November 3, 2014

ROOT CAUSE ANALYSIS REPORT
Downtown Underground Network Event on August 13, 2014
AGENDA

1. Introductions & Overview
2. Root Cause Analysis Review
3. O’Neill Management Consultants Review
4. IPL Action Plan
5. Response to IURC Data Requests
6. Q&A
• **Kelly Huntington**  
  – President & CEO

• **Joe Bentley**  
  – Senior Vice President, Customer Operations

• **Mike Holtsclaw**  
  – Director, T&D Engineering

• **Jim Sadtler**  
  – Director, Transmission Field Operations

• **Kelly Millhouse**  
  – Director, Substations and AC Networks
Root Cause Analysis Review
IPL OPERATORS RESPONDED QUICKLY TO SAFELY RESOLVE EVENT WITHIN 15 MINUTES

<table>
<thead>
<tr>
<th>Time</th>
<th>Occurrence</th>
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<tbody>
<tr>
<td>1:25p</td>
<td>- Conflicting 911 calls reporting smoke and loud banging noise from underground structure and smoke from manholes at 100 S Meridian Street</td>
</tr>
<tr>
<td>1:31p</td>
<td>- 1&lt;sup&gt;st&lt;/sup&gt; IFD units on scene</td>
</tr>
<tr>
<td>1:33p</td>
<td>- IPL Team Leader Field Service on scene</td>
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<tr>
<td>1:40p</td>
<td>- IPL Transmission Operations Control Center operator opens Gardner Lane UG 651 feeder breaker</td>
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<td></td>
<td>- Event ends</td>
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IPL IMMEDIATELY CONDUCTED ITS INVESTIGATION AND INITIATED A ROOT CAUSE ANALYSIS PROCESS

- Evidence preservation began immediately
- Assembled In-house team
- Contacted Eaton Corporation the next day
- Gathered Data
  - YouTube Videos & Security Video
  - IFD information
  - Maintenance & Inspection Records
  - Network Protector Information
  - PI Historian data (Network SCADA & ECS SCADA)
- Analyzed Data
- Developed Conclusions & Action Plans
IPL’S ROOT CAUSE ANALYSIS IDENTIFIED THE TWO POSSIBLE EVENT SCENARIOS

TERMINAL COMPARTMENT

MAIN TANK

CORE AND COIL ASSEMBLY

PRIMARY SWITCH COMPARTMENT CLOSED-OPEN-GROUND

NETWORK PROTECTOR

SECONDARY CABLE

MAIN BREAKER CONTACTS

CT FOR MASTER RELAY

NETWORK PROTECTOR
THE EVENT WAS COMPLETELY CONTAINED IN THE NETWORK PROTECTOR

- The Network Protector door remained closed which reduced damage to other vault equipment
O’Neill Management Consultants Review
IPL Action Plan
### IPL HAS A THOROUGH PLAN TO OPTIMIZE DOWNTOWN NETWORK OPERATIONS

<table>
<thead>
<tr>
<th>Action Plan</th>
<th>Timing</th>
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<tbody>
<tr>
<td>1. Replace all 480-Volt Network Protectors</td>
<td>12/31/2018</td>
</tr>
<tr>
<td>3. Meet with Indianapolis Fire Department</td>
<td>9/10/2014</td>
</tr>
<tr>
<td>4. Develop Mitigation Strategy</td>
<td>3/31/2015</td>
</tr>
<tr>
<td>7. Update Succession Plans</td>
<td>June 1&lt;sup&gt;st&lt;/sup&gt; Annually</td>
</tr>
<tr>
<td>8. Conduct Staff Training</td>
<td>June 1&lt;sup&gt;st&lt;/sup&gt; Annually</td>
</tr>
</tbody>
</table>
• Replace ALL 480-Volt Network Protectors
  – Will replace all 480-Volt network protectors
    • 137 protectors in 44 vaults
  – Developed a five year program to replace approximately 30 per year
  – Estimated capital cost of $15M

• Verify the location of all 58 pre-1985 Westinghouse CM-22 network protectors - COMPLETE

• Re-prioritize the replacement program sequence COMPLETE
IPL ACTION PLAN | #1 CONT.

- Complete change outs by December 31, 2018
- Timetable allows for minimizing customer outages during the change-out and reduces reliability risks for the downtown network
- Responsible Party: Director, Transmission Field Operations
IPL’S ROOT CAUSE ANALYSIS IDENTIFIED THE TWO POSSIBLE EVENT SCENARIOS

IPL’s action plan addresses both possible event scenarios

26 S Meridian Street 480-Volt Spot Network Vault
• Document a formal written Network Event Response and Test Plan including:
  – Identification of key personnel
  – Event notification
  – Incident command structure for handling network events
  – Identification of on-scene IPL incident commander
  – Annual tabletop drill of the plan

• Complete Plan by March 31, 2015

• Responsible Party: Director, T&D Engineering
• Schedule meeting with the Indianapolis Fire Department - **COMPLETE**
  – Review the response for a network event
  – Discuss coordination with IPL
  – Discuss lessons learned from August 13\(^{th}\) event
  – Meeting was held on 9/10/14 and feedback will be incorporated in Network Event Response Plan (Recommendation #2)

• **Meeting was held on September 10, 2014**

• **Responsible Party: Director, T&D Engineering**
Develop a mitigation strategy that limits severity and consequences of a network transformer or network protector failure
  – Better information at the substation level

Complete Action Plan, including identification of major milestones for selected strategy by March 31, 2015

Responsible Party: Director, Asset Management
• Conduct a review of all Gateway Vault circuits for communications stability and frequency of telemetry errors
  – Determine frequency of communication errors
  – Review response process for Network SCADA communication errors and who is notified
  – Review the routing of Blue Network SCADA communications cable in the vaults. Determine if there is a way to provide increased fire protection during an event.

• Complete Review and Develop Action Plan, including major milestones by March 31, 2015

• Responsible Party: Director, Transmission Field Operations
• Enhance the network protector inspection process
  – Add visual inspection of the bottom area around the transformer bus in the network protector for debris or evidence of tracking on the bus support insulators - **Added to tablet electronic inspection form**
  – Add visual inspection of the network protector bushing for signs of cracks or tracking - **Added to tablet electronic inspection form**

• Complete Changes to tablet software by **November 1, 2014**

• Responsible Party: Director, Asset Management
• Update Staffing Plans
  – Ensure no critical loss of institutional knowledge
    • Continue to monitor, update, and implement the Company’s succession plan for key staff responsible for network operations and emergency response
    • Includes control room staff, first responders, engineering support, and those responsible for public and customer communications

• Complete by **June 1st** annually

• **Responsible Party: Customer Operations Leadership**
• **Staff Training**
  – Actively participate in industry forums and conferences where other companies that operate secondary network systems also participate
    • Example: 2015 Eaton Electrical Network Systems Conference
  – Annual funding for travel and memberships is included in O&M budget

• **Complete by June 1\(^{st}\) annually**

• **Responsible Party: Customer Operations Leadership**
• **Network Inspection Process Audit**
  – Implement process to verify inspection data from tablets is downloaded properly to on-line systems - **COMPLETE**
  – Implement periodic auditing of maintenance and inspection records for completeness
  – Conduct audit of back office process to improve and assure the retrieval and completeness of inspection and maintenance records in master database

• **Complete Process Audit and develop Action Plan to address any gaps identified by March 31, 2015**

• **Responsible Party: Director, Asset Management**
Responses to IURC Data Requests
IPL ENGAGES IN SUCCESSION PLANNING

• Long-Term Succession Planning
  – Downtown Network is supported by an organization of 72 people and IPL regularly reviews scheduled work activities to optimize this number
  – The downtown network has an integrated web of leadership that is not dependent on any one individual
  – IPL’s Power Delivery Staffing Study analyzes specific workforce and future needs to help support the succession plan process
  – IPL leverages this information to identify and develop individuals for all positions
IPL IS COMMITTED TO MAINTAINING A SKILLED WORKFORCE

• Multi-faceted approach to succession planning
  – Hiring the right people
  – Job rotations
  – On-the-job training
  – External formal training and conferences
  – System and Technical enhancements
  – Coaching and mentoring of young professionals
IPL HAS STRENGTHENED THE RIGOR OF POWER DELIVERY ASSET MANAGEMENT

• Asset Management Framework
  – Maintenance/Inspection and capital investment
  – Asset replacement programs for downtown network
  – Systematic approach using performance indicators

• Power Delivery Organization integrated with DP&L as part of the new Customer Operations Organization
  – Ensures continued high reliability provided in an efficient and effective manner
  – Provides additional people resources and increased opportunities to share best practices and knowledge
IPL’S COMMITMENT

• IPL’s downtown network system is safe and reliable

• IPL is committed to taking the necessary actions to assure the continued safe and reliable operation of its downtown network

• IPL continues to take actions to reduce the likelihood and impact of any future occurrences within its downtown network system
Questions
November 3, 2014

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Appendix
APPENDIX: POST EVENT UG 651
NETWORK PROTECTOR
APPENDIX: ORGANIZATIONAL CHARTS

Customer Operations Organization Attachment

Legend
Green = Key Positions at IPL
Yellow = Backup Positions at IPL
Blue = Mutual Assistance/Supplemental to Key Positions located at DPL
APPENDIX: ORGANIZATIONAL CHARTS

Design Engineering Group Attachment

Legend
- Green = Key Positions @ IPL
- Yellow = Backup Positions @ IPL
- Blue = Mutual Assistance/Supplemental to Key Positions located @ DPL

*Team Leader Major Underground Projects Engineering
APPENDIX: ORGANIZATIONAL CHARTS

IPL Major Underground Projects Engineering Group Attachment

Legend
Green-Key Positions @ IPL
Yellow-Backup Positions @ IPL
Blue-Mutual Assistance/Supplemental to Key Positions located @ DPL

*Team Leader Major Underground Projects Engineering
APPENDIX: ORGANIZATIONAL CHARTS

T&D Operations Team Attachment

Legend:
- Green: Key Positions @ IPL
- Yellow: Backup Positions @ IPL
- Blue: Mutual Assistance/Supplemental to Key Positions located @ DPL
APPENDIX: ORGANIZATIONAL CHARTS

IPL Substation and Network Field Operations Group Attachment

Legend
Green-Key Positions @ IPL
Yellow-Backup Positions @ IPL
Blue-Mutual Assistance/Supplemental to Key Positions located @ DPL
APPENDIX: ORGANIZATIONAL CHARTS

DPL Substations & AC Network Team Attachment

Legend
Green-Key Positions @ IPL
Yellow-Backup Positions @ IPL
Blue-Mutual Assistance/Supplemental to Key Positions located @ DPL
DPL Substations and AC Network Team Attachment (Continued)