the established industry standards). IPL's Asset Management policy, strategies, plans and objectives are in alignment with its corporate vision, and significant progress has been achieved in many of the more tactical aspects of the Program (e.g.; development of Asset Life Cycle Plans, applying risk assessment methodologies to drive capital investment and O&M program spending decisions, and improving the quality and availability of asset condition and performance data to inform asset-related decisions). In fact, returning to the notion of "aspirational" vs. "operational" IPL is close to realizing fully operational and effective asset management processes:

- The Collaborative selected 10 key elements ("attributes") to define the state of IPL's Asset Management Program Implementation. IPL's view is that it is (1) nearing a "***Competent***" rating for each of these 10 key elements (i.e.; all are in place and are being applied and are integrated - only minor inconsistencies may exist) ***and*** (2) ahead of or on a par with industry norms in all categories;

- Reviewing the status of 27 Asset Life Cycle Plans ("ALCP") that represent the assets most critical to the safe and reliable operation of IPL's electric distribution system (9 asset classes for the CBD Underground Network presented as one consolidated Asset Life Cycle Plan and 18

separate Asset Life Cycle Plans for IPL's electric T&D system outside the CBD), though 9 are still in various stages of development ranging from not started to nearing draft form, over 80 percent of the more critical attributes that are typically addressed within an ALCP (defined in the section entitled, "Asset Life Cycle Plan Status – Level 2") are in place. This is indicative of an organization committed to Asset Management and places IPL well above the norm across the US electric utility industry;

- IPL continues to make progress on a number of technical initiatives related to the CBD Underground Network, many of which are geared towards establishing a more proactive posture regarding risks to public safety and reliability.
- A review of asset management related performance metrics substantiates that IPL's program is well on its way towards being fully operational:
    - With the noted exception of power transformers (for which risk mitigation strategies are in place), preventive maintenance and asset renewal rates are specified by IPL's Asset Management Program and IPL is currently on track with (if not ahead of) its plans
    - A review of asset condition ratings, a metric currently being refined as part of the collaborative process, is illustrative of a risk-based approach in repairing / replacing critical assets, and
    - CBD Underground Network events (total of all events and number of significant events) have decreased significantly since 2015.
- The allocation of capital across the CBD Underground Network assets and the balance of IPL's electric T&D system reflects IPL's intention to maintain a strong balance between mandatory investments (i.e.; safety, environmental, compliance, new customer connections, and public requirements) and those related to system performance and risk.

IPL's efforts currently underway to effect continuous improvement include:

- Expanding the asset condition and criticality (e.g.; risk) assessment process from its initial focus on the CBD Underground Network assets to those comprising the balance of IPL's electric T&D system (IPL is in the process of distilling the results in the form of performance metrics).
- Applying the principles used to arrive at an optimized capital investment portfolio to O&M program spending (currently developed based on a "*historical*", as opposed to "*risk*", perspective).

- Augmenting current tactical approaches to assuring reliability with a longer range grid revitalization strategy (along the lines specified in SB250) to more holistically address aging infrastructure.
- Completing the integration of Asset Life Cycle Plans with the overarching Asset Management practices and programs such as Capital Investment and O&M Spending Prioritization, Repair vs. Replacement of critical assets, Preventive Maintenance Optimization and Grid Modernization.
- Expanding the depth and dissemination of Root Cause results as part of IPL's goal of being a continuous learning and improving organization.
- Maintaining focus on succession planning to mitigate the impact of an aging work force and to improve IPL's position with respect to implementing new technology.
- Exploring the formation of a consortium of other electric utilities with underground networks similar to that serving the City of Indianapolis, to formalize the exchange of "best practices" in maintaining and operating these networks.

Background

The IURC's Order dated March 16, 2016 requests an assessment of IPL's Asset Management Program within six months of the first meeting of the Collaborative, primarily to define "what part of the process is mature and solid versus that which is aspirational." With the assessment framework already developed and submitted as part of the Oversight Process in the July 22nd, 2016 and October 24th, 2016 filings, this report, prepared by IPL (in concert with UMS Group, an Institute of Asset Management (IAM) endorsed assessor of Asset Management programs), seeks to expand upon and lend context to information provided in that filing. However, prior to delving into IPL's self-assessment, we offer the following brief discussion of Asset Management and the methodology used to self-assess IPL's program; with the goal of establishing a "common language" and understanding around this topic.

Asset Management Defined

Asset Management defines the approach, methodology and practices that optimize the inherent trade-offs between risk, operational effectiveness and economics in operating, maintaining and replacing critical assets. Making a clear distinction between those who define the required work related to assets (Asset Managers) and those who perform the work on the assets (Service Providers), Asset Management allows a utility to drive proactive decisions in areas such as the repair vs. replacement of assets, the maintenance regimen to be assigned to a specific asset (e.g.; interval, condition, or risk-based), and how best to allocate capital and O&M spending across the portfolio of a utility's assets. Underlying these decisions are analyses of asset condition and performance, and an assessment of each asset's relative importance (criticality) to the system, thereby establishing high standards for the completeness, accuracy and availability of asset-related data and information. Although data and information based decision-making on critical assets is a cornerstone to effective asset management, there are other equally important aspects to consider, such as:

- Alignment of asset related decisions with corporate strategy regarding safety, operational effectiveness, risk, and financial constraints,
- Work prioritization and assignment based on asset / system performance and safety requirements as opposed to the more traditional approach where the composition and capabilities of the current work force drive workload,
- Life cycle management of critical assets from design and procurement through retirement, and
- Skills, competencies and technology required to perform these functions.

Standards exist (discussed below), providing a roadmap to guide utilities through the implementation process, and IPL has incorporated the underlying philosophy and concepts of these standards through implementation of the AES Global Asset Management Program. Excerpts from the reports submitted in IPL's July 22nd and October 24th filings, included as Appendices A and B, reflect attributes that are consistent with these standards.

Applicability of Pre-established Industry Standards

International Organization for Standardization (ISO) 55000/55001/55002 and its predecessor, Publicly Available Specification (PAS) 55 are the accepted standards utilized across multiple industries for measuring an organization's effectiveness with respect to asset management. In short, the ISO 55000 series of standards provide guidance and a requirements checklist of good practices to assure the proper operation and care of tangible and intangible assets, and equally important, provides a common language and framework to assist companies in achieving system performance objectives at optimal cost on a sustainable basis. The various tables that support IPL's reported progress in implementing an Asset Management Program and improving its CBD Underground Network (included in Appendices D and E of the July 22nd, 2016 filing) reflect key aspects of these standards. This is evidenced by the mapping of the 24 criteria that define the requirements specified in the ISO Standard and the specific elements ("attributes") around which these tables were designed (see Appendix C of this report), a point that is further accentuated by a deeper dive into some of the more pragmatic elements of Asset Management, namely:

- Development of Asset Life Cycle Plans for 19 electric T&D system Asset Classes including CBD,
- Development of the 9 components (asset classes) that define the Asset Life Cycle Plan for the CBD Underground Network , and
- Tracking of Open / Pending CBD Underground Network Initiatives with summary of next steps and projected completion date.

The level of detail provided in Appendices A and B (extracts from IPL's Asset Management Program and IPL's Central Business District Underground Network Asset Management Program Oversight Reports submitted as part of the July 22nd, 2016 and October 24th filings), address the valid concern that sole reliance on industry standards can lead to excessive concentration on the philosophy of asset management, or an intensive effort at building extensive databases. Not only do these appendices provide a detailed view of IPL's strategy and tactics in implementing its Asset Management process, they also

reflect IPL's pragmatic approach to first, focus investment on those areas where real traction and leverage can be garnered in building value and realizing efficiency, and satisfying the need to balance cost with performance. Thus, IPL believes it is already realizing many of the benefits that result from a mature program without yet having fully developed all the structure and individual elements of an Asset Management Program. For example:

- The software applications that support various programs are widely varied, tailored to the meet the needs of the specific endeavors each support. Instead of immediately purchasing a costly enterprise-wide asset management software suite of products which oftentimes provides at best, mixed results, IPL's approach has been to design a portal (a share point site, termed the "AM Website") to collect relevant data and analytic results from the myriad legacy systems that define IPL's current Asset Management technology platforms (e.g.; EMPAC, IVARA, and WMIS). In so doing, real-time data and information drive asset-related decisions is available, but without the change management challenges that can oftentimes drive costly, yet low-value added process re-engineering efforts (particularly when hastily implemented without thorough implementation planning). This approach provides sufficient time to work out the implementation and operating details, should a more robust, "one-stop" IT solution be called for in the future.
- Although only ten of the nineteen electric T&D system Asset Life Cycle Plans (including CBD) are reported as "completed," over 80 percent of the more critical elements ("attributes") that are included in these plans have been addressed across ***all eighteen asset classes***. This reflects IPL's focus on substance (e.g.; actual asset inventory, failure analysis, maintenance plans, and asset risk indexing) over form (summarizing history, documenting innovative practices in place, defining reporting formats, etc.). See Appendix B for the state of each attribute for each asset class.
- Within the CBD Underground Network, representing IPL's most significant exposure from an asset risk perspective, many of the key elements of effective asset management have been applied in advance of IPL's overall Asset Management Implementation Plan.

Asset Management Program Self-Assessment

IPL has adopted a four-domain assessment framework to report progress achieved in its drive towards industry leadership in Asset Management. Generally, assessments undertaken in the industry focus on only one of the four domains (the specifics of which vary by utility) when considering the level of proficiency in Asset Management. IPL's approach is to view its process from these multiple, overlapping perspectives to ensure that it has a clear picture of where it stands and what next steps are most valuable and cost-effective in continuing to improve its process

- Domain 1: Asset Management Program Implementation, reports current status and next steps (if applicable) across 10 performance domains (or "attributes") that correlate to the 24 criteria specified in ISO 55000/55001/55002. These 10 performance domains include: 1.Asset Management Program Structure, 2. Asset Risk Management, 3. Information Management and Technology, 4. Capital Investment and O&M Spending Program Optimization, 5. Asset Life Cycle Plan Integration, 6. Root Cause Analysis and Special Investigations, 7. Asset Management Skills and Recruiting, 8. Integrated Disaster Recovery Plans, 9. Asset Management Innovation and Continuous Improvement, and 10. Benchmarking and Best Practice Identification / Evaluation. Appendix A includes Definitions as well as Measures of Effectiveness for each of the 10 performance domains listed above.

- Domain 2: Asset Life Cycle Plan[2] Status (System-Wide and CBD Underground Network), reports progress in the development of 19 electric T&D and the 9 components (asset classes) that define the CBD UG Network Asset Life Cycle Plan, focusing on the 10 technical elements (or "attributes") that are typically included in such plans. These 10 technical elements include: Asset Inventory, Failure Analysis, Unit Costs, Sourcing / Supply Chain, Maintenance Plan, Renewal Plan, Asset Health / Risk Indexing, Technology and Practice Survey, Asset Condition and Performance Monitoring, and Decision Bases. Appendix B includes a description of each of the 10 technical elements listed above, as well as a situationally-based attribute: Special Studies of Emerging Issues.

- Domain 3: "Deep Dive" reports the completion status and next steps in addressing the major CBD UG Network initiatives that will require IPL action over time (seven outstanding items,

[2] Though Asset Life Cycle Plans are viewed as foundational to an effective Asset Management Program, they address the more technical and tactical factors in managing assets, and assessments that focus solely on these plans are likely to omit the more strategic aspects of sound Asset Management. Similarly, absent these Plans, the more holistic elements addressed in the Domain 1 assessment could potentially lack the substance necessary to drive meaningful technical improvement in developing and/or existing Asset Management programs.

summarized in Figure 5, are currently being tracked and reported in the periodic Oversight Reports).

- Domain 4: Review of the Five Asset Management-related Performance Metrics, presented in Figures 6 through 16, includes a presentation of: 1. Percent Planned Maintenance Completed, 2. Asset Renewal Rate, 3. Asset Condition Rating, 4. Number of Reportable CBD Underground Network Events, and 5. Total Number of Equipment/Component Failures in the CBD UG Network per Year, again reported routinely in the periodic Oversight Reports. These metrics will be reported routinely in IPL's Annual Performance Metrics Report, the initial presentation of which was included as Appendix G in the July 22nd, 2016 and October 24th filings.

Asset Management Program Implementation - Domain 1

The following discussion summarizes IPL's view of the current state across ten elements / attributes (Definitions and Measures of Effectiveness are included in Appendix A) that, when effectively deployed, assure a properly directed and continuously improving Asset Management process:

- *Asset Management Program Structure*: The basic elements that define the structure of a utility's Asset Management Program are in place at IPL (e.g.; Asset Management Policy Strategy and Objectives, Organization Charts and supporting documentation that clarify authorities, accountabilities, and responsibilities, and KPIs that measure and trend the effectiveness of IPL's Asset Management processes).
- *Asset Risk Management*: IPL's framework and methodology for deploying a Risk Register has been established, a capability that is in the early stages of use in informing Asset Management-related decisions. IPL is on its way to having a fully operational Risk Register by the end of 2017. That said, the accelerated availability of asset risk information for four of the more critical asset classes within IPL's CBD Underground Network (Manholes, Network Transformers, Network Protectors, and Vaults) and electric T&D system substation breakers and transformers speaks to IPL's progress, and more importantly, its sense of priority in taking on the more critical assets first.
- *Information Management and Technology*: IPL's Asset Management Website represents IPL's effective and efficient approach towards assuring organization-wide access to critical Asset Management-related data. It serves as a portal to collect relevant data and to deliver analytic results from the myriad systems that define IPL's current Asset Management technology

platforms (e.g.; EMPAC, IVARA, and WMIS, etc.); thus providing access to real-time data and information from which to make asset-related decisions. This solution is delivering "*early wins*", as well as providing time to work out implementation and operating details, should a more robust, "one-stop" IT solution be called for in the future. In the interim, significant work remains in developing data architecture and establishing data collection requirements; and IPL continues to explore the development / implementation of additional decision support IT tools to improve analytics around reliability, work management and capital investment / O&M spending planning.

- *Capital Investment and O&M Spending Program Optimization*: IPL uses an internally developed prioritization tool ("PASE") to assist in scoring and prioritizing "candidate investments" for capital investment funding:
    - With due regard to safety, mandates to serve, and the myriad public and regulatory requirements, IPL's Asset Management organization evaluates, prioritizes and selects capital projects for its electric T&D system;
    - Primary sources for these projects include the aforementioned Asset Life Cycle Plans (ALCPs), Asset Risk Calculations, and Leading / Lagging Performance Indicators (many of which are included in the IPL's Annual Performance Metrics Report);
    - PASE accounts for value and risk related to achieving its strategic goals and objectives (e.g.; Safety, Reliability, Compliance and Financial);
    - The actual prioritization (and subsequent selection) of projects is driven by a risk-based, benefit-to-cost ratio (provided by the decision support tool), augmented by the oversight of subject matter experts; and
    - Integration of the capital investment portfolio with IPL's AM Website provides transparency regarding funded and unfunded initiatives, and facilitates the mid-course adjustments to the overall portfolio should there be changes to the assumptions that drove the initial funding decisions.

Since approximately 50 percent of the capital investment budget is allocated for system performance improvement (e.g.; reliability) and infrastructure revitalization, the significance of this process cannot be overstated; and IPL's plans to extend the risk and value scoring process embedded in this tool to O&M programs is commendable. That said, it appears that the magnitude and composition of IPL's capital budgets are more reflective of an ever-changing asset risk profile (with large dependence on input from Subject Matter Experts), and the O&M program budgets are, as is the case in most utilities, established based on a historical perspective. Though

the results, particularly in its reliability metrics, reflect IPL's prudence with respect to allocation of capital investment and O&M spending, it would appear that risks related to aging electric distribution infrastructure, again common throughout the industry, are increasing.

Because of the importance to the Collaborative of this component of Asset Management, IPL has held focused discussions with the Stakeholders on aspects of the process where they have remaining questions and concerns. The specific topics were guided by the Stakeholder interests to support improving the understanding on the part of the Stakeholders and to resolve any concerns.

- *Asset Life Cycle Plan (ALCP) Integration*: The Asset Life Cycle Plans (status of which is addressed as part of the Level 2 discussion) are in various stages of development. Viewed as primary "building blocks" for an effective Asset Management Program, they serve as links between a utility's Asset Management Strategy and a specific asset class. This attribute addresses the extent to which the criteria and practices outlined in IPL's Asset Life Cycle Plans are integral to overarching Asset Management practices and programs (e.g.; Capital Investment and O&M Spending Prioritization, Repair vs. Replacement of critical assets, Preventive Maintenance Optimization, and Grid Modernization). As IPL's development of these plans are in various stages of completion, such integration has occurred, but on an asset and/or attribute-specific basis. Until all 19 system-wide asset classes and 9 CBD Underground Network asset classes have been fully addressed, this will remain an open item. That said, the mere existence of ALCPs and a commitment to complete them is relatively unusual in the US electric utility industry.

- *Root Cause Analysis and Special Investigations*: IPL has an approved policy governing the execution of root cause analyses and special investigations, which affords sufficient latitude to vary the level of investigation based on the significance of an event leading to the need for such an analysis or investigation. In addition, IPL is in compliance with this policy in terms of governance and actual preparation and submittal of these reports. IPL has established a SharePoint site to improve the dissemination of this information throughout IPL's Customer Operations Group (and enterprise-wide as the situation dictates), thereby fully "operationalizing" the information in a manner that promotes continuous improvement and learning across the business. Recommendations from the RCA's are tracked for implementation.

- *Asset Management Skills and Recruiting*: IPL has applied prudence in its approach to developing its Asset Management capability, maximizing leverage of existing skills and competencies within operations for subject matter expertise, while staffing the Asset Management group with individuals who are familiar with the assets and system operations, but also knowledgeable of analytics and their application in managing risk and optimizing the allocation of capital and O&M

spending. In so doing, IPL has avoided the pitfalls experienced by large cost insensitive organizations that often build up "silo" organizations that operate in an isolated, semi-detached manner from system and field operations; and instead, through cross training and staff sharing, has created an environment where the cooperation between the Field and Asset Management is exemplary.

IPL does acknowledge the need to further train and develop its Asset Management staff as well as other organizations within Customer Operations, and to provide better documentation to improve accountability of employee and organization participation. Broadening the focus of this topic to the skills and competencies required to maintain, operate, and ultimately dispose of assets (i.e.; the service provider role in the Asset Management model), IPL, ahead of many other U.S. electric utilities, has a succession strategy and plan to account for (1) new skills and competencies necessary to accommodate advanced and emerging technologies, and (2) the lag time to develop a recruit into a fully productive employee, amidst the realities of an aging work force.

- *Integrated Disaster Recovery Plans*: IPL's response to the myriad events that occur in the process of maintaining and operating its electric transmission and distribution business substantiates the existence of a well-established process in this domain. Evidence includes its consistent top-quartile (mostly top-decile) performance in reliability (a significant portion of which pertains to service restoration), its performance during storm restoration (supported further by its comparatively high ratings in customer satisfaction), and its rapid response to CBD Underground Network events. That said, IPL remains committed to proactive measures that address the underlying causes of these events through continued improvement of its asset management process. The CAC has suggested, and IPL supports a future discussion on potential impacts from extreme weather events.

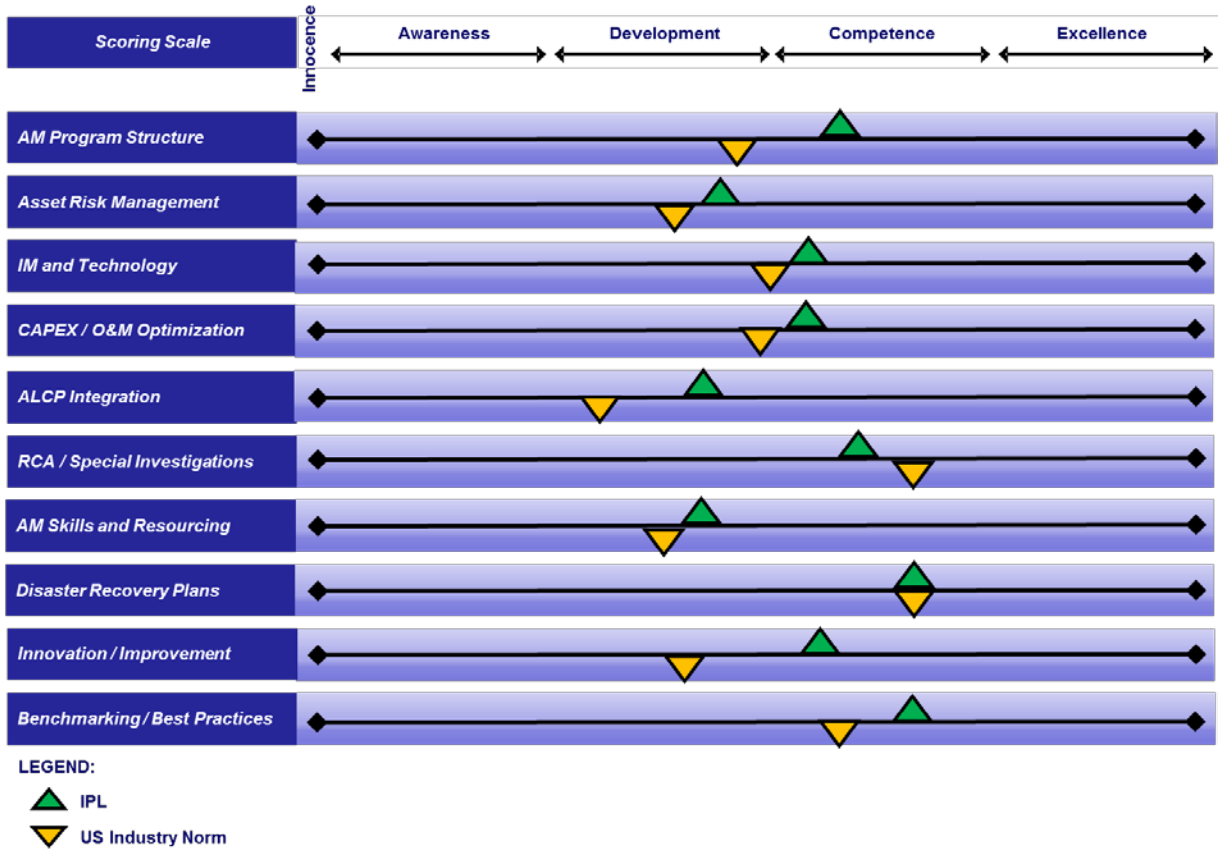
- *Asset Management Innovation and Continuous Improvement*: IPL has established a process to identify, evaluate, and if deemed valid, operationalize ideas for continuous improvement. Actual implementation of the more formal aspects of this program has lagged behind others, as IPL has assigned greater urgency to deploying the tactics related to its CBD Underground Network and maintaining safe and reliable service to its customers (e.g.; Pilot Project re: Fiber Optic Cable / ODTR technology to monitor duct line temperature, and expansion of Asset Management Website to improve Operations Analytics in support of asset management decisions).

- *Benchmarking and Best Practice Identification / Evaluation*: IPL has always been proactive in connecting with other electric utilities to identify best practices or "lessons learned" across all aspects of Customer Operations, a routine that has recently been applied in the area of Asset

Management. With respect to more formal comparative analyses (e.g.; benchmarking), its participation in a Substation Best Practices Forum, IEEE and JD Powers Surveys, and use of Transmission and Distribution Reliability Tools to mine its Outage Management System (OMS) data attest to a predisposition towards transparency and continuous improvement. Consistent with this view, IPL is planning to explore the formation of a consortium of electric utilities with similar underground networks, geared towards sharing best practices.

Summarizing the above discussion, Figure 1 illustrates IPL's current state across these 10 elements / attributes, both in an absolute sense (applying the Asset Management Maturity Scale (see Appendix C), used in assessing programs against ISO 55000 / PAS 55), and relative to other U.S. electric utilities (provided by UMS Group, whose credentials as an expert in Asset Management have been well-established).

Figure 1: IPL's Comparative Ratings



Asset Life Cycle Plan Status – Domain 2

Asset Life Cycle Plans, previously described as the link between a utility's Asset Management Strategy and related groups of assets, accumulate and document the rationale and key decisions used to manage the tradeoffs between asset risk/safety, cost and performance. O'Neill Management Consulting offers the following framework against which to assess and report progress in the development of each Asset Life Cycle Plan:

Building Blocks

- Asset Inventory (sometimes called an "asset register"): Viewed as the basic building block of asset management, an asset register collects and maintains the details on all key characteristics of all installed assets (e.g.; age, type, manufacturer, model, condition and criticality).
- Failure Analysis: Starting with the capture of failure data in a systematic manner, failure analysis attempts to identify root causes and actions to reduce the frequency and/or to mitigate the impact of specific failures.

Asset Management Strategy

- Unit Costs: Understanding the costs for replacing a specific asset informs utility asset managers of the economics in optimizing its expenditures against risk and operating performance.
- Sourcing / Supply Chain: Similar to unit costs, decisions around material specifications, purchase price, inspection / oversight, commissioning and the storage / sparing of assets weigh in balancing cost with risk and operating performance.
- Maintenance Plan: Developing an optimum maintenance strategy for each asset (based on condition and criticality), including interval-based, condition-based, risk-based, or "as-required" represents the essence of effective asset management.
- Renewal Plan: As an alternative to optimizing maintenance, effective asset management defines criteria governing the choices involving replacement, extensive overhaul or life-extending actions for critical assets, oftentimes establishing methodologies to translate all aspects of the repair vs. replace decision into economic terms.

Added Value Measures

- Asset Health / Risk Indexing: Traditionally developed using the judgment and knowledge of subject matter experts, asset management is transitioning to balancing SME perspectives with actual asset condition and performance data. Used in conjunction with an assessment of criticality (relative importance / impact of a specific asset on system performance and safety), risk can then be quantified and subjected to subject matter expert review for validation.
- Special Studies of Emerging Issues: Fully mature Asset Management Programs provide for "deep dive studies" to unearth trends, anomalies, or insights that can be used to improve decisions around assets. As activities that fall under this category are situational and not consistently applied to all asset classes, this measure is not considered in assessing progress in the development of Asset Life Cycle Plans.
- Technology and Practice Surveys: The application of "pilot efforts' or surveying other utilities with similar system demographics (and the presumption that a specific issue may apply to them) can alleviate concerns in adopting new technology that could otherwise place the utility on the "bleeding edge" (as opposed to the "leading edge").

Results

- Asset Condition and Performance Monitoring: Appropriate condition monitoring provides the basis for routinely assessing and trending asset condition and performance, as well as key inputs to assure proactive corrective maintenance and timely replacement of critical assets to assure safe, reliable and efficient service to our customers.
- Decision Bases: To effectively drive continuous improvement, the discipline of documenting the bases for all major asset-related decisions (e.g.; employee/contractor/public safety, reliability, service restoration during major storm events, total life cycle costs, and regulatory compliance) should be documented.

Figure 2 illustrates the extent to which the above attributes exist (or are in development) in support of the Asset Life Cycle Plans for the 19 more critical asset classes that make up IPL's electric T&D system.

Figure 2: Electric T&D System Asset Life Cycle Plan Status

Asset Class	Percent Complete (Initial Version) 0% 50% 100%	Status
High Asset Criticality		
Power Transformers		Completed
Circuit Breakers		Completed
Relay System Protection		Completed
Substation Batteries		Completed
Substation CTs and PTs		In Progress
Substation Communications		In Progress
Transmission Structures		Completed
Transmission Lines		Completed
Medium Asset Criticality		
URD Cable		Completed
Wood Poles		Completed
Overhead Distribution Lines		Completed
Reclosers and Sectionalizers		In Progress
Meters		In Progress
Disconnect Switches		In Progress
Capacitors		In Progress
SCADA		In Progress
Low Asset Criticality		
Pole Top Hardware		In Progress
Distribution Transformers		In Progress

Acknowledging that the initial version of CBD Underground Network Asset Life Cycle Plan is completed, Figure 3 lists the components (asset classes) that comprise this plan.

Figure 3: CBD Underground Network Asset Life Cycle Plan Status

Asset Class	Percent Complete (Initial Version) 0%	20%	40%	60%	80%	100%	Status
High Asset Criticality							
Secondary Cable							Completed
Medium Asset Criticality							
Primary Cable							Completed
Network Protectors							Completed
SCADA							Completed
Network Transformers							Completed
Low Asset Criticality							
Manholes Structure							Completed
Vaults Structure							Completed
Ducts Structure							Completed
Services							Completed

And returning to IPL's electric T&D system, Figure 4 summarizes IPL's progress in addressing the key attributes that are addressed within an Asset Life Cycle Plan.

Figure 4: Attribute Completion Status – Electric T&D System

Category	Attribute	Number of Asset Classes (18)	
		Completed	In Progress
Building Blocks	Asset Inventory	14	4
	Failure Analysis	14	4
Asset Strategy	Unit Costs	18	0
	Sourcing / Supply Chain	18	0
	Maintenance Plan	18	0
	Renewal Plan	18	0
Added Value	Asset Health / Risk Indexing	14	4
	Technology and Practice Survey	11	7
Results	Asset Condition and Performance Monitoring	1	17
	Decision Bases	18	0
	TOTAL	**144**	**36**

Summarizing and / or supplementing the information presented in Figures 3, 4 and 5:

- IPL's overall completion status[3] for the 19 asset classes that define its electric T&D system is reported at 76 percent, with completion dates for the 9 remaining asset classes ranging between Q3 2016 and Q4 2017, and
- Though, there are 9 asset classes in IPL's electric T&D system for which formal Asset Life Cycle Plans have not been issued, across all 19 asset classes, 80 percent of the more critical attributes that formulate such a plan are in place (see Figure 4 above).
- The nine components (asset classes) of the Asset Lifecycle Plan for the CBD Underground Network are essentially complete, but will undergo refinement when the results of the Steam Monitoring initiative and subsequent criticality scoring in IPL's Asset Management System (i.e.; IVARA) is completed.
- Of the ten Asset Life Cycle Plans that have been initially completed (CBD – comprising of nine asset classes and nine Asset Life Cycle Plans for the electric T&D system), all are being enhanced, primarily in the area of Asset Condition and Performance Monitoring, illustrating the point made in the Commission's Order that "asset management is an iterative process."

More detail regarding the completion status (color coded) and projected completion dates for IPL's Asset Life Cycle Plans is provided in Appendix B.

Central Business District (CBD) Underground (UG) Network Initiatives – Domain 3

The fact that IPL's Asset Management process has been more fully developed for its CBD Underground Network reflects IPL's sound rationale in prioritizing management focus, based on risk and the performance of the system. That is not to imply that such focus has been at the expense of the balance of the electric T&D system. Rather, in light of the increase in number of Reportable CBD Underground Network events in 2014 and 2015 (and noting continued strong performance in overall system reliability), the effort to fully implement asset management in this part of the system was appropriately accelerated. The following table, extracted from Appendix E of the July 22nd and October 24th filings, substantiates IPL's commitment to transparency and focus on improving the performance of this critical set of assets.

[3] The differing percent completes account for the fact that the effort to produce an Asset Life Cycle Plan includes activities beyond that necessary to address the ten critical attributes summarized above.

Figure 5: Summary of Ongoing CBD Underground Network Initiatives

Initiative	Scope/Objective	Projected Completion Date
Monitor Duct Line Temperatures	Pilot project to determine if fiber optic cable type technology can be used to monitor / identify temperature excursions in duct lines	Expanded pilot to 35,000 feet
Digital Relay Installation	Replace electromechanical feeder relays at Edison and Gardner Lane substations with microprocessor relays and associated substation remote terminal units (RTUs) for SCADA	Complete
Crab and Limiter Connections for new Secondary Cable Installations	Pilot new secondary cable and termination practices	Complete
Replace 480v Network Protectors	Replace all 480v Network Protectors	12/31/2018
Update and Improve Construction Standards for CBD Equipment	Update and add additional standard drawings and specifications based on new equipment and installation pilot programs	12/31/2017
Increase the Robustness of the CBD SCADA	Add additional SCADA VaultGard communication collection points to reduce the amount of single failure communication outages	Complete and On-going
Implement PI Historian Automatic Email Notifications	Upgrade the PI server, and using PI-Notifications, send emails (texts) for specific abnormal conditions (e.g.; overloads and frequent protector operations)	Complete

Within the same appendix of the July 22nd and October 24th filings, there was a listing of 22 completed or ongoing initiatives (ongoing in that the commitment was met, but continued actions are required to assure the desired outcomes are sustained), summarizing the scope / objective of each initiative and its benefit. The more notable ones included:

- Completion of a Stray Voltage Survey,
- Improved Primary and Secondary Cable Specifications (better heat tolerance capability and less smoke generation),
- Improved coordination with outside agencies including Citizen's Energy and the Indianapolis Fire Department,
- Network Protector Replacement Program, and
- Swiveloc Manhole Cover Installation Program.

Asset Management – Related Performance Metrics – Domain 4

The following discussion presents the performance results in the areas referenced in *IPL's Asset Management Program Oversight Report* and the *Central Business District (CBD) Underground (UG)*

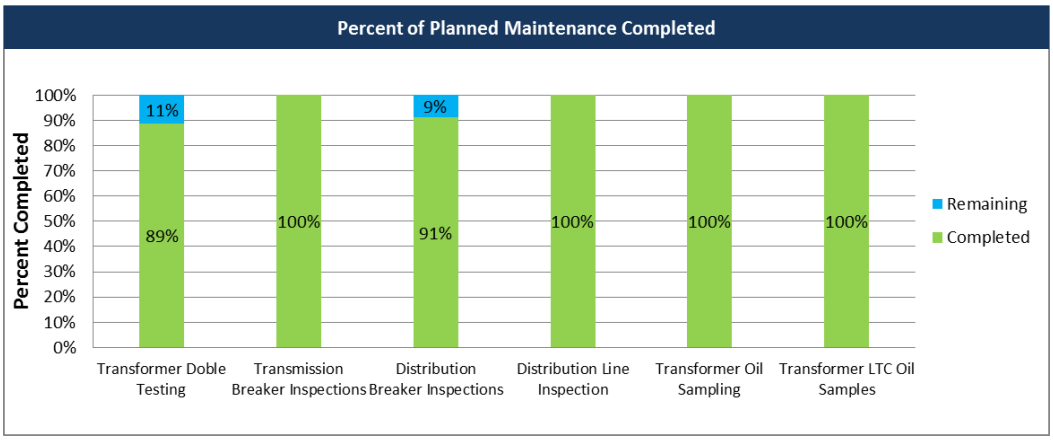
Network Asset Management Program Oversight Report (portions of which are included as Appendices A and B); and with the exception of the Asset Condition Rating, were included in the July 22nd and October 24th filings to the IURC. Overall, IPL's performance on the five key categories of metrics (introduced on page 10) reflect well on the effectiveness of its Asset Management Program:

- With the exception of Substation Power Transformers, IPL is projecting ***completion of all scheduled Preventive Maintenance activities*** in 2016. In an effort to remediate any risk related to the Power Transformers, IPL is ensuring these tests are completed for transformers deemed critical to the system, or where the results of Dissolved Gas Analysis (a leading indicator of condition risk, which is on schedule for all transformers) indicate the need for additional testing.
- Similarly, in tracking the ***renewal rates*** of seven asset classes, only the replacement of Power Transformers lags behind industry norms on a percentage basis. In an effort to mitigate this risk IPL maintains a "watch list" of all Power Transformers deemed critical to system performance with a condition rating of "critical" or "alarm."
- With respect to ***Asset Condition***, the results suggest that IPL is applying asset risk-based criteria in implementing remedial actions (replacement or refurbishment).
- The number of ***reportable events*** in IPL's CBD Underground Network thus far in 2016 returned to the pre-2011 levels.
- The ***total number of CBD Underground Network equipment/component failures*** has reduced significantly since 2014.

Percent Planned (Preventive) Maintenance Completed

Figures 6 and 7 provide an effective summary of IPL's completion of Planned Maintenance (as of the end of 2016) for six asset classes across the electric T&D system and four asset classes in the CBD UG Network. In reviewing the completion percentages against the year-end targets, Transformer Doble (Power Factor) testing and Distribution Breaker Maintenance was slightly under target.

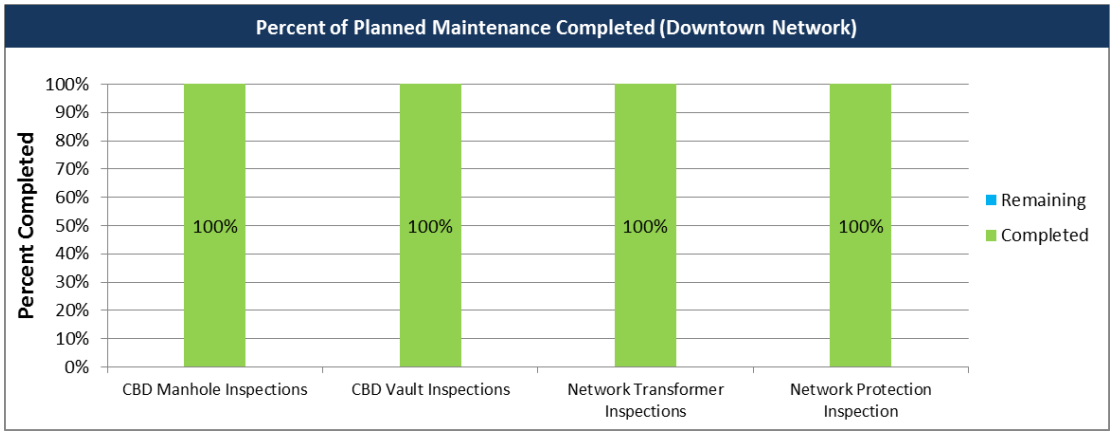
Figure 6: Electric T&D System Planned Maintenance Completed



Electric Transmission and Distribution System

- IPL's overhead distribution lines are inspected on a four-year cycle and was completed ahead of schedule in 2016.
- Substation Transmission Breaker inspections were completed as scheduled. Distribution Breaker inspections are currently prioritized for completion.
- As previously mentioned, Substation Power Transformer Doble tests are lagging. In an effort to remediate the risk, IPL is ensuring these tests are completed for transformers deemed critical to the system, or where the results of Dissolved Gas Analysis (DGA) signal the need for additional testing. Other Substation Power Transformer testing was completed: (i.e., Oil Sampling Testing for DGA and Load Tap Changer (LTC) Oil Sampling).

Figure 7: CBD UG Network Planned Maintenance Completed

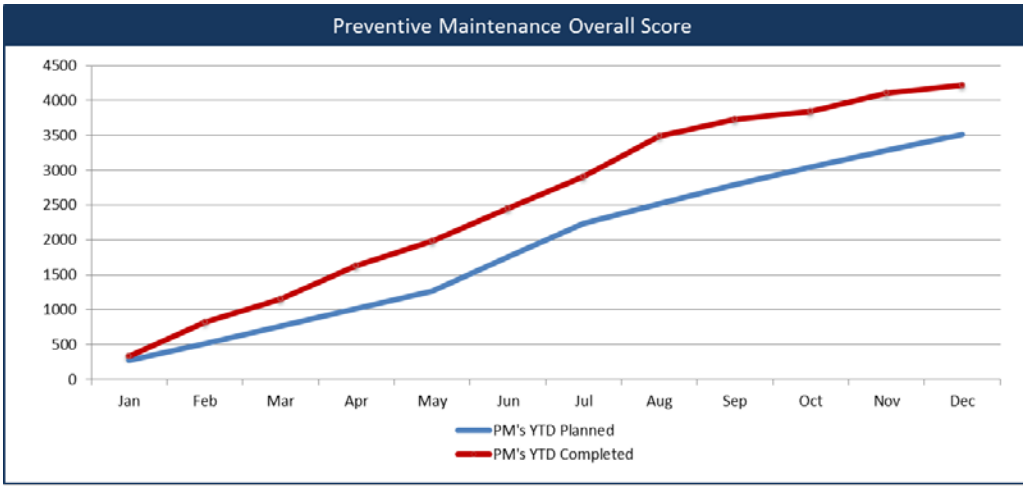


CBD Underground Network

- There were no manhole inspections required for 2016 (the result of an accelerated manhole inspection schedule from 2013 through 2015). However, 404 inspections were performed to assure the three-year inspection cycle is maintained.
- Similarly, vault inspections are well-ahead of schedule.
- Inspection of Network Transformers and Network Protectors were also complete as of August 2016.
- Primary Feeder "Drop" Tests are scheduled monthly to ensure that protective devices are cycled at least once every six months, thus minimizing the probability of them binding mechanically when required to operate during a fault.
- IPL establishes monthly targets for the number of breakers or network protectors to be cycled, with the goal of evenly distributing this semi-annual testing across the year.

And, in reviewing preventive maintenance across all asset classes (Figure 8), IPL is well ahead of schedule. This is largely the result of the level of importance assigned to this key activity by IPL Management and productivity enhancements attributed to the use of electronic tablets in the field.

Figure 8: System-wide Preventive Maintenance

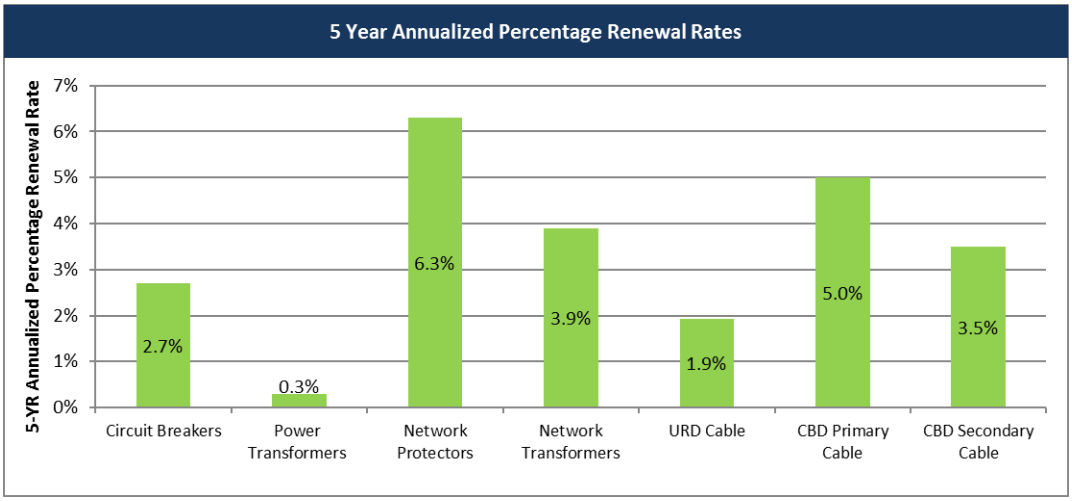


This chart is a summary of the more significant preventive maintenance programs for 2016 and whether IPL is meeting the overall target. Even with acceptable numbers on the chart below some individual programs may still be behind schedule. The total consists of line patrol, substation, and downtown network maintenance programs.

Asset Renewal Rate

Asset renewal (calculated by taking the average of the new assets being installed per year between 2011 and 2015 and dividing this value by the total number of assets within each asset class) reflects risk-based decisions based on the condition of an asset (or category of assets – e.g.; pre-1991 vintage URD cable) and age (to the extent that advances in design, manufacturing and technology can lead to improved performance or reduced costs in maintaining or operating the system). Accordingly, Figure 9 provides a five-year average annualized percentage renewal rate for seven asset classes across IPL's electric T&D system, including its CBD Underground Network. With the exception of Power Transformers, IPL's renewal rates are consistent with industry norms (in the case of network protectors and CBD cable more frequent than industry norms); and in the case of Power Transformers, IPL maintains a "watch list" where asset risk (as defined by poor condition and high criticality) is the primary driver for proactive replacement.

Figure 9: Asset Renewal Rate



As IPL's CBD Underground Network represents its greatest exposure from an overall risk perspective, the following additional information is provided on network-specific assets to (1) lend context to preceding charts, and (2) illustrate IPL's consideration of asset risk in prioritizing its asset replacement programs:

- 277/480V Network Protector replacements are currently ahead of the five-year replacement plan (62 were replaced in 2015, 15 were replaced in 2016, 30 are scheduled in March/April of 2017, and 28 are scheduled to complete the program in 2018).
- Poorly performing XPLE (Cross-Linked Polyethylene) Primary Network Cable replacement is on schedule.

- Secondary Network Cable will continue to be replaced (based on condition assessments) with improved material that has been tested and proven in other utility underground network systems.
- Network Transformers are being replaced based on an assessment of condition (IPL typically replaces six to 8 per year), but the last 5 year trend has been closer to 12 per year.

In general, IPL's replacement of these critical CBD Underground Network assets are on schedule. In the few instances where they are not, actual condition assessments have indicated that replacement is not yet warranted, or IPL is working on coordinating replacement and system outage schedules.

As IPL's Condition and Performance Monitoring program expands to other asset classes, the scope of this presentation will expand. IPL views this as an impressive accomplishment, as few utilities in the U.S. would be able to present such well-grounded replacement strategies for even three or four asset classes.

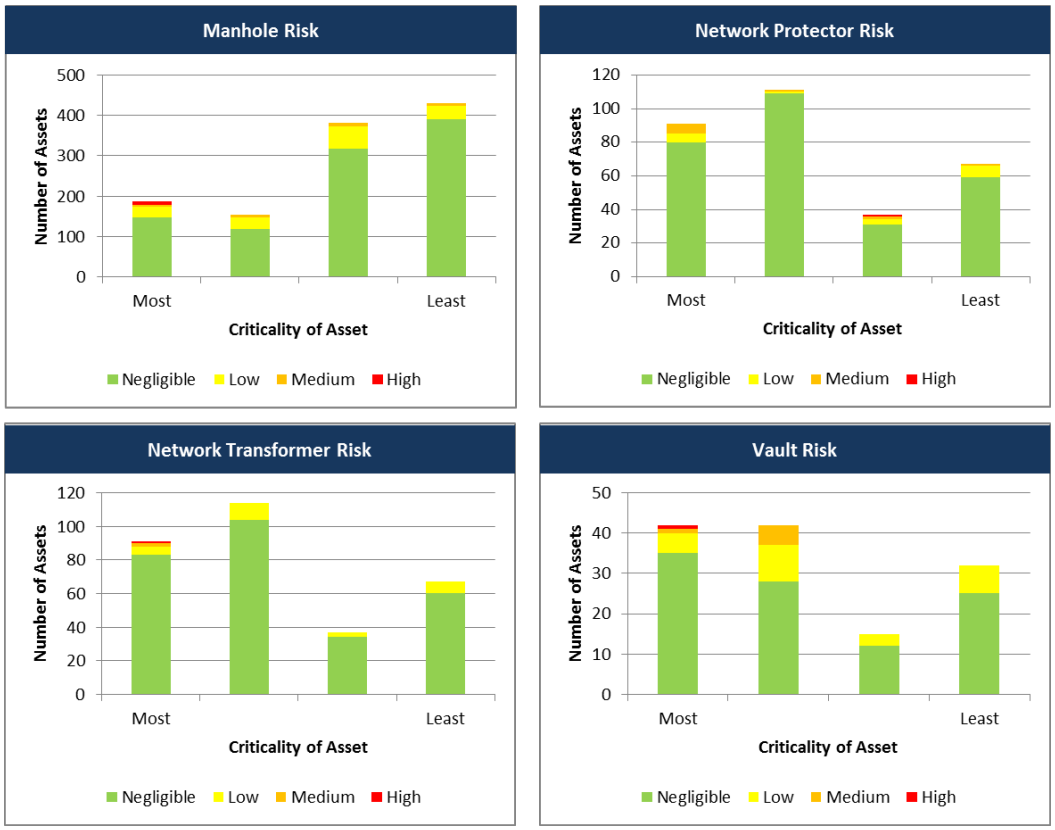
Asset Condition Rating

IPL uses the results from routine inspections, test, and maintenance activities, and targeted asset condition assessments to determine the condition of its assets (represented as an Asset Health Index – AHI). In so doing, IPL is able to assess the likelihood that an asset will fail, and combined with the criticality (relative importance in terms of safety, network performance, environmental impact, financial considerations and regulatory impact), produce an asset-specific risk score. While still a "work in progress," IPL has appropriately focused its initial efforts on the critical assets that comprise its CBD Underground Network, IPL also has asset specific risk scores for two asset classes that constitute the highest priority in IPL's electric T&D network (Substation Transformers and Breakers). The Substation Transformers and Breakers risk calculations are currently being reviewed and tuned as part of on-going asset management improvement efforts

The following figures provide a high-level view of both asset health and risk associated with the total number of critical assets in IPL's CBD Underground Network. These metrics support an ever-expanding summary of IPL's assets (system-wide) and, in this instance, provide a high-level view of whether risk is being effectively managed in the Underground Network.

Figure 10: Asset Health Summary
(Percent of Total CBD UG Assets by Asset Class)

Figure 11: Asset Risk Summary
(Percent of Total CBD UG Assets by Asset Class)



Viewed separately and in tandem, Figures 10 and 11 reveal the following:

- The percentage of assets comprising IPL's CBD Underground Network that are assessed as having condition or health in the "*Alarm*" or "*Critical*" state ranges between 9.2% and 20.2%.
- But, when adjusted for risk (based on the criticality of the assets), the percentage of CBD Network assets in the "Medium" or "High" state of risk is extremely low (ranging between 1.0% and 5.4%).
- The assets with the lowest health rating in the CBD are manholes and vaults. This rating is due to structural issues which require more time to remedy. As shown in figure above, these assets have a low criticality rating.

Segmenting out only those CBD Underground Assets of highest criticality (importance from a risk management perspective):

Figure 12: Asset Health Summary of High Criticality CBD UG Assets (Percent of Total CBD UG Assets by Asset Class)

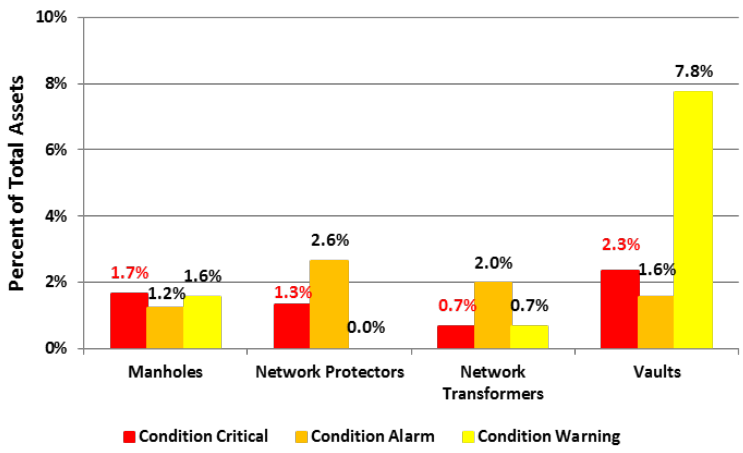
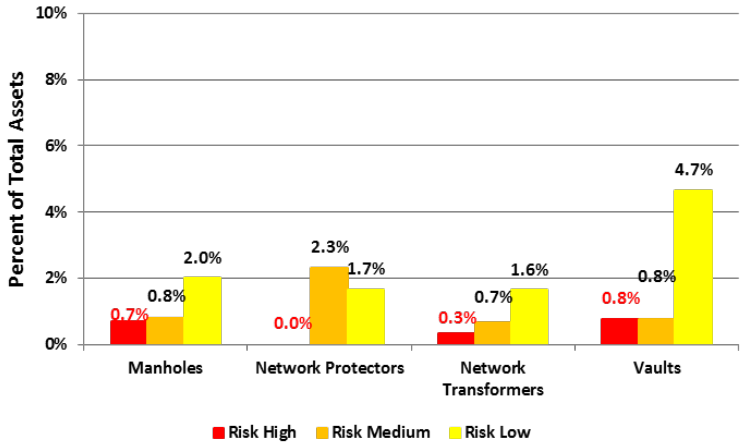


Figure 13: Asset Risk Summary of High Criticality UG Assets (Percent of Total CBD UG Assets by Asset Class)



Viewed separately and in tandem, Figures 12 and 13 reveal the following:

- The percentage of the most critical assets comprising IPL's CBD UG Network that are assessed as having health in the "Alarm" or "Critical" state is relatively low (ranging from 2.6% to 4.0%).
- When adjusted for risk (based on the criticality of the assets), the percentage of CBD Network assets in the "Medium" or "High" state is extremely low (ranging from 1.0% to 2.3%).
- The risk profile of network protectors is below the renewal rate of 6.3%, as is the risk profile of network transformers, which is below the renewal rate of 3.9%.

The underlying message derived from Figures 10 through 13 is summarized below:

Figure 14: Total vs. High Criticality CBD UG Network Assets
(Percent of Total CBD UG Network Assets by Asset Class)

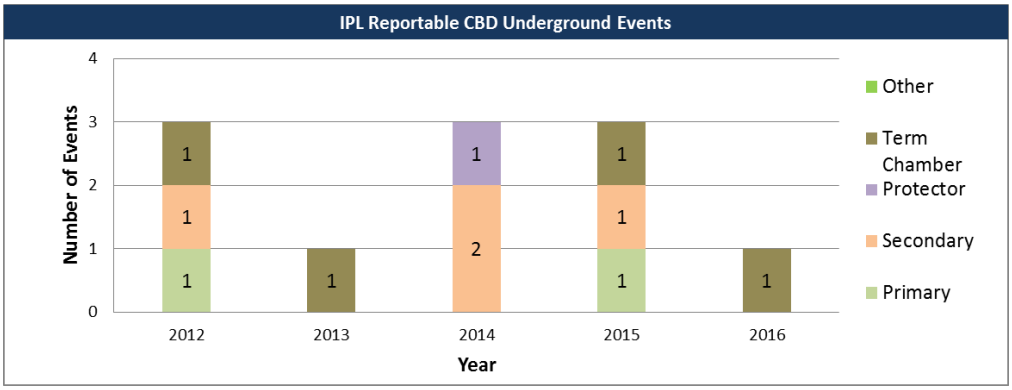
Asset Class	Asset Health (Condition: Critical. Alarm or Warning)		Asset Risk (Risk: High or Medium)	
	Total	High Criticality	Total	High Criticality
Manholes	24.4%	4.5%	3.4%	1.5%
Network Protectors	9.2%	3.9%	3.9%	2.3%
Network Transformers	12.4%	3.4%	1.0%	1.0%
Vaults	42.6%	11.7%	5.5%	1.7%

Figure 14 above show a consistent pattern in both the Asset Health and Asset Risk domains of a rather significant improvement (lower percentage) between the total number of assets (within each asset class) and those categorized as "High Criticality" (most important). This suggests that IPL is applying asset risk-based criteria in allocating its remedial actions (replacement or refurbishment); that IPL is conserving capital investment appropriately, and maintaining a strong balance between safety, risk and reasonable electricity rates. As IPL continues to implement its Asset Management strategy, we anticipate continuation of this pattern, as well as a reduction in the percent of total assets (within each class) from both the Alarm / Warning Health and Med / High Criticality domains.

Number of Reportable CBD UG Network Events

In 2016, there was a decrease in the number of reportable events in IPL's CBD Underground Network. (A reportable event is one in which sustained fire or smoke emanates from a manhole, or through the grate of a transformer vault). With respect to customer impact, the only event over the past five years to result in disrupted service to a large number of customers (956 customer outages) occurred in 2015.

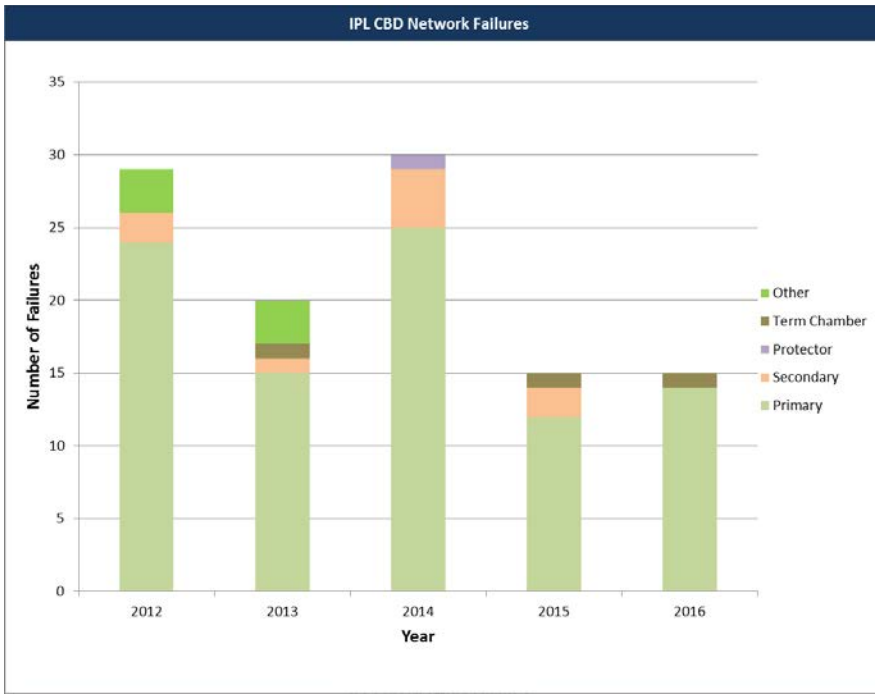
Figure 15: Reportable CBD UG Network Events



Total Number of CBD Underground Network Equipment/Component Failures per Year

Figure 16 presents the total number of CBD Underground Network Equipment/Component Failures per year since 2011, illustrating significant improvement in 2015 and in 2016.

Figure 16: Total Number of CBD UG Network Events per Year



Summary

- Consistent with IPL's objective to be among the industry leaders in Asset Management (and a corresponding list of initiatives designed to assure continuous improvement in the overall process), IPL has progressed well into the "Development" (nearing "Competence") phase of implementing an effective Asset Management program; and contends that it is far ahead of many U.S. electric utilities in actual practice: IPL's assessment of the current state across the ten elements / attributes that correlate to the 24 criteria specified in ISO 55000/55001/55002 places it ahead of or on a par with the U.S. electric utility industry;
- IPL has completed the Asset Life Cycle Plan for the CBD Underground Network (addressing nine critical components or asset classes) and ten of the 19 Asset Life Cycle Plans targeted for its electric T&D system. Though completion of 9 Asset Life Cycle Plans is still pending, 80 percent of the more critical attributes that are addressed in these plans have been addressed;

- The completion of major CBD Underground initiatives remains a top focus of IPL management, and significant progress continues in improving the safe and reliable operation of this critical portion of IPL's electric system; and
- IPL's assesses the set of Asset Management-related performance metrics identified by the Collaborative as indicative of (1) an effective preventive maintenance program, (2) a sound approach to asset renewal, (3) an ever-expanding process to assess asset condition and integrate this information into its asset replacement strategy, and (4) improved performance of its CBD Underground Network system (reportable and total number of events).

Thus it is IPL's view that the Asset Management process supports its objectives to assure public and employee safety, satisfy public requirements, meet system performance targets, mitigate or remediate risk, and maintain comparatively low electricity rates.

Appendix A – Asset Management Program Implementation

Asset Management Program Implementation

The following tables address those attributes that assure the asset management program is properly directed and continuing to improve the asset management process. Viewed in tandem with the tables in Appendix B, stakeholders are provided a full view of IPL's progress in implementing its Asset Management process.

Attribute	Definition	Measure of Effectiveness	Current Status	Next Steps
Asset Management ("AM") Program Structure	Alignment of AM Policy, Strategy and Objectives, establishment of KPIs to measure AM process effectiveness, and organizational clarity regarding authorities and accountabilities for the Asset Owner, Asset Manager and Service Provider roles	• Existence of AM Policy, Strategy and Objectives • Charts to clarify authorities, accountabilities and responsibilities • Key Performance Indicators ("KPIs") measure effectiveness of AM process	• AM Policy, Strategy and Objectives established. • Charts outlined in AES Global AM Standards • KPIs in AM monthly report measure AM process effectiveness	Annual review and update of AM Policy, Strategy and Objectives if necessary.
Asset Risk Management	Identification, analysis, evaluation and setting of asset-related risk thresholds	• Comprehensive Risk Register • Effective leading indicators for equipment failures	• Framework for Risk Register established • Risk Register is being populated with data from various sources	Add to Risk Register with additional operational data. (2017)
Information Management and Technology	Clearly defined data needs, with effective quality controls to ensure Data integrity and availability. Effective Asset Management decision support tools and systems.	• Asset performance and condition data identified for all critical asset-related decisions • Data fully analyzed, maintained and translated into meaningful information to support asset-related decisions	• AM Website represents "Best Practice" step in assuring access to critical AM-related data • Significant work remains in developing data architecture and data collection requirements • Expanded use of decision support tools includes Distribution and Transmission reliability	Increase the use of 'push" technology (On-going) Distribution Reliability Tool (DRx) evaluation and enhancement.
Capital Investment and O&M Spending Portfolio Optimization	Identification, prioritization, planning, execution, control and closeout of Capital Expenditure ("CAPEX") projects and Major Operations and Maintenance ("OPEX") Programs; and establishment of appropriate CAPEX and OPEX investment and spending levels	• Optimization of CAPEX and OPEX is aligned with the business' strategic objectives • Actual investment and spending levels reflect trade-offs between economics and required service levels	• Internally developed prioritization tool ("PASE") provides a consistent approach across all Business Areas for prioritization/ selection of CAPEX projects • Budgets established based on historical perspective (as opposed to heavy reliance on risk-based approach)	CapEx process is well defined – move the lessons learned to O&M programs. (2017)
Asset Life Cycle Plan Integration	Annual update of summarized and integrated plan that rolls up and presents the results of strategies and plans across the entire portfolio of T&D assets, (budgets, replacements planned, assumptions, etc.)	• Plan exists that reflects a roll up of individual Asset Life Cycle Plans (risk and criticality), investment levels, and multi-year replacement / refurbishment programs	• ALCPs are partially developed requiring the incorporation of less structured approach	Further develop existing ALCP plans – (annual review) Continue to develop ALCPs according to present ALCP schedule

Asset Management Program Implementation *(Continued)*

Attribute	Definition	Measure of Effectiveness	Current Status	Next Steps
Root Cause Analysis ("RCA") and Special Investigations	Methods and practices for identifying and addressing underlying causes of an incident / non-conformance with the goal of preventing re-occurrence and ultimately improving effectiveness and sustainability of asset performance	• Defined RCA process • "Triggers" based on consequences of failure • Actions to mitigate / prevent reoccurrence • Effective follow up to ensure sustainability of corrective actions	• RCA process is defined • *Reasonably good* application of this process to incidents • Current application lacks *some* rigor in documentation	Increase the number of formal "small" RCA's for lesser incidents.
Asset Management Skills and Resourcing	Recruiting and succession strategy, as well as training and development programs to ensure organizational competence in the full range of Asset Management capabilities - from analyzing risk and likely reliability of a major piece of equipment to making correct repairs and properly documenting work orders	• Succession plan drives recruiting, hiring and training requirements • Field – Asset Management interface effective in assuring collection of critical asset performance and condition data • Established competencies in Operational Analytics	• Succession plan established but lacking formality in documenting training of key personnel • Cooperation between Field and Asset Management in capturing relevant data is exemplary • "Novice" status in demonstrating prowess in Operations Analytics	Improve Operational Analytics using PI-Historian Asset Management Framework (2017) Explore software options for high-level data analysis (2017)
Integrated Disaster Recovery Plans	Plans to address and correct, or mitigate potential major disasters or extreme variances in operational and / or financial performance.	• Plans exist and are practiced / drilled on a regular basis	• Well established process within the Transmission and Transmission organization	
AM Innovation and Continuous Improvement	Structured approach to address Asset Management system related problems, selecting solutions, monitoring progress, and if successful, incorporating them into the formal Asset Management process	• Continuous Improvement Program exists (APEX) • Innovation initiatives are identified in Asset Life Cycle Plans	• APEX process is established, and has been applied to the largest improvement opportunities, but not yet fully implemented, or integrated into daily operations	Continue to explore additional innovations with ideas from vendors, utility trade groups and best practice forums (on-going)
Benchmarking and Best Practice Identification / Evaluation	Formalized process to compare IPL's Asset Management practices and performance with the industry and evaluate relevance and practicality of integrating new "learnings" with the current process.	• Demonstrated comparisons to Industry Standards • Scores from AES Peer Review Process (Best Practice audits by other AES Companies) • Demonstrated comparisons to AES Asset Management Peer Review Protocol	• Active participant in annual Substation Best Practices Forum • Participates in IEEE and JD Powers Surveys • Implementing Transmission and Distribution Reliability Tools • Exploring g starting CBD UG Network Best Practices Forum	The recent addition of members of CEATI has allowed access to a wide range of best practice information. These documents are being reviewed and incorporated in AM processes.

Appendix B – Asset Life Cycle Plan Status

Asset Life Cycle Plan Framework

Attribute[1]	Attribute Description	Asset Class A	Asset Class B	Asset Class C
Asset Criticality	Relative ranking (High-Medium-Low) of how critical the asset class is	High	Medium	Low
ALCP Done/Due	Asset Life Cycle Plan Due Date or Latest Draft Completed Date			
ALCP Content	Breadth and depth of ALCP scope as currently planned or executed			
Asset Inventory	Availability and accuracy of asset-specific information (quantities broken out by age, condition, size, class, type, and manufacturer and other characteristics – as applicable)			
Failure Analysis	How failures are tracked and analyzed for root cause and impact			
Unit Costs	Installation costs (Direct and Loaded) and maintenance costs, so that a budget of X dollars can be translated into how many units it covers, and what percent of the asset population			
Sourcing/Supply Chain	Specifications for new equipment; analysis of vendors and of stores/spares			
Maintenance Plan	Inspection and maintenance scope and frequency (time or condition-based)			
Renewal Plan	Multi-year plan and budget for preventive and corrective replacement or refurbishment, with implications for asset performance over time			
Asset Health/Risk Indexing	Ability to display at a point in time which individual assets entail the most risk, in terms of both probability and impact of failure (where risk = probability x impact)			
Technology and Practice Survey	Comparison of practices with the rest of the industry, with explanation for differences			
Asset Condition and Performance Monitoring	System for tracking asset condition and performance, including specific metrics, analyses, exception reporting, and variance explanations			
Decision Bases	Main reasons driving the business case for key decisions, e.g., safety, reliability, cost			
Special Studies of Emerging Issues	Analysis of a special issue associated with an asset, as applicable, e.g., environmental, new technology, work practices			

Color coding legend:
The color of each block is meant to show the relative level of maturity or development of that attribute for that asset class. As such, it is an indication of the stage in a multi-year and ultimately continuous process. It is not an evaluation of the quality of that activity.

Red: Envisioned, but not yet started.

Yellow: In progress, with substantial content, but some "TBD" parts.

Green: Mature – no near-term plan for further enhancement.

Gray: Not applicable/Other

Asset Classes:
Currently there are 18 asset classes for distribution, and an additional set of 9 classes for the assets in the Central Business District.

Asset Life Cycle Plan Status

Applying the Attributes, Measures of Effectiveness and the Legend presented in the previous slide, the following summarizes IPL's progress in implementing key elements of Asset Class – specific Asset Management Plans for 18 asset classes. The CBD Network is addressed as a separate document.

Attribute	Pole Top Hardware	Underground Residential Cable (URD)	Distribution Transformers
Asset Criticality	Low	Medium	Low
ALCP Done / Due	Q2 2018	9/3/16	Q3 2017
ALCP Content	Not yet developed	Later versions will have more detail.	Not yet developed
Asset Inventory	Age and type for all pole top hardware installed after 1999	Length, spans and size. Age recorded for installations after 1999. Estimated 4.25 M ft. pre-1991 XPLE cable remaining. All post 1991 is EPR.	95k by OH/UG manufacturer, voltage, size and age (~35 yrs.).
Failure Analysis	Some equipment is turned in by crews for entering into an Access database. Trends are spotted using this database and feedback from Standards meetings. Database populated since 2003. (>600 items/yr.)	Track and monitor failure trends and locations.	Track failures in OMS. ~ 0.2% per year. A sample of equipment is in an Access database. Trends are spotted using this database and feedback from Standards meetings. Database since 2003.
Unit Costs	Average cost tracked on design and as-built based on compatible units. Monitored and adjusted as needed since 1999.	Average cost per foot design and as-built based on compatible units. Monitored and adjusted as needed. Rehab $16/ft. Refurbish $7/ft.	Individual costs tracked by size and type. Estimate installation and removal costs.
Sourcing / Supply Chain	Standards & stores specified	Standards & stores specified	Standards & stores specified
Maintenance Plan	4 year visual and infrared inspection. Separate inspection for NESC compliance on 10 year cycle also includes items like broken insulators, etc.	Refurbish before significant number of cable faults.	OH part of 4 year visual and infrared. URD 10 year external inspection
Renewal Plan	Replaced on an as needed basis (failure, inspection).	Rehab on first failure today. Proactively rejuvenate ~250k feet per year. Replace ~100k feet per year.	Replaced on an as needed basis (failure, inspection).
Asset Health / Risk Indexing	No, but no indications of a need.	Track number of failures in GTECH.	No. Track overall failure trends.
Technology and Practice Survey	Infrared, piloted Partial Discharge, fuse links, switches, polymer material	Cable injection (refurbishment)	Type 1 versus Type 2 pad mount FR3 Review
Asset Condition and Performance Monitoring	SAIFI Trends	URD SAIFI Trends, Count of Abnormal Switching Sheets	Transformer SAIFI Trends
Decision Bases	Safety and Cost-Effectiveness	Safety and Cost-Effectiveness	Safety, Reliability, and Cost-Effectiveness
Special Studies of Emerging Issues	EPRI Grid Resiliency – Project 3002006780	Most UG is loop fed to reduce outage times. CEATI	2016 DOE efficiency standards

Asset Life Cycle Plan Status *(Continued)*

Attribute	Wood Poles	Overhead Distribution Lines	Reclosers and Sectionalizers
Asset Criticality	Medium	Medium	Medium
ALCP Done / Due	12/18/15	3/1/16	Q4 2017
ALCP Content	Comprehensive	Later versions will have more detail.	Not yet developed
Asset Inventory	165k by type and age (35yrs)	All types, lengths and sizes. Age recorded for installations after 1999.	266 Reclosers, 41 Automated Switches 171 2/3 Shot Sectionalizers by location and age for automated equipment.
Failure Analysis	Thorough: low (1.5%) reject rate, by age, species, treatment.	Some equipment is turned in by crews for entering into an Access database. Trends are spotted using this database and feedback from Standards meetings. Database populated since 2003. (>600 items/yr.)	Reclosers monitored through SCADA. Failures tracked in WMIS.
Unit Costs	$3,795 to replace, etc.	Cost per foot design and as-built based on compatible units. Monitored and adjusted as needed.	$50k recloser installation in WMIS. Sectionalizers based on average cost based on compatible units since 1999.
Sourcing / Supply Chain	Standards & stores specified	Standards & stores specified	Standards & stores specified
Maintenance Plan	For non CCA poles over 17 years old. Inspect and ground line treat every 10 years. Replace or reinforce as needed. (by grid map)	4 year line patrol visual inspection plus infrared scan of 4 kV, 13kV and 34 kV lines . 10 year NESC inspection – check for certain clearance and/or access prevention problems governed by the NESC (by circuit)	4 year visual and infrared inspection.
Renewal Plan	Replace or re-enforce rejects.	Replaced on an as needed basis (failure, inspection load growth).	Replacing auto switches with reclosers. Replaced on an as needed basis (failure, inspection).
Asset Risk Indexing	No, but no indications of a need.	No. Monitor worst performing circuits and MAIFI/SAIFI trends.	No, but no indication of a need.
Technology and Practice Survey	Fiberglass, New pole inspection process CCA-ET	Infrared at least every 4 years. Sacrificial arc protective devices for poly wire trial.	Recloser data historized in PI (75 points per recloser)
Asset Condition and Performance Monitoring	Inspection reject rate. 50% of rejects are pole failures above ground (top).	SAIFI Trends by circuit and device.	SAIFI Trends by circuit and device.
Decision Bases	Safety and Cost-Effectiveness	Safety and Cost-Effectiveness	Safety, Reliability, and Cost-Effectiveness
Special Studies of Emerging Issues	Joint use; CCA vs Penta	DRx tool.	Standardized on G&W with SEL relays

Asset Life Cycle Plan Status *(Continued)*

Attribute	Meters	Disconnect Switches	Power Transformers
Asset Criticality	Medium	Medium	High
ALCP Done / Due	Q2 2017	Q2 2018	9/11/2015
ALCP Content	Not yet developed	Not yet developed	Additional development planned
Asset Inventory	(~490k) Type, manufacturer, age, location.	Number (# Subs, # Dist) General types.	Voltage, size, manufacturer, age, type. (Avg 43 years)
Failure Analysis	Tracked with monthly reporting metrics	Formal database for selected distribution failures. Subs are tracked in EMPAC.	Tracked and RCA performed for significant issues. EMPAC tracks corrective issues. (~0.2% failure rate)
Unit Costs	Individual costs tracked by size and type. Estimate installation and removal costs. ($168) for single phase AMI meter including installation	For Dist. average cost per design and as-built based on compatible units. Monitored and adjusted as needed. Subs tracked by project.	Yes, both installation and maintenance. by individual asset.
Sourcing / Supply Chain	Standards & stores specified	Standards & stores specified	Standards & stores specified
Maintenance Plan	Periodic sample test. Use AMR/AMI system and logic for reports on questionable meters	Infrared and visual inspection.	Infrared, Oil DGA and Oil Quality at least yearly. Critical transformers more often. Visual inspect at least quarterly. Power factor test every 5 years.
Renewal Plan	Monitor operation data for replacements.	Replaced on an as needed basis (failure, inspection).	Replacement based on risk evaluation using AHI and criticality calculations.
Asset Health / Risk Indexing	No but monitor reads and check for various abnormalities and trends.	Track number of failures in GTECH.	Yes. Ivara.
Technology and Practice Survey	Moving from AMR to AMI. 35k AMI meters. AMR last gasps, power ups, and automatic meter pings integrated with OMS.	Investigation of new type of in-line distribution disconnect switch	Alarm and load monitoring for transformers and LTC (>10MVA) through SCADA. TOA-4 and Ivara alarms. E-mails on abnormal oil conditions.
Asset Condition and Performance Monitoring	Monitor failure trends	Dist. Infrared an visual anomalies in EMPAC.	AHI in Ivara
Decision Bases	Safety, Reliability, and Cost-Effectiveness	Safety, Reliability, and Cost-Effectiveness	Safety, Reliability, and Cost-Effectiveness
Special Studies of Emerging Issues	AMI Reconnect/Disconnect, AMI temperature monitoring.	Large # of distribution disconnect switches, CEATI information	LTC condition-based maintenance. TOA-4, CEATI information

Asset Life Cycle Plan Status *(Continued)*

Attribute	Circuit Breakers	Capacitors	Relay System Protection
Asset Criticality	High	Medium	High
ALCP Done / Due	12/15/2015	Q4 2017	12/1/2015
ALCP Content	Additional development planned	Not yet developed	Additional development planned
Asset Inventory	Voltage, manufacturer, model, age, type. (Avg. 40 years?)	Type and age for substation. All locations. Age for distribution installed after 1999.	Estimated by group.
Failure Analysis	Tracked (open/close failures) and RCA performed for significant issues. EMPAC tracks corrective issues.	Sub cap banks tracked in EMPAC. Line tracked in WMIS.	Relay correct and incorrect operations tracked since 1983. All relays tested with automated software.
Unit Costs	Yes, both installation and maintenance by individual asset.	Sub depends on size and voltage. Line $12k for new (includes pole and hardware).	No, but not needed at individual relay level. Protections systems are tracked at the project level.
Sourcing / Supply Chain	Standards & stores specified	Standards & stores specified	Standards & stores specified
Maintenance Plan	External Maintenance based on type, use and voltage. Power Factor Test: SF6 - Only on initial placement in service, OCB every 6 years Internals – Condition-based only.	Sub: Yearly infrared and quarterly visual. Line: Monitored and controlled (35? pts.) through RCCS control system. Tied to feeder VAR to verify correct operation.	Transmission 6 year cycle Distribution 14 year
Renewal Plan	Replacement based on risk evaluation using AHI and criticality calculations.	Replacement based on failures, inspections or remote monitoring.	Relay schemes are replaced on past performance and coordinated with other substation equipment upgrades.
Asset Health / Risk Indexing	Yes. Ivara.	No. Track overall operation failure trends.	No. Track overall operation failure trends.
Technology and Practice Survey	Assure operation of 34kv, 138 kV, 345 kV and CBD feeders by exercising by remote control those breakers that have not operated in 6 months. Condition-based internals only	Automatically controlled centrally by RCCS to optimize substation and feeder VAR. Will operate independently on distribution line voltage. Verify operation remotely.	SEL Relays Pilot remote relay interrogation Computer testing Synchro-phasores
Asset Condition and Performance Monitoring	AHI in Ivara	Monitor failures	Incorrect relay operation trends
Decision Bases	Safety, Reliability, and Cost-Effectiveness	Safety, Reliability, and Cost-Effectiveness	Safety, Reliability, and Cost-Effectiveness
Special Studies of Emerging Issues	CEATI Practices, <5% responsible for all close/open issues last 10 years	Conservation Voltage Reduction, CEATI Practices	NERC Standards, IPS Energy

Asset Life Cycle Plan Status *(Continued)*

Attribute	Substation Batteries	Substation CT's and PT's	SCADA
Asset Criticality	High	High	Medium
ALCP Done / Due	9/16/2016	Q4 2017	Q2 2018
ALCP Content	Additional development planned	Not yet developed	Not yet developed
Asset Inventory	Type and age in PowerDB and MS Access databases.	EMPAC. Location, some age and type.	Type and estimated age.
Failure Analysis	No, but not needed.	Tracked and RCA performed for significant issues. EMPAC tracks corrective issues.	No.
Unit Costs	Project specific	Project specific	Project specific
Sourcing / Supply Chain	Standards & stores specified	Standards & stores specified	Standards & stores specified
Maintenance Plan	Inspect substation batteries not in scope of NERC requirements. Three interval definitions (3m, 6m, 1y), each with different levels of detail. This is per IEEE 450 (which says capacity test within first two years and then intervals not to exceed 25% of battery life expectance). Load Test - 5 years. This applies to some batteries not in scope of NERC requirements.	Yearly infrared and quarterly visual.	Monitored
Renewal Plan	Condition and criticality specific. No formal documentation of this risk.	CTs and PTs are replaced on past performance and coordinated with other substation equipment upgrades.	RTUs are replaced on past performance and coordinated with other substation equipment upgrades.
Asset Health / Risk Indexing	In design development	No, track overall failure trends.	No.
Technology and Practice Survey	Load test	Majority of PT secondary voltages monitored through SCADA.	Monitor real-time, DNP, Pilot SEL devices
Asset Condition and Performance Monitoring	Not in Ivara, but Condition Indicators are monitored	Infrared and visual anomalies traced in EMPAC and through limited SCADA monitoring.	SCADA failures are logged in the Energy Control System.
Decision Bases	Safety, Reliability, and Cost-Effectiveness	Safety, Reliability, and Cost-Effectiveness	Safety, Reliability, and Cost-Effectiveness
Special Studies of Emerging Issues	NERC, Replace as needed individual cells., CEATI Practices	CEATI Practices	>97% of customers fed from substations have SCADA

Asset Life Cycle Plan Status *(Continued)*

Attribute	Substation Communications	Transmission Structures	Transmission Lines
Asset Criticality	High	High	High
ALCP Done / Due	Q2 2017	8/18/2016	Draft
ALCP Content	Not yet developed	Additional development planned	Additional development planned
Asset Inventory	Partial (Jmux) 45 locations Age estimates	GTECH - Interconnected lines also. Location and type. Age in TAMIS.	GTECH - Interconnected lines also. Location and type. Age in TAMIS.
Failure Analysis	No.	Inspection data tracked in TAMIS. Follow up work in WMIS.. RCA for significant issues.	Inspection data tracked in TAMIS. Follow up work in WMIS. RCA for significant issues.
Unit Costs	Project specific.	Project specific	Project specific
Sourcing / Supply Chain	Standards & stores specified	Standards & stores specified	Standards & stores specified
Maintenance Plan	Monitored	345 and 138kV (non-urban) helicopter patrol every 1 years - some critical may see 6 months. Walking and thermal every 10 years. Wood poles are part of existing 10 year Osmose inspection/replacement program. Tower painting as-needed.	345 and 138kV (non-urban) helicopter patrol every 1 years - some critical may see 6 months. Walking and thermal every 10 years.
Renewal Plan	Schemes are replaced on past performance and coordinated with other substation equipment upgrades. Existing $3M program to upgrade important substations (~45) to MPLS technology.	Replaced on an as needed basis (failure, inspection).	Replaced on an as needed basis (failure, inspection).
Asset Health / Risk Indexing	No, but no indications of a need.	No. Track overall failure trends.	No. Track overall failure trends.
Technology and Practice Survey	Leased copper lines unavailable.	LIDAR, PLS CAD, CEATI data (Center for Energy Advancement through Technological Innovation)	LIDAR, PLS CAD, CEATI data (Center for Energy Advancement through Technological Innovation)
Asset Condition and Performance Monitoring	Very limited.	TADES, TAMIS (Transmission Asset Management Information System), relay log of all fault operations.	TADES, TAMIS (Transmission Asset Management Information System), relay log of all fault operations.
Decision Bases	Safety, Reliability, and Cost-Effectiveness	Safety, Reliability, and Cost-Effectiveness	Safety, Reliability, and Cost-Effective
Special Studies of Emerging Issues	Moving to fiber, SONET/MPLS technology	CEATI Practices and AHI Calculations, Outside Paint Inspection	CEATI Practices and AHI Calculations

IPL's CBD UG Network Asset Life Cycle Plan Status

Attribute	Secondary Cable	Primary Cable	Network Protectors
Asset Criticality	High	Medium	Medium
ALCP Done / Due	9/3/2015	9/3/2015	9/3/2015
ALCP Content	Completed	Completed	Completed
Asset Inventory	198,000 feet (37.5 miles) (75% or 28 miles is 350MCM PILC , 5% or 2 miles is 500 MCM PILC) GTECH and AutoCAD systems	367,131 feet (69.5 miles). GTECH and AutoCAD system.	303 total Protectors, 137 ;227/480 volt (58 pre 1985 CM 22) and 166; 120/208 volt class.
Failure Analysis	Track and monitor failure trends and locations . Detail data after 2003. EMPAC tracks corrective issues. RCA performed for significant issues.	Track and monitor failure trends and locations . Detail data after 2003. EMPAC tracks corrective issues. RCA performed for significant issues.	Track and monitor failure trends and locations . Detail data after 2003. EMPAC tracks corrective issues. RCA performed for significant issues.
Unit Costs	Project specific tracked in WMIS. Manhole to Manhole, material plus labor, $70/foot, average length 100 feet..	Project specific tracked in WMIS. Material plus labor, $70/foot, average length 100 feet.	Project specific tracked in WMIS. (~$100k material and labor protector).
Sourcing / Supply Chain	Standards & stores specified	Standards & stores specified	Standards & stores specified
Maintenance Plan	Part of Manhole (3 yr.) and Vault (2 yr.) inspection cycle	Part of Manhole (3 yr.) and Vault (2 yr.) inspection cycle	Every 2 years visual and infrared. Exercised every 6 months.
Renewal Plan	Replacement based on risk evaluation using AHI and criticality calculations. (Target $2.5M/yr.)	Existing program to replace XLPE cable out of Edison substation.	Replacement based on risk evaluation using AHI and criticality calculations.(Target $2.5M/yr.)
Asset Health / Risk Indexing	IVARA Criticality Scoring (based on Maintenance inspection results) Reviewing Steam Monitoring	IVARA Criticality Scoring (based on Maintenance inspection results) Reviewing Steam Monitoring	IVARA Criticality Scoring (based on Maintenance inspection results)
Technology and Practice Survey	Fiber cable temperature pilot (real time monitoring) on selected cable locations with previous steam issues.	Fiber cable temperature pilot (real time monitoring) on selected cable locations with previous steam issue. Continuously monitored with SCADA.	480V protector replacement program for arc flash mitigation. Assure operation of protectors by exercising with SCADA remote control those protectors that have not operated in 6 months.
Decision Basis	Safety, Reliability, and Cost-Effectiveness	Safety, Reliability, and Cost-Effectiveness	Safety, Reliability, and Cost-Effectiveness
Asset Condition and Performance Monitoring	Failures tracked in database.	Failures tracked in database.	Failures tracked in database.
Decision Basis	Safety, Reliability, and Cost-Effectiveness	Safety, Reliability, and Cost-Effectiveness	Safety, Reliability, and Cost-Effectiveness
Special Studies of Emerging Issues	Power Survey Inc. Stray voltage annual survey, Overlay maps of Steam and IPL assets for risk locations. Move to crab and limiter connections.	Purchase Low smoke, high temp cable (Okonite OKOCLEAR-TS). Also SEL fault indicators (for PILC) being used in selected key locations (since 2012)	Future opportunity identified to update Construction Standards (12/2017)

IPL's CBD UG Network Asset Life Cycle Plan Status *(Continued)*

Attribute	SCADA	Network Transformers	Manholes Structure
Asset Criticality	Medium	Medium	Low
ALCP Done / Due	9/3/2015	9/3/2015	9/3/2015
ALCP Content	Completed	Completed	Completed
Asset Inventory	303 protectors monitored	305 total transformers. 137 ;227/480 volt and 166; 120/208 volt class	Manhole locations in GTECH. Contents in Product Center on manhole data sheets.
Failure Analysis	Track and monitor failure trends and locations (detailed data after initial equipment was installed in 2012)	Track and monitor failure trends and locations (detailed data after 2003). RCA performed for significant issues. EMPAC tracks corrective issues.	Tracked and RCA performed for significant issues. EMPAC tracks corrective issues.
Unit Costs	Repair/replace equipment on protector $5k, on collector $10k	Project Specific, work orders tracked in WMIS. (~$100k average per transformer labor and material)	Project Specific, work orders tracked in WMIS. (~$75k average rebuild)
Sourcing / Supply Chain	Standards & stores specified	Standards & stores specified	Standards & stores specified
Maintenance Plan	Monitored real time.	Part of Vault Inspection program every 2 years. Infrared and visual.	3 Year infrared and visual inspection cycle.
Renewal Plan	Adding additional VaultGard and H&L fiber interfaces to increase robustness of the communications.	Replacement based on risk evaluation using AHI and criticality calculations.	Replacement based on risk evaluation using AHI and criticality calculations.
Asset Health / Risk Indexing	No.	IVARA Criticality Scoring (based on Maintenance inspection results)	IVARA Criticality Scoring (based on Maintenance inspection results)
Technology and Practice Survey	100% SCADA.	Continuously monitored with SCADA.	Visual Inspection Program done via Tablets (starting in 2012) Pilot program for flexible racking system.
Asset Condition and Performance Monitoring	Percent of time not communicating is tracked in a PI Historian.	AHI trends tracked.	AHI trends tracked.
Decision Basis	Safety, Reliability, and Cost-Effectiveness	Safety, Reliability, and Cost-Effectiveness	Safety, Reliability, and Cost-Effectiveness
Special Studies of Emerging Issues	SCADA to PI process books.	Termination chamber FR3 retrofit completed in 2013, Debris Shields installed in 2012, New equip spec updated in 2012. Bolted termination connections. No transformer electrical failures (just termination chambers) in >30 years.	Locking Manhole covers (Swiveloc)

IPL's CBD UG Network Asset Life Cycle Plan Status *(Continued)*

Attribute	Vaults Structure	Ducts Structure	Services
Asset Criticality	Low	Low	Low
ALCP Done / Due	9/3/2015	9/3/2015	9/3/2015
ALCP Content	Completed	Completed	Completed
Asset Inventory	Vault location in GTECH. Contents in EMPAC. Many have recorded videos on IT network.	433 miles of duct by type.	
Failure Analysis	Tracked and RCA performed for significant issues. EMPAC tracks corrective issues.	Tar, cellulose based ducts installed in the mid 19xx??	
Unit Costs	Project Specific, work orders tracked in WMIS.		
Sourcing / Supply Chain	Standards & stores specified	Standards & stores specified	Standards & stores specified
Maintenance Plan	2 Year infrared and visual inspection cycle.	Part of Manhole and Vault inspection cycle	Part of Manhole and Vault inspection cycle
Renewal Plan	Replacement based on risk evaluation using AHI and criticality calculations. Civil engineer used to prioritize replacement or refurbishment.	Reviewing using steam line temperature monitoring impact data for duct.	
Asset Health / Risk Indexing	IVARA Criticality Scoring (based on Maintenance inspection results)	IVARA Criticality Scoring (based on Maintenance inspection results)	IVARA Criticality Scoring (based on Maintenance inspection results)
Technology and Practice Survey	Visual Inspection Program done via Tablets (starting in 2012)	Fiber Optic Temperature Monitoring	
Asset Condition and Performance Monitoring	AHI trends tracked		
Decision Basis	Safety, Reliability, and Cost-Effectiveness	Safety, Reliability, and Cost-Effectiveness	Safety, Reliability, and Cost-Effectiveness
Special Studies of Emerging Issues		Fiber Optic Temperature Monitoring	

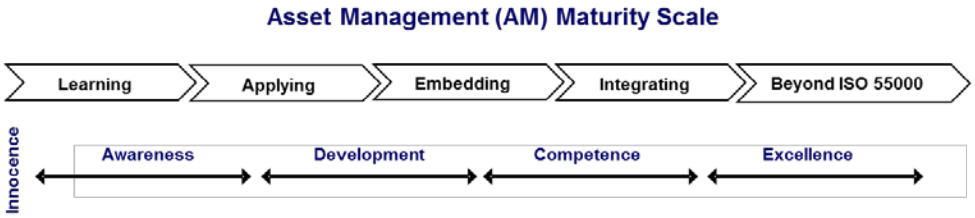
Appendix C – Mapping of ISO 55001 Requirements to AM Program Implementation Framework – Oversight Process

Mapping of ISO 55001 Requirements to AM Program Implementation Framework – Oversight Process

Category	Section	Clause	AM Program Implementation Elements / Attributes[4]
Organizational Context	**4.1**	Understanding the organization and its context	Asset Management Program Structure
	4.2	Understanding the needs and expectations of stakeholders	Asset Management Program Structure
	4.3	Determining the scope of the asset management system	Asset Management Program Structure
	4.4	Asset Management System	Asset Management Program Structure Asset Life Cycle Plan Integration
Leadership	**5.1**	Leadership and commitment	Asset Management Program Structure
	5.2	Policy	Asset Management Program Structure
	5.3	Organization roles, responsibilities and authorities	Asset Management Program Structure
Planning	**6.1**	Risks and Opportunities	Asset Risk Management
	6.2	Asset management objectives and planning	Asset Management Program Structure Asset Risk Management
Support	**7.1**	Resources	Asset Management Skills and Competencies
	7.2	Competence	Asset Management Skills and Competencies
	7.3	Awareness	Asset Management Program Structure Asset Management Skills and Competencies
	7.4	Communication	Asset Management Program Structure
	7.5	Information Requirements	Information Management and Technology
	7.6	Documented Information	Information Management and Technology
Operations	**8.1**	Operational Planning and Control	Asset Management Program Structure Asset Risk Management Capital Investment and O&M Spending Portfolio Optimization Asset Life Cycle Plan Integration Root Cause Analysis and Special Investigations
	8.2	Management of Change	Asset Risk Management Integrated Disaster Recovery Plans Root Cause Analysis and Special Investigations
	8.3	Outsourcing	Asset Management Skills and Competencies
Performance Evaluation	**9.1**	Monitor/Measure/Analyze/Evaluate	Benchmarking and Best Practice Identification / Evaluation
	9.2	Internal Audit	Benchmarking and Best Practice Identification / Evaluation
	9.3	Management Review	Benchmarking and Best Practice Identification / Evaluation AM Innovation and Continuous Improvement
Improvement	**10.1**	Nonconformity and Corrective Action	Root Cause Analysis and Special Investigations
	10.2	Preventive Action	Root Cause Analysis and Special Investigations Integrated Disaster Recovery Plans AM Innovation and Continuous Improvement
	10.3	Continual Improvement	Benchmarking and Best Practice Identification / Evaluation AM Innovation and Continuous Improvement

[4] The ten AM Program Implementation elements / attributes listed in the above table represent an encapsulated view of the key aspects that comprise effective asset management (defined further in Appendix A). The purpose of this table is to illustrate this point via cross-reference to ISO 55001.

Appendix D – Asset Management Maturity Scale



Maturity Level 0	Maturity Level 1	Maturity Level 3	Maturity Level 4	Maturity Level 5
The elements typical of mature AM organizations are not in place. The organization is in the process of developing an understanding of AM	The organization has a basic understanding of AM. It is in the process of deciding how the elements of AM will be applied and has started to apply them.	The organization has a good understanding of AM. It has decided how the elements of AM will be applied and work is progressing on implementation	All elements of AM are in place and are being applied and are integrated. Only minor inconsistencies may exist.	Using processes and approaches that go beyond the requirements of AM. Pushing the boundaries of AM development to develop new concepts and ideas.