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May 4, 2012

Via Email
Mr. Doug Webber
General Counsel
Indiana Utility Regulatory Commission
101 W. Washington Street, Suite 1500 E.
Indianapolis, IN 46204
DWebber@iurc.in.gov

Dear Mr. Webber,

In accordance with your letter dated April 4, 2012, enclosed please find the responses of Indianapolis Power & Light Company ("IPL") to the Indiana Utility Regulatory Commission's questions regarding IPL's Root Cause Analysis Report on the Center Substation 138 kV Circuit Breaker Event.

If you have any questions or comments, please contact me at 317-261-8600.

Sincerely,

Barry J. Bentley

RESPONSE OF INDIANAPOLIS POWER & LIGHT COMPANY ("IPL") TO INDIANA UTILITY REGULATORY COMMISSION QUESTIONS ISSUED APRIL 4, 2012 CONCERNING THE CENTER SUBSTATION ROOT CAUSE ANALYSIS REPORT

1. Regarding the circuit breaker that failed on 1-16-12 at Center substation,

a. When was it originally manufactured, purchased, and placed in service?

IPL Response:

The purchase order for this circuit breaker was issued July 23, 1981.
The circuit breaker arrived on IPL property on March 4, 1982.
It was placed in service January 27, 1983.

b. What are its type, make, model, and serial number?

IPL Response:

Manufacturer: Siemens-Allis.
Model: BZO-145-63-6. Serial Number: 40703-1.

c. How many others of that make and model does IPL own, and what are the age and location of each?

IPL Response:

IPL owns 18 other BZO-145-63-6 breakers. The locations and ages are shown in the table below.

Location	Age
BROOKWOOD -- 132-36 LINE BREAKER	36
FORD -- 132-08 LINE BREAKER	37
FRANKLIN TOWNSHIP -- BUS TIE BREAKER	29
GUION -- 132-40 LINE BREAKER	36
LILLY-SOUTH -- 132-61 LINE BREAKER	36
LILLY-SOUTH -- 138KV BUS TIE BREAKER	36
PETERSBURG -- 100-138 LINE BREAKER ("HE - RATTS") – Not in service due to recent configuration change	30
PETERSBURG -- 138-25 LINE BREAKER ("DUKE - VINCENNES-WASHINGTON")	30
PETERSBURG -- 138-38 LINE BREAKER ("DUKE - OAKLAND CITY")	30
PETERSBURG -- GA-3 BREAKER	30
PETERSBURG -- Z-84-3 DUFF ("SIGE") LINE BREAKER	30
PROSPECT -- 138KV 28-75 TIE BREAKER	29
HARDING STREET -- 132-14 E BREAKER	37
HARDING STREET -- 138-98 O.C.B. (to GT Yard)	37

Location (continued)	Age
HARDING STREET -- GEN #5 W	37
HARDING STREET -- GEN #6 W	37
HARDING STREET -- UNIT 7 5A	27
HARDING STREET -- UNIT 7 5CBREAKER	30

d. What is IPL's standard for inspection and maintenance of breakers of that type, with an explanation of any differences by asset characteristics and condition?

IPL Response:

- All BZO-145-63-6 circuit breakers have the same inspection and maintenance standards.
- External Inspection - every 5 years.
- Exercise - exercise at least once if the breaker has not operated within the prior six months.
- Insulation Test - insulation (Doble) test every 5 years.
- Internal Inspection - Internal inspections are scheduled as needed based on external inspection results.
- Infrared – Annual substation infrared scan includes circuit breakers as part of the substation scan. Reports are exception only for equipment.

e. Provide a copy of the maintenance records for that breaker for the last ten years, explaining any differences between your records and what would be expected from the standards.

IPL Response:

From 2006 to present, maintenance records are stored electronically in the EMPAC maintenance management system.

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The following list summarizes the EMPAC maintenance records for the breaker and the substation infrared scans. Some entries have additional notes in italics to help understanding of the entry.

Date Complete	Description
2/17/2006	Infrared Insp - Perform routine Infrared Inspection of the substation
4/10/2006	External. Maintenance. on Breaker
4/12/2006	Hot tank. Probably a bad interruptor. Will need to be out for 3+ days. More than two people.
4/12/2006	Doble Test Breaker
5/10/2006	Take dissolved gas test of A, B, and C phase tanks monthly until further notice
4/25/2006	Take dissolved gas test of A, B, and C phase tanks. Set up for repeating work order every month until further notice.

Date Complete	Description
8/16/2006	Counter unreadable
8/15/2006	Take dissolved gas test of A, B, and C phase tanks monthly until further notice
9/14/2006	Take dissolved gas test of A, B, and C phase tanks monthly until further notice
10/13/2006	Take dissolved gas test of A, B, and C phase tanks monthly until further notice
11/8/2006	Take dissolved gas test of A, B, and C phase tanks monthly until further notice
5/7/2007	Infrared Insp - Perform routine Infrared Inspection of the substation
1/14/2008	Infrared Insp - Perform routine Infrared Inspection of the substation
1/2/2009	BREAKERS: Switchman reports hydraulic oil is very low. Investigate and add oil as needed. Reported 12/30/2008 oil level is very very low.
1/28/2009	TEST CREW: Infrared Insp - Perform routine Infrared Inspection of the substation
1/12/2010	TEST CREW: Infrared Insp - Perform routine Infrared Inspection of the substation
9/28/2010	BREAKERS: External inspection *Note: This is the inspection that found high ductor readings and triggered the internal inspection work order.*
12/9/2010	TRANSFORMERS: OIL SAMPLE - Obtain an oil sample for PCB analysis - Each tank. Will be entering tanks week of 12/13/10.
8/8/2011	TEST CREW: Infrared Insp - Perform routine Infrared Inspection of the substation *Note: No high temperature conditions were reported on Center West Circuit Breaker*
1/4/2012	TEST CREW: Infrared Insp - Perform routine Infrared Inspection of the substation *Note: This inspection generated the IR report on Center West Circuit Breaker. It is the first time high temperatures were found and reported.*
1/5/2012	TRANSFORMERS: Obtain oil samples to be tested for PCB and oil quality from each of the 3 tanks.
1/16/2012	CONSTRUCTION: Make clearances as needed to facilitate removal of faulted breaker. Clean insulators/etc. as needed.
1/17/2012	BREAKERS: Drain oil...prep breaker for removal from site.
1/17/2012	Move breaker from pad to along south fence area
1/18/2012	BREAKERS: INTERNAL INSPECTION - During external completed 09/28/2010, B-phase ductor reading was 34,279 and C-phase ductor reading was 66,490. IR completed 1/4/2012 indicates 35.51 degrees rise at 32.6 ambient - Tanks 1 and 2. Will need to complete internal inspection. *Note: This is the internal inspection work order that was not completed before the breaker failure. The work order was cancelled on 1/18/12 after the breaker failed on 1/16/12.*

Date Complete	Description
1/18/2012	TEST CREW: Complete Doble Test Note: This was a pending work order that was also cancelled on 1/18/2012 after the breaker failed on 1/16/12. It would have been completed along with the repair work order.
1/20/2012	WELDER: Cut tanks apart, cut loose from pads, and prep for removal from pads.
2/12/12	TEST CREW: Infrared Insp - Perform routine Infrared Inspection of the substation with specific focus on 132-03 incoming and West BUS TIE BKR area. *Note: This was an additional out of cycle scan to check the new circuit breaker and the substation in general just prior to the Super Bowl.*

f. Provide the annual spending on substation maintenance and substation capital replacement, both overall for all of IPL and for the Center substation, for the last ten years.

IPL Response

Below is a chart showing the substation capital replacement and annual maintenance spending. The capital does not include any new capacity additions. The specific Capital and annual maintenance data for Center substation is not available from IPL's accounting system.

Year	Total Capital	Capital - Replacements	O&M
2011	$7.8	$7.8	$4.0
2010	$5.4	$2.7	$4.0
2009	$4.9	$2.7	$4.6
2008	$4.8	$2.9	$5.2
2007	$7.0	$3.3	$5.2
2006	$5.7	$3.6	$5.5
2005	$3.6	$1.3	$3.9
2004	$3.8	$2.8	$4.0
2003	$7.9	$5.0	$4.0
2002	$2.9	$1.2	$3.9

Note – Dollars are in millions

2. Describe what specific actions IPL has taken, since the event, related to:

a. Repair or replacement of the failed breaker and associated controls such that at least that breaker will not again cause a similar problem.

IPL Response:

The circuit breaker was replaced with a new circuit breaker.

b. Inspection or maintenance of other breakers of that type or with similar warning signs in terms of high ductor readings, high infrared readings, or other significant warning signs like high levels of dissolved gas, etc.

IPL Response:

IPL reviewed the maintenance records for the other 18 BZO-145-63-6 breakers and found no similar issues. Recently, the 132-65 line breaker at Gardner Lane had a ductor reading slightly over 1000 micro-ohms on one phase. Before this breaker was put back in service, the manufacturer was consulted. The manufacturer deemed it was acceptable to put the breaker back in service. After it was returned to service an infrared inspection of the breaker showed no problems. The breaker is scheduled for an internal inspection this Spring.

c. Ensuring all primary and secondary relays are functional and tested.

IPL Response:

All relays on the 132-03 line are scheduled to be replaced in 2012 with microprocessor relays that use fiber optic cable for the communication medium. The fiber cable is installed., but still must be terminated. The relay equipment has been ordered and will be installed by the end of the 3rd quarter of 2012.

d. Improving processes or training to avoid future occurrences of the human errors cited in the report.

Does IPL have a substation naming convention that avoids transposing names etc. when communicating by radio, entering data, etc.? If not, has IPL considered such a convention?

IPL Response:

IPL does have a substation naming convention that avoids transposing names, etc. The naming convention for substations is to use the street name, customer served, or general area where the substation is located for its name. IPL selects names for substations that avoid similar sounding names which could lead to confusion. The names are reviewed and approved by Engineering, Operations, and Field Maintenance before the name is final.

The substation name was not a factor for the Center event. The operator read down one line on the written report and read the wrong name. IPL has improved the readability of the report to solve that problem. The names IPL uses for substations have not been an operational issue.

3. For each recommendation listed in the root cause analysis report, provide:

a. An explanation of the expected benefit, i.e., how it would be expected to help in avoiding similar events from occurring in the future.

IPL Response:

1) **Establish a formal infrared and ductor criteria to trigger maintenance priorities.**
   The establishment of a formal infrared and ductor criteria to trigger maintenance criteria is expected to reduce the uncertainty of how urgent follow up work should be done.

2) **Improve readability of maintenance spreadsheet that contains list of circuit breakers to be operated for the month.**
   Improving the readability of the maintenance breaker exercise list should reduce the likelihood of operating the wrong breaker in the future.

3) **Create review process to check for outstanding maintenance problems before issuing maintenance cycling orders to System Operations.**
   A review process to check for outstanding maintenance before exercising breaker will improve the visibility of any breakers that have important maintenance open maintenance tasks.

4) **Develop a plan to return primary relaying to normal operation.**
   While the primary relay scheme was out of service it did not contribute to the breaker failing; it is best practice to have primary relay schemes in service on transmission lines, see item 2C.

5) **Improve documentation of substation maintenance records.**
   Improving documentation and visibility of substation maintenance records will help to prioritize all work within and across asset classes.

6) **Fully utilize automated asset management tools specifically designed for substation maintenance.**
   Fully utilizing asset management tools for substation maintenance expects to use data and equipment criticality to help score and prioritize maintenance and/or replacement work.

7) **Allocate resources and implement tools to assure that substation maintenance activity is adequately tracked, and prioritized efficiently.**
   By allocating additional resources to implement tools to assure that substation maintenance activity is tracked and prioritized efficiently will help prioritize work and make abnormal readings linked and more visible.

8) **Implement a procedure to track work scheduling delays and ordering parts to efficiently plan field work.**

The implementation of procedures to track scheduling or part ordering delays will help identify equipment or schedules that need to continue to increase in priority and make it more transparent to a broader range of personnel.

9) **Document process for field data review and subsequent work flows.**

By documenting a process for field data review and subsequent work flows it is expected that IPL can better identify areas or processes that need improved tools or flows to help identify at risk equipment.

b. ***The expected cost of implementing the recommendation, short term and long term.***

IPL Response:

1) Minimal.
2) Minimal.
3) Minimal.
4) The 132-03 primary relay scheme is being upgraded from a pilot wire phase comparison scheme over copper wire to phase comparison scheme over fiber optic cable. The estimated cost is $100,000.
5) This cost will be minimal other than the cost associated with process and configuration of existing systems.
6) This is mostly internal labor cost for configuration of software. It is estimated to be less than $50,000.
7) Within the last few months IPL added two individuals to the asset management group. This yearly cost is approximately $200,000.
8) This is mostly process driven and additional cost is minimal.
9) Minimal.

c. In addition, estimate the cost of replacing the breaker.

IPL Response:

The cost of replacing the breaker was $276,353.

d. The action plan for implementation.

IPL Response:

1.) Partially complete and implemented. Infra-Red guidelines in place; ductor guidelines in progress and will be complete in the 2nd quarter.

2.) Complete and implemented.
3.) Complete and implemented.
4.) The plan for the 132-03 line is complete and the implementation is in progress. It is expected the new primary relay scheme will be in service by the end of the third quarter of this year.
5.) IPL is reviewing this process. Completion is expected in the fourth quarter of this year.
6.) This action plan has been well under way since last year. This process will be ongoing; however, we expect to have a substantial level of improvement by the end of the third quarter this year.
7.) Complete and implemented.
8.) This is on-going.
9.) A document has been developed.

4. Provide a copy of any reports or communications with MISO, ReliabilityFirst, or NERC regarding the incident, including their response.

IPL Response:
The reports IPL filed with Reliability First are not public information and contain confidential Critical Energy Infrastructure Information. This information can be made available for inspection at IPL, 1 Monument Circle, Indianapolis IN. Alternatively, IPL can provide the information subject to a protective order and appropriate nondisclosure agreement.

IPL submitted two written reports to Reliability First. The initial report was submitted within the first 24 hours on January 17, 2012 and the second follow-up report was submitted on January 20, 2012. Reliability First notified IPL by phone a few days later that no further action was required by IPL and the event was closed with NERC. IPL also provided Reliability First with a copy of the Center Sub Root Analysis Root which has previously been provide to the Commission.

5. Describe what, in hindsight, IPL would like to have done differently to avoid the event, and how helpful that would have been, focusing on the most cost-effective measure(s) IPL might have taken which would most likely have avoided the incident or mitigated its impacts.

IPL Response:
Hindsight recommendations are the same as the recommendations in the root cause analysis.

6. Explain for a well-informed but not deeply technical audience the following:

a. ***The ductor measurement test, what high readings indicate, and why a five digit reading instead of four may be indicative of an error.***

IPL Response:

Circuit breakers have internal contacts that conduct electricity when in the closed position. These contacts normally have very low resistance. A ductor measurement uses a specialized instrument designed to accurately measure this low resistance. The test injects current through the contacts while the circuit breaker is closed but out of service. The instrument measures voltage caused by the injected current and calculates contact resistance. A four digit readout on the instrument reports the resistance, typically in micro-ohms. Since the instrument only reads four digits, a measurement report with five digits of accuracy may indicate a reading error.

b. The thermal readings and how to interpret high readings.

IPL Response:

All objects emit infrared radiation based on their temperature and other properties. The radiation varies with temperature and can be detected similar to the way human eyes detect different colors. Infrared cameras operate much like television cameras. They are calibrated to display different temperatures as different colors on a screen visible to the human eye.

Thermal inspections use infrared cameras to see temperature differences on equipment. Thermal inspections look for equipment that is operating hotter than nearby equipment. Interpreting high readings requires skill and understanding of expected temperature rise for different kinds of equipment along with the equipment loading, heating from the sun, camera settings, and other factors when the measurement is taken. Here are some examples:

- A heavily loaded transformer will have more temperature rise than a lightly loaded transformer.
- A switch contact in open air will show more temperature rise than the same contact under oil inside a circuit breaker tank.

In order to account for these differences, infrared guidelines set criteria for different equipment. IPL issued improved guidelines subsequent to the event at Center Substation.

c. The oscillograph readings and alarms and how they should be interpreted.

IPL Response:

Oscillograph readings and alarms referenced in the root cause analysis are two different items.

Oscillograph readings are voltage, current and status values recorded at the time of an event. Oscillographs continuously monitor and store data in a scrolling, temporary memory. Oscillographs also have trigger inputs to indicate abnormal events as defined by the trigger settings. When triggered, the oscillograph transfers some of the temporary memory into

permanent memory. It records information just before and during the event. Oscillograph readings contain thousands of data points for durations of about one second. Oscillograph readings are useful for detailed after event analysis. They are not used for real-time analysis.

Oscillograph alarms arise from the trigger inputs and settings. Oscillograph alarms appear on alarm screens in the Transmission Operations Control Center (TOCC). Often, many oscillographs operate during a single event. Each oscillograph sends an alarm to the TOCC; so many alarms appear in the control center. The alarms tell system operators the oscillograph has operated but do not provide any details about the event. System operators use this along with other alarms and readings to respond to events.

d. The intermittent conduction that occurred as the breaker was failing and how it was measured.

IPL Response:

The intermittent conduction was measured in after the fact analysis using new Smart Grid synchrophasor information. This was very helpful in determining the sequence of events.

Intermittent conduction occurred as the circuit breaker contact rapidly deteriorated just prior to the final event. The breaker was in the closed position with full system voltage available on both sides of the contacts. The contacts deteriorated enough to stop current flow. The contacts remained very close together as the breaker was mechanically in the closed position. From time to time, current would resume, due to internal arcing across the contacts.

e. The function of the pilot cables in supporting the function of the primary relays.

IPL Response:

Pilot cables support communication between relays protecting a single line, but are located in different substations. They enhance coordination and provide faster fault clearing by allowing protection relays at each substation to quickly agree the problem is in their zone of protection.

f. The relaying schemes used to protect the failed breaker.

IPL Response:

The breaker is included in two overlapping protection schemes: 138KV bus differential and 132-03 line protection.

g. ***The rise in the neutral current on the attached transmission line, and whether it caused a burning down of the neutral wire.***

IPL Response:

The neutral (ground) current arose from short circuits between energized phases and grounded equipment at Center Substation. This is normal and expected. The first short circuit was between B phase and the tank of the circuit breaker. Later, as second short circuit started as conductive gasses enveloped C phase of a switch above the breaker.

The exact mode of failure (mechanical or electrical) of the neutral (static) wire is not known. It was considered as a possible root cause, but eliminated based on careful examination of the physical location and position, as well as oscillograph data.

7. Provide copies of the following documents, with a brief explanation of how to read the information in each document:

a. The one-line electrical diagram of the Center substation.

IPL Response:

The detailed substation one-line diagram is considered Confidential Critical Energy Infrastructure Information. Such information can be made available for inspection at IPL, One Monument Circle, Indianapolis, IN. Alternatively, IPL can provide the information subject to a protective order and appropriate nondisclosure agreement.

b. The results of the ductor testing of the failed breaker.

IPL Response:

Copies of the completed work order are provided and include the results of the ductor tests.

See Exhibit: IPL-Q7b

c. The work order indicating maintenance was required after the 9-30-10 high ductor reading.

IPL Response:

A copy of EMPAC Work Order 10-040728-0000 printed April 23, 2012 is attached. There are no notes or signatures because it was cancelled electronically after the January 16, 2012 failure.

See Exhibit: IPL-Q7c

d. Any internal communication assessing what parts needed to be ordered.

IPL Response:

A copy of the email requesting that parts be ordered for the Center West Bus Tie breaker (132-03 Line) have been provided. This email was sent from a Section Leader in the Field Operations group to support engineer who coordinates the ordering of parts.
See Exhibit: IPL-Q7d

e. The parts order and the delivery receipt or acknowledgement.

IPL Response:

A copy of the Purchase order for the parts has been provided along with copies of the receiving information and packing slip showing when the parts arrived.
See Exhibit: IPL-Q7e

f. The thermal scan on 1-4-12.

IPL Response:

Spot Temperatures are labeled as SP01, SP02 and SP03. The symbol "+" marks the target temperature location. The attached IPL thermal scan has 3 separate temperatures listed; one for each of the three tanks. Two of the three temperatures, SP01 and SP02 are elevated by 35 °F over ambient. This rise over ambient indicates heating inside the tank. The tanks each contain a set of moveable main contacts.
See Exhibit: IPL-Q7f

g. The dissolved gas analysis results from the sample taken 1-5-12.

IPL Response:

IPL acquired oil samples and specified "Oil Quality" and "PCB" tests from an independent lab, Weidman Diagnostic Solutions. Resulting data was reported on a per tank basis. OCB A refers to the oil circuit breaker tank A. See results also for OCB B and OCB C. The oil quality test includes 7 different condition results and diagnostic conditions under the "Comment:" section of the report. IPL requested PCB sampling of the oil. This is a routine test due to the fact employees would be entering the main tank during an internal inspection.
See Exhibit: IPL-Q7g

h. The oscillograph recordings referenced in the report.

IPL Response:

See Exhibit: IPL-Q7h

8. Explain any constraints caused by congestion or loading on related equipment which might have prevented or delayed timely maintenance on the Center substation or specifically the breaker that failed.

IPL Response:

The 132-03 line normally sees significant power flows. When maintenance outages are required, IPL works with the Midwest ISO to schedule this line out of service for times that will have the least impact on system reliability. To the extent possible line outages are coordinated with other line and generation outages in the area to minimize congestion impacts.

9. Explain the following:

a. Why the breaker was put back in service after the high ductor readings on 9-30-10, and how long it had remained closed until it was mistakenly ordered opened and closed on 1-16-12.

IPL Response:

The breaker was returned to service because the condition was considered acceptable for service until completion of the internal inspection. It generally remained closed and available for service until 1-16-12. The breaker operated successfully on six occasions between 9-30-10 and 1-16-12. The six successful operations were normal maintenance operations. Some provided safety isolation for other maintenance activities, and some were to exercise the breaker per maintenance practices. It should be noted that four successful operations occurred before the substation thermal scan on 8-8-11. The thermal scan did not indicate any thermal problems with the breaker at that time.

b. Why the recommended internal inspection on that breaker was not done even though a work order that was written on 9-30-10.

IPL Response:

The circuit breaker must be removed from service in order to perform an internal inspection. A four day outage request was approved, and the internal inspection was scheduled for the week of 12-13-10. However, the outage request was cancelled due to inclement weather.

After the cancellation, a decision was made to order additional parts (more than the 2006 replacement) in July 2011. This circuit breaker experienced a similar problem in 2006. Work completed on April 12, 2006 replaced contacts. Unfortunately the problem re-appeared in 2010. Ordering additional parts helped to assure all work could be completed with one outage and to help assure the repair would be more permanent.

The parts arrived on August 15, one week after a thermal scan indicated breaker temperatures

were normal. This, and previous experience, reinforced the assessment that the breaker could remain in service for some time before repairs. The decision was made to coordinate this work during the Spring 2012 Harding Street Unit 7 scheduled maintenance outage.

c. Why it took almost a year to order the parts.

IPL Response:

See the response to 9 b above.

d. Why the particular parts were ordered, i.e., including springs, etc.

IPL Response:

Past operating and maintenance history suggested contacts would likely be the cause. Spring buttons were not replaced in 2006. Supervision and field crew members asked for springs and spring buttons to be ordered in addition to the contacts. The additional parts helped to assure all work could be completed with one outage and to help make the repair more permanent.

e. Why the maintenance was scheduled to be delayed until April, 2012.

IPL Response:

See the response to 9 b above.

f. How long the pilot cables and primary relays had been out of service at the time of the event, who owns the pilot cables, why the pilot cables and primary relays were out of service, and the work required to return them to service.

IPL Response:

IPL owns all the equipment. Relays were taken out of service 6/29/2009 due to unusable pilot wire circuit. To return the relays to service on copper pilot wire requires replacing 17,388 feet of pilot cable.

g. Whether the option to replace the breaker was considered, and why it was rejected.

IPL Response:

The option to replace the breaker was considered. Replacing contacts is more cost effective than replacing the breaker. The estimated cost to replace the contacts and springs for that style of breaker would have been $15,000. Past experience has shown that that type of repair will resolve the high ductor reading.

10. Describe the customer outage experience that resulted from this event, including momentaries, unplanned, and planned outages.

IPL Response:

When the 132-03 breaker failed at 11:04 AM the protection equipment isolated the West 138 kV bus section resulting in the loss of source to the 138/13.2 kV H-Unit. The customers served from this transformer lost power. Operators in the Transmission Operations Control Center transferred the load via the Energy Control System to the 138/13.2 kV F-Unit on the East 138 kV bus which was still in service. The 3,541 customers on the H-Unit saw a loss of power for up to 2 minutes. Because of the transmission level fault in the 132-03 breaker, all customers across the IPL system saw a momentary dip in voltage, they would have seen a quick blink of their lights, but they did not lose power.

IPL requested assistance from the Indianapolis Fire Department (IFD) to help extinguish the fire in the 132-03 breaker control cabinet. Before IFD personnel would enter the substation they required that all equipment in the substation be de-energized for their safety. IPL complied with this request by de-energizing all 138 kV and 34.5 kV transmission lines into Center Substation. This resulted in the 9,386 customers being served by the Center Sub F-Unit and H-Unit to lose power for 29 minutes while the fire in the 132-03 breaker control cabinet was extinguished by IFD. As soon as the fire was out and the firemen were safely out of the substation, IPL re-energized the transmission lines into Center Substation, restoring service to all customers being served out of Center Sub.

11. Describe:

a) The organizational responsibility within IPL for making decisions in response to equipment inspection findings.

IPL Response:

The organizational responsibility within IPL for making decisions in response to equipment inspection findings is a combination of guidance from Asset Management and responsible departments to follow that guidance.

Asset Management is responsible for setting inspection criteria and guidelines. Asset Management is also responsible to monitor inspection results along with asset performance. Asset management is responsible to review this information and update guidelines as needed.

Individual departments are responsible to follow the guidelines and provide feedback to Asset Management for continuous improvement.

This Asset Management responsibility is a recent organizational change from previous practices. Each department had more autonomy for guidelines and decisions before this change.

b) How does something like a high reading on a ductor test, Doble test, dissolved gas analysis test, thermal image, etc., or a condition that appears unsafe or leading to imminent fault or outage, get communicated to a manager within IPL who can then direct that action be taken?

IPL Response:

Technicians who measure and test have guidelines for recognizing abnormal results. The amount of departure from normal determines a priority response. Slight departures may suggest more frequent testing. Larger departures may indicate a more detailed inspection or repairs within a specific interval. The largest reading departures from normal indicate equipment may need immediate repair and/or removal from service. Scheduling Coordinators review the results and initiate appropriate work orders with priorities commensurate with the urgency. The level of urgency is sometimes refined through consultation with section leaders, schedulers, and other subject matter experts. Technicians and schedulers alert their supervisors when measurements indicate urgent response.

In rare cases, measurements indicate equipment is unfit for service and/or potentially unsafe. These are reported immediately. Supervisors escalate these conditions to management. Work orders are issued and crews are assembled to make urgent repairs. Also, conditions indicating equipment is unsafe or unfit for service are reported to the System Operator, and the equipment is isolated from service until repaired. If it affects equipment operation the dispatch office is also notified.

c) How is that action then tracked until completion, and by whom?

IPL Response:

IPL monitors compliance with high priority work completion as part of weekly, face to face performance meetings among managers and department heads. Special emphasis is placed on timely completion of urgent work.

All priorities of repair work for substations are recorded in EMPAC. They remain in and are tracked by EMPAC until completion. Work order status is visible to schedulers, supervisors and management. Progress is discussed weekly in face to face performance meetings.

d) What systems are used, e.g., work order system, project prioritization system, etc., and who can access them?

IPL Response:

EMPAC is the work management system for substation, central business district work and Power Supply. The EMPAC system can be and is accessed by any employee including management, first line supervisors, Scheduling Coordinators, crew leaders, and crew members.

Dissolved gas readings are available on the vendor's web site, e-mailed to subject matter experts and the paper form is filed in the equipment history. Doble and infrared data is stored electronically on the IPL internal network.

IPL is transitioning to a central repository for storage of inspection, test and criticality data. This system, is known as Ivara. Ivara will improve visibility of test data and enhance IPLs ability to initiate condition based maintenance through condition trigger algorithms. This will allow IPL not only to optimize work within asset classes but also across asset classes.

e) What formal (written, promulgated, trained) processes or procedures govern the process of decision making about equipment inspection, maintenance, renewal, and replacement for substation major equipment like circuit breakers?

IPL Response:

IPL Asset management has specific roles and responsibilities for these decisions approved at the executive level. These are relatively new. Distribution of and training are underway for these new procedures.

f) What level of internal compliance to these processes would IPL say existed prior to 1-16-12, and what evidence of such compliance does IPL have?

IPL Response:

For the IPL Customer Operations group customer reliability is a key indicator of process success. To that extent, IPL' excellent reliability is evidence of good internal compliance. IPL's weekly meetings include strong emphasis on completion of high priority work in conformance with guidelines. IPL maintains and monitors a variety of service level indicators to assure performance and compliance with programs. However, IPL's reorganization to emphasize Asset Management recognized there still is an opportunity to improve prioritization, visibility, and documentation of all work.

g) How does IPL's system of financial controls (budgets, funding, authorizations, and reviews) facilitate or constrain the decision making described in these procedures?

IPL Response:

The budgeting process is centralized within the Asset Management group. Asset Management prioritizes all large capital projects and programs. Large discretionary projects also go through executive challenge processes to help ensure optimum use of funds.

Starting in 2011, the new Asset Management organization increased the number of proactive replacement programs considered within the long range budget process. These include accelerated funding for URD cable replacement, additional targeted funding for the CBD network, and rehabilitation of transmission substations including Center Substation. These enhancements were approved and are in the long range plan.

h) Why didn't the procedures in place prior to 1-16-12 prevent the event at the Center substation?

IPL Response:

The root cause analysis identifies what caused the event at Center substation. Answers to questions in this response give additional insights with respect to timing and decision making. With respect to procedures in place, infrared guidelines did not generate a maintenance priority as high as the same measurement would generate today. A higher priority would have been more visible to supervisors and managers and would have been repaired sooner.

IPL does not minimize this event. IPL is committed to completing the recommendations in the root cause analysis. IPL is also committed to improving overall Asset Management procedures, practices and culture.

List of Exhibits

Number	Description
IPL-Q7b	Ductor Test Results
IPL-Q7c	132-03 Breaker Work Order
IPL-Q7d	Internal Email
IPL-Q7e	Purchase order & Receiving Information
IPL-Q7f	132-03 Breaker Thermal Scans
IPL-Q7g	132-07 Breaker DGA Results
IPL-Q7h	Oscillographs

Originator	: Brown, Charles	**Start Date**	: 09/28/2010
Requester	: Brown, Charles	**Action Code**	: PD-Preventive
Shutdown	: Isolation Requ	**Priority**	: Priority 4
Planner	: Brown, Charles	**Parts Reqd**	:
Project	: 0001514700	**Reference**	:
Area Code	:	**Date Reqrd**	: 10/30/2009
Repair Tag	:	**Late Date**	:
Tagout No.	:	**GL Code Combo**	: .163110.....999...

Description : BREAKERS: External inspection

Asset	: CENTER-W BUS TIE BKR	**Revision Number**	: 5
Asset Number	: BRSA407031	**Category**	: 100020
Keyword, Qualifier	: BREAKER-PD, OCB	**Last Meter Reading**	:
Asset Description	: CENTER -- W BUS TIE		
Location	: 343 W. WISCONSIN	**Last Reading Date**	:

Description

Step	Crew Craft	Schedule Date	Tagout No.
1.	PD-SUBM-S SUBMECH	09/28/2010	

External Inspection

9/28/10
BØ & CØ Ductor readings are very high. Internal maintenance needed.

Record Time Daily

Date	Employee Number	Hours	Enter
			[ ]
			[ ]
			[ ]
			[ ]

*** End of Report (1106259) ***

NOTES: Indicate any remarks or comments on the reverse side.
Completed by Employee Number: 1003 **Signature:** D.A.
Date:_____ **Reconciliation:**____ **Failure:**____
Accepted by Employee Number:_____ **Signature:**_____
Asset Downtime:_____ **Meter Reading:**_____ **As Found Rating:**_____

EXHIBIT IPL-Q7B(1)

138kV Breaker Maintenance Data Sheet

Date 9/28/10 **Counter Reading** 602

Type of Maintenance: Internal: _____ **External:** ✓ **Mechanism:** ✓

CENTER-W BUS TIE BKR

Insulating Type: OCB

Make: SA | Model: BZO-145-63-6 | Serial No: 40703-1 | Mfg Date: 3/2/1982

Volt Rate: 138000.00 | Amp Rate: 3000 | Irupt Rate: | Mechanism Type: PH-33T-5

Last Doble Test: 04/12/2006
Last Counter Reading:

Last Intr Inspection:
Last Counter Reading:

Last Extr Inspection: 10/27/2004
Last Counter Reading: 555

Retest:
Analyze:

Cabinet heater checked working? ✓

Gallons: 2151
PCB PPM: 30
PCB Date: 9/25/1984
PCB PPM-A PHASE:
PCB PPM-B PHASE:
PCB PPM-C PHASE:

Memo: Replaced counter / Recharged Accum. / BØ & CØ Ductor reading are very high. Internal Maintenance needed

	A	B	C
DUCTER READINGS	158	179	165
NEW READINGS	190	34,279	44,490

	A	B	C
PENETRATION READINGS	58/64	53/64	54/64
NEW READINGS	57/64	31/64	31/64

GS

Special Notes:

EXHIBIT IPL-Q7B(2)

Printed: Thursday, September 23, 2010 8:25:26 AM

Originator	: Stevenson, Jonathan	**Start Date**	: 12/13/2010
Requester	: Stevenson, Jonathan	**Action Code**	: PD-Preventive
Shutdown	: Isolation Requ	**Priority**	: Priority 4
Planner	: Stevenson, Jonathan	**Parts Reqd**	:
Project	: 0001514700	**Reference**	:
Area Code	:	**Date Reqrd**	: 12/17/2010
Repair Tag	:	**Late Date**	:
Tagout No.	:	**GL Code Combo**	: .163110.....999...

Description : BREAKERS: INTERNAL INSPECTION - During external completed 09/28/2010, B-phase ductor reading was 34,279 and C-phase ductor reading was 66,490. IR completed 1/4/2012 indicates 35.51 degrees rise at 32.6 ambient - Tanks 1 and 2. Will need to complete internal inspection.

Asset	: CENTER-W BUS TIE BKR	**Revision Number**	: 5
Asset Number	: BRSA407031	**Category**	: 100016
Keyword, Qualifier	: BREAKER-PD, OCB	**Last Meter Reading**	:
Asset Description	: CENTER -- W BUS TIE - Faulted January 2012.		
Location	: 343 W. WISCONSIN	**Last Reading Date**	:

Description

Step	Crew Craft	Schedule Date	Tagout No.
1.	SUBMECH		

During external completed 09/28/2010, B-phase ductor reading was 34,279 and C-phase ductor reading was 66,490. Will need to complete internal inspection.

Record Time Daily

Date	Employee Number	Hours	Enter
			[ ]
			[ ]
			[ ]
			[ ]

NOTES: Indicate any remarks or comments on the reverse side.
Completed by Employee Number:_____ Signature:_____
Date:_____ Reconciliation:____ Failure:___
Accepted by Employee Number:_____ Signature:_____
Asset Downtime:_____ Meter Reading:_____ As Found Rating:_____

EXHIBIT IPL-Q7C(1)

Asset	: CENTER-W BUS TIE BKR	**Revision Number**	: 5
Asset Number	: BRSA407031	**Category**	: 100016
Keyword, Qualifier	: BREAKER-PD, OCB		

Description

Step	Crew Craft	Schedule Date	Tagout No.

*** * * End of Report (1321114) * * ***

NOTES:

EXHIBIT IPL-Q7C(2)

Carla Jones

From: Tim L. Gentry
Sent: Thursday, July 28, 2011 5:52 AM
To: Tom Edwards
Subject: FW: Siemens Renewal Parts Quotation # SF11214180 for Indianapolis Power & Light (IPL)
Attachments: Siemens Energy Terms & Conditions 10-2008.pdf

Can I get you to order these parts for me? They are for the Center W. Bus Tie Breaker. Thanks....Tim

---

From: Larry Sudbeck [mailto:larry.sudbeck@siemens.com]
Sent: Wednesday, July 27, 2011 16:39
To: Tim L. Gentry
Subject: Siemens Renewal Parts Quotation # SF11214180 for Indianapolis Power & Light (IPL)

SIEMENS

Siemens Energy, Inc

Your Siemens Quote # SF11214180

Dear Tim,

Indianapolis Power & Light (IPL)
Siemens Parts Quotation#: SF11214180
Customer RFQ #:

We are pleased to quote you the following:

For BZO-145-63 s/n 40703-1

For 1 Breakers (3Tanks)

60 each Contact Finger 72211653002 $78.00 each
60 each Button 71110249002 $5.00 each
60 each Compression Spring 72112660001 $30.00 each

Total amount: USD 6,780.00

EXHIBIT IPL-Q7d(1)

INDIANAPOLIS POWER & LIGHT COMPANY
Morris Street Service Center
1230 W. Morris St.
Indianapolis, IN 46221-1744
FEDERAL ID NO:35-0413620

Purchase Order

PO Number	Revision	Page
887706	0	1

REQ #: 26871 dated 8/4/11

SIEMENS ENERGY INC
7000 SIEMENS ROAD
WENDELL, NC 27591
ATTN: K WEATHERS

Ship To:
1230 W. Morris St.
Indianapolis,IN 46221-1744
Refer to Items for exceptions

Bill To:
Attn: Accounts Payable
1230 W. Morris St.
Indianapolis,IN 46221-1744

Order Date	Revision Date	Print Date
08-AUG-11		08-AUG-11
Payment Terms	**Freight Terms**	**F.O.B.**
NET 30	Prepaid & Add	Destination
Requestor	**Buyer**	**Supplier Number**
Tom Edwards	Carla Jones	1308

Note:
REFERENCE QUOTATION #SF11214180, 6/27/2011

ITEM	DESCRIPTION	NEED BY DATE	QUANTITY	U.O.M.	UNIT PRICE	EXTENDED
1		22-AUG-11	60.00	EACH	$78.0000	$4,680.00
	CONTACT FINGER. PART #72211653002. SIEMENS ENERGY INC. QUOTATION #SF11214180, 6/27/2011.					
2		22-AUG-11	60.00	EACH	$5.0000	$300.00
	BUTTON. PART #71110249002. SIEMENS ENERGY INC. QUOTATION #SF11214180, 6/27/2011.					
3		22-AUG-11	60.00	EACH	$30.0000	$1,800.00
	COMPRESSION SPRING. PART #72112660001. SIEMENS ENERGY INC. QUOTATION #SF11214180, 6/27/2011.					

PO NUMBER MUST APPEAR ON ALL SHIPPING PAPERS, PACKAGES, BILLS OF LADING, & INVOICES.	TOTAL	$6,780.00

Carla Jones
Phone 317-261-8075
Fax 317-261-8975
Email carla.jones@aes.com

EXHIBIT IPL-Q7e(1)

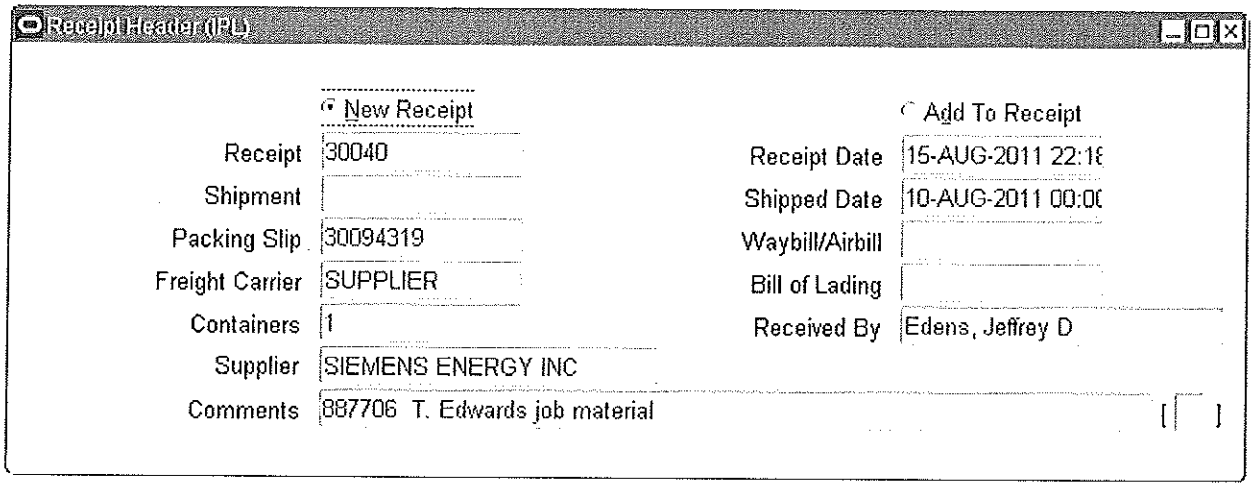


EXHIBIT IPL-Q7e(2)

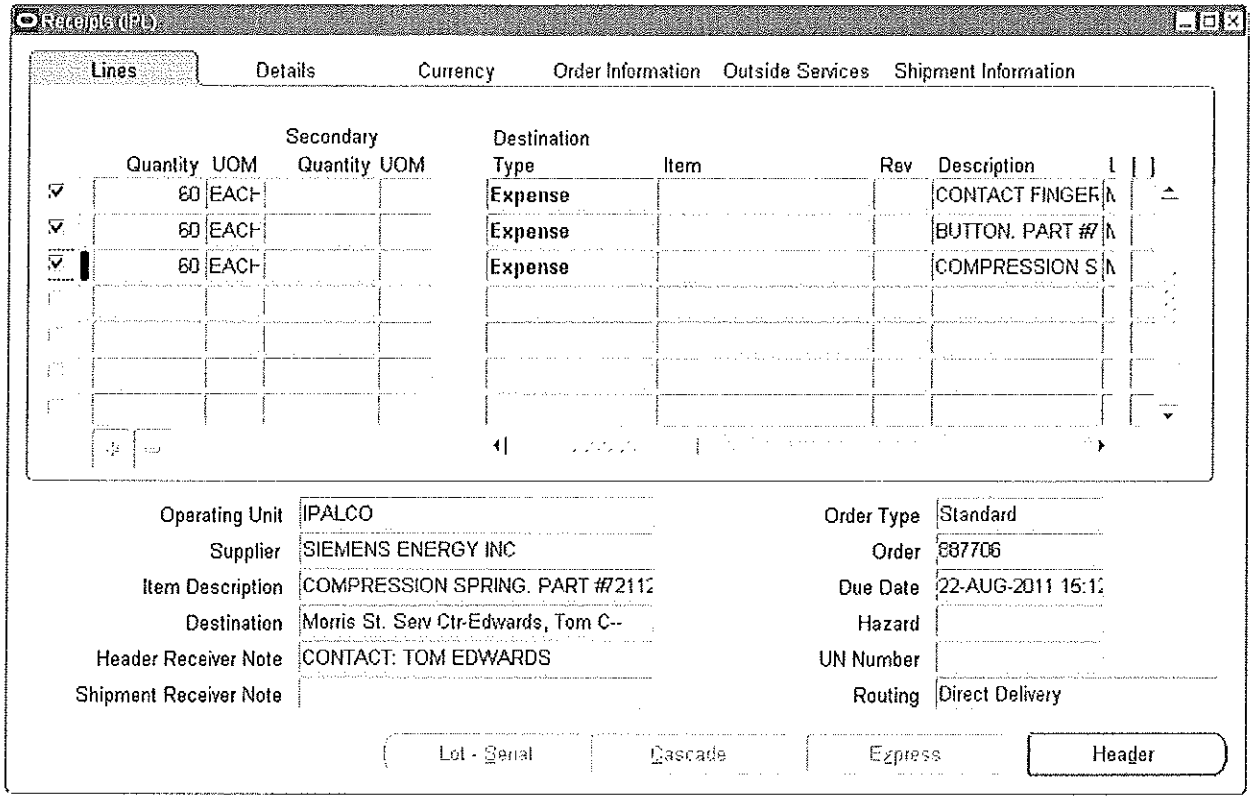


EXHIBIT IPL-Q7e(3)

SIEMENS
Siemens Energy, Inc.
Power Distribution Division
7000 Siemens Road
WENDELL, USA NC 27591

Phone: 919 365-2200
Fax: 919 365-2200

Packing List

Ship to:	Information	
Indainapolis Power & Light Co.	**Bill of Lading No.**	**SIUSG0040098684**
1230 West Morris Street	**Ship Date**	Aug 10, 2011
INDIANAPOLIS IN 46221	**Sales Order Number**	30094319
USA	**Sales Order Date**	Aug 09, 2011
	Purchase Order No.	887706
	Carrier	UPS
	No. Packages	1
	Shipping Type	Best Way
	Ship Freight Amount	PRADD
	Order Type	DOM

Package No.	Package Type	Total	Unit	Package No.	Package Type	Total	Unit
01	1 BOX	18.800	LB				

TOM EDWARDS

Del.Item#	Pkg	Pkg.Item#	Qty	Bk Ord Qty	Unit	Part No.	Description
000100	01	1	60.000	0.000	EA	72211653002	CONTACT FINGER
	Cust. PO #: 887706, PO line #: 1						
000200	01	2	60.000	0.000	EA	71110249002	BUTTON
	Cust. PO #: 887706, PO line #: 2						
000300	01	3	60.000	0.000	EA	72112660001	SPR, COMP .480 OD X .80
	Cust. PO #: 887706, PO line #: 3						

Siemens Energy, Inc., Shipper,

Per _____
Permanent post office address of shipper,

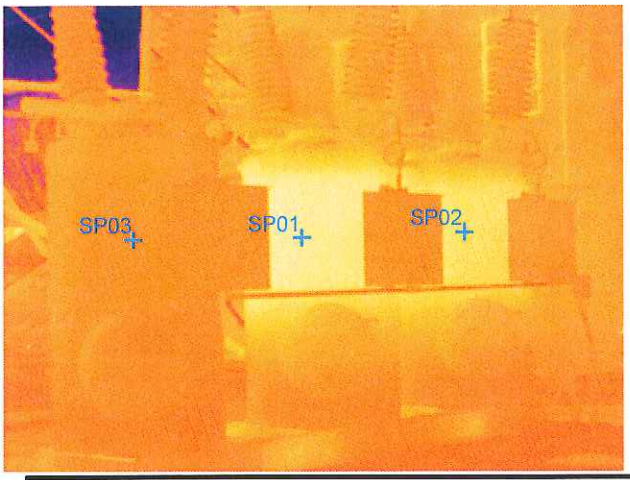
_____ Agent

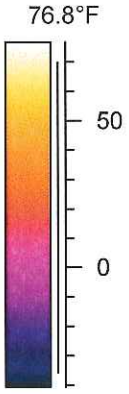
Per _____

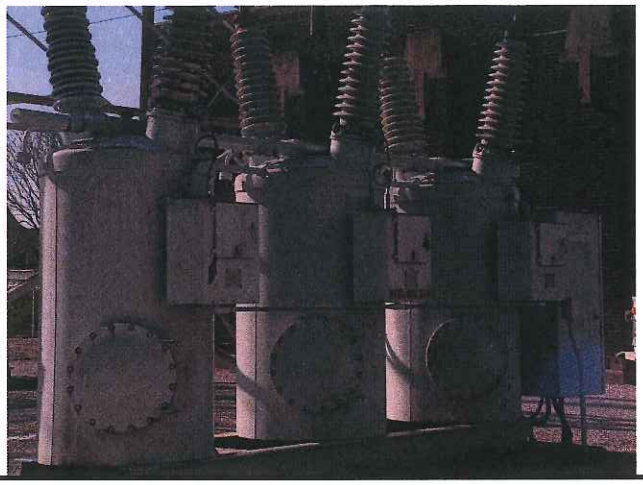
EXHIBIT IPL-Q7e(4)

EMPAC # 10-040128

IPL
INFRARED INSPECTION
FIELD DOCUMENTATION REPORT







IR information	Value
Date of creation	1/4/2012
Time of creation	11:02:17 AM
File name	C0104-02.img
Object parameter	**Value**
Emissivity	0.85
Ambient temperature	32.6°F
Label	**Value**
SP01	68.1°F
SP02	63.3°F
SP03	38.8°F

SPOT1 - AMBIENT =	35.51°F

1 (**Intermediate**)	100 - 150 Deg. F	Repair in the near future
2 (**Serious**)	151 - 250 Deg. F	Repair in immediate future
3 (**Critical**)	> 250 Deg. F	Repair immediately

Severity of problem:	**Serious**

Inspection By	BJ
Date	O1/O4/2012
To Dept.	124
Name	TIM GENTRY
Location	CENTER SUB.
Special ID:	138KV WEST BUS TIE BKR.
Problem	INTERNAL HEATING ON TANK ONE AND TWO.
Rise	35.51 Deg. F

completed by:

COMMENTS:

EXHIBIT IPL-Q7f

Return completed work order to John Willey or Bill Jones.

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TEST REPORT
05-6376601-381861-00

Polychlorinated Biphenyls (PCBs) Report

EPA Method 8082

INDIANAPOLIS POWER & LIGHT
1230 MORRIS STREET

INDIANAPOLIS, . 46221 US
ATTN: LARRY RUDOLF
PO#: BLANKET
Project ID:
Customer ID: BRSA407031

Order#: 381861
Account: 396
Received: 01/05/2012
Reported: 04/09/2012
Lab Contact: JAMES NEAL

Lab Control #	Date Sampled	Sample Identification / Serial Number / Equipment Type	Analyst ID / Batch#	Date Analyzed / Date Extracted	Matrix	Results	PCB Aroclor	Reporting Limit
6376601	01/05/2012	CENTER W BUS TIE SIEMENS OCB A 407031A OCB	LP 123 DF-75 ---------	01/16/2012 01/16/2012 ---------	MIN	2.9 PPM	1260	1.0
Comment:								
6376602	01/05/2012	CENTER W BUS TIE SIEMENS OCB B 407031B OCB	LP 123 DF-75 ---------	01/16/2012 01/16/2012 ---------	MIN	2.5 PPM	1260	1.0
Comment:								
6376603	01/05/2012	CENTER W BUS TIE SIEMENS OCB C 407031C OCB	LP 124 DB-66 ---------	01/16/2012 01/16/2012 ---------	MIN	2.9 PPM	1260	1.0
Comment:								

End of Test Report

Authorized By: _____
SUPERVISING CHEMIST

Notations: - Oil reporting units (mg/kg). Solids dry wt. reporting units (mg/kg). Wipe reporting units in micrograms (ug). Water reporting units in PPB. All other PCB tests in PPM. Quality control documentation is available upon request.

Notations: 2. This test is conducted by a subcontracted laboratory. 3. Subcontracted laboratory has received ISO Standard 17025 accreditation for this test.

EXHIBIT IPL-Q7g(1)

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TEST REPORT
08-6376601-381861-00

Oil Circuit Breaker (OCB) Oil Analysis & Diagnostic Evaluation

INDIANAPOLIS POWER & LIGHT
1230 MORRIS STREET

INDIANAPOLIS, . 46221 US
ATTN:LARRY RUDOLF
PO#:BLANKET
Project ID:
Customer ID: BRSA407031

Serial#: 407031A
Location: CENTER W BUS TIE SIEMENS OCB A
Unit#:
Model:
Bank: **Phase:** A
Fluid: MIN **USGal:** 690

Pole: A
kV: 138
Interrupt Rating:
Mfr: SIEMENS
Year Mf'd: 1982
Sampled By:
Syringe ID:

Control#: 6376601
Order#: 381861
Account: 396
Received: 01/05/2012
Reported: 04/09/2012
Last Filtered:
Last Changed:
Bottle ID: 1

	Lab Control Number:	6376601	5445872	5399647	5391020	5383604
	Date Sampled:	01/05/2012	05/03/2007	11/08/2006	10/13/2006	09/14/2006
	Order Number:	381861	181874	172429	170840	169395
	Oil Temp:					
	Counter (normal):					
	Counter (fault):					
Dissolved Gas Analysis (DGA)	**Hydrogen (H2) (ppm):**			81	<2	6
ASTM	**Methane (CH4) (ppm):**			19	1	3
D-3612	**Ethane (C2H6) (ppm):**			<1	1	<1
	Ethylene(C2H4) (ppm):			25	3	6
	Acetylene (C2H2) (ppm):			70	5	14
	Carbon Monoxide (CO) (ppm):			48	23	64
	Carbon Dioxide(CO2) (ppm):			694	495	793
	Nitrogen (N2) (ppm):			53783	61010	63127
	Oxygen (O2) (ppm):			20935	27429	16679
	Total Dissolved Gas (TDG) (ppm):			75655	88967	80692
	Total Dissolved Combustible Gas (TDCG) (ppm):			243	33	93
	Equivalent TCG percent:			0.2856	0.0231	0.0817
Physical Evaluation						
D-1533	**Moisture in Oil (ppm):**	91	31			
D-1500	**Color Number (Relative):**	L1.5	L1.5			
D-971	**Interfacial Tension (dynes/cm):**	**27.44**	27.0			
D1816	**Dielectric Breakdown 1 mm (kV mm-C):**					
Particle Profile	**Greater than 5 um(c)/ml:**					
D-6786	**Greater than 6 um(c)/ml:**					
	Greater than 10 um(c)/ml:					
	Greater than 14 um(c)/ml:					
	Greater than 21 um(c)/ml:					
	Greater than 38 um(c)/ml:					
	Greater than 70 um(c)/ml:					
Microscopic Evaluation						
	Fibrous Particles %:					
	Metal Particles %:					
	Carbon Particles %:					
	Other Particles %:					
	Opacity Rating:					

Notations: 2. This test is conducted by a subcontracted laboratory. 3. Subcontracted laboratory has received ISO Standard 17025 accreditation for this test.

EXHIBIT IPL-Q7g(2)

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TEST REPORT
08-6376602-381861-00

Oil Circuit Breaker (OCB) Oil Analysis & Diagnostic Evaluation

INDIANAPOLIS POWER & LIGHT
1230 MORRIS STREET

INDIANAPOLIS, . 46221 US
ATTN:LARRY RUDOLF
PO#:BLANKET
Project ID:
Customer ID: BRSA407031

Serial#: 407031B
Location: CENTER W BUS TIE SIEMENS OCB B
Unit#:
Model:
Bank: **Phase:** B
Fluid: MIN **USGal:** 690

Pole: B
kV: 138
Interrupt Rating:
Mfr: SIEMENS
Year Mf'd: 1982
Sampled By:
Syringe ID:

Control#: 6376602
Order#: 381861
Account: 396
Received: 01/05/2012
Reported: 04/09/2012
Last Filtered:
Last Changed:
Bottle ID: 2

	Lab Control Number:	6376602	5445875	5399653	5391022	5383609
	Date Sampled:	01/05/2012	05/03/2007	11/08/2006	10/13/2006	09/14/2006
	Order Number:	381861	181874	172429	170840	169395
	Oil Temp:					
	Counter (normal):					
	Counter (fault):					
Dissolved Gas Analysis (DGA)	**Hydrogen (H2) (ppm):**			92	2	4
ASTM	**Methane (CH4) (ppm):**			27	4	3
D-3612	**Ethane (C2H6) (ppm):**			3	2	<1
	Ethylene(C2H4) (ppm):			41	6	5
	Acetylene (C2H2) (ppm):			101	1	3
	Carbon Monoxide (CO) (ppm):			76	43	52
	Carbon Dioxide(CO2) (ppm):			653	512	613
	Nitrogen (N2) (ppm):			52977	64481	61123
	Oxygen (O2) (ppm):			20941	24486	20104
	Total Dissolved Gas (TDG) (ppm):			74911	89537	81907
	Total Dissolved Combustible Gas (TDCG) (ppm):			340	58	67
	Equivalent TCG percent:			0.3581	0.0464	0.0637
Physical Evaluation						
D-1533	**Moisture in Oil** **(ppm):**	41	30			
D-1500	**Color Number** **(Relative):**	L4.5	L1.5			
D-971	**Interfacial Tension** **(dynes/cm):**	**30.13**	26.3			
D1816	**Dielectric Breakdown 1 mm** **(kV mm-C):**					
Particle Profile	**Greater than 5 um(c)/ml:**					
D-6786	**Greater than 6 um(c)/ml:**					
	Greater than 10 um(c)/ml:					
	Greater than 14 um(c)/ml:					
	Greater than 21 um(c)/ml:					
	Greater than 38 um(c)/ml:					
	Greater than 70 um(c)/ml:					
Microscopic Evaluation						
	Fibrous Particles %:					
	Metal Particles %:					
	Carbon Particles %:					
	Other Particles %:					
	Opacity Rating:					

Notations: 2. This test is conducted by a subcontracted laboratory. 3. Subcontracted laboratory has received ISO Standard 17025 accreditation for this test.

EXHIBIT IPL-Q7g(3)

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Oil Circuit Breaker (OCB) Oil Analysis & Diagnostic Evaluation

INDIANAPOLIS POWER & LIGHT
1230 MORRIS STREET

INDIANAPOLIS, . 46221 US
ATTN:LARRY RUDOLF
PO#:BLANKET
Project ID:
Customer ID: BRSA407031

Serial#: 407031C
Location: CENTER W BUS TIE SIEMENS OCB C
Unit#:
Model:
Bank: **Phase:**
Fluid: MIN **USGal:** 690

Pole:
kV: 138
Interrupt Rating:
Mfr: SIEMENS
Year Mf'd: 1982
Sampled By:
Syringe ID:

Control#: 6376603
Order#: 381861
Account: 396
Received: 01/05/2012
Reported: 04/09/2012
Last Filtered:
Last Changed:
Bottle ID: 3

	Lab Control Number:	6376603	5445876	5399655	5391023	5383611
	Date Sampled:	01/05/2012	05/03/2007	11/08/2006	10/13/2006	09/14/2006
	Order Number:	381861	181874	172429	170840	169395
	Oil Temp:					
	Counter (normal):					
	Counter (fault):					
Dissolved Gas Analysis (DGA)	**Hydrogen (H2) (ppm):**			96	5	6
ASTM	**Methane (CH4) (ppm):**			26	6	3
D-3612	**Ethane (C2H6) (ppm):**			3	3	<1
	Ethylene(C2H4) (ppm):			38	8	6
	Acetylene (C2H2) (ppm):			108	1	7
	Carbon Monoxide (CO) (ppm):			87	64	50
	Carbon Dioxide(CO2) (ppm):			751	588	732
	Nitrogen (N2) (ppm):			61665	58849	62874
	Oxygen (O2) (ppm):			23416	14576	22928
	Total Dissolved Gas (TDG) (ppm):			86190	74100	86606
	Total Dissolved Combustible Gas (TDCG) (ppm):			358	87	72
	Equivalent TCG percent:			0.3301	0.0855	0.0641
Physical Evaluation						
D-1533	**Moisture in Oil** **(ppm):**	64	36			
D-1500	**Color Number** **(Relative):**	L5.0	L1.5			
D-971	**Interfacial Tension** **(dynes/cm):**	**28.99**	26.4			
D1816	**Dielectric Breakdown 1 mm** **(kV mm-C):**					
Particle Profile	**Greater than 5 um(c)/ml:**					
D-6786	**Greater than 6 um(c)/ml:**					
	Greater than 10 um(c)/ml:					
	Greater than 14 um(c)/ml:					
	Greater than 21 um(c)/ml:					
	Greater than 38 um(c)/ml:					
	Greater than 70 um(c)/ml:					
Microscopic Evaluation						
	Fibrous Particles %:					
	Metal Particles %:					
	Carbon Particles %:					
	Other Particles %:					
	Opacity Rating:					

Notations: 2. This test is conducted by a subcontracted laboratory. 3. Subcontracted laboratory has received ISO Standard 17025 accreditation for this test.

EXHIBIT IPL-Q7g(4)

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TEST REPORT
01-6376601-381861-00

INDIANAPOLIS POWER & LIGHT	**Serial#:**	407031A	**Mfr:**	SIEMENS	**Control#:** 6376601
1230 MORRIS STREET	**Location:**	CENTER W BUS TIE SIEMENS OCB A	**kV:**	138	**Order#:** 381861
	Equipment:	OCB	**kVA:**		**Account:** 396
INDIANAPOLIS, . 46221 US	**Compartment:**	OCB	**Year Mf'd:**	1982	**Received:** 01/05/2012
ATTN: LARRY RUDOLF	**Breathing:**	FB	**Syringe ID:**		**Reported:** 04/09/2012
PO#: BLANKET	**Bank:**	**Phase:** A	**Bottle ID:**	1	
Project ID:	**Fluid:**	MIN **USGal:** 690	**Sampled By:**		
Customer ID: BRSA407031	**Model:**				

		Lab Control Number:	6376601	6236211	5445872	5399647	5391020
		Date Sampled:	01/05/2012	12/09/2010	05/03/2007	11/08/2006	10/13/2006
		Order Number:	381861	351866	181874	172429	170840
		Oil Temp:					
Dissolved Gas Analysis (DGA)		**Hydrogen (H2) (ppm):**				81	<2
ASTM		**Methane (CH4) (ppm):**				19	1
D-3612		**Ethane (C2H6) (ppm):**				<1	1
		Ethylene (C2H4) (ppm):				25	3
		Acetylene (C2H2) (ppm):				70	5
		Carbon Monoxide (CO) (ppm):				48	23
		Carbon Dioxide (CO2) (ppm):				694	495
		Nitrogen (N2) (ppm):				53783	61010
		Oxygen (O2) (ppm):				20935	27429
		Total Dissolved Gas (TDG) (ppm):				75655	88967
		Total Dissolved Combustible Gas (TDCG) (ppm):				243	33
		Equivalent TCG (%):				0.2856	0.0231
DGA Diagnostics		**DGA Keys Gas / Interpretive Method:** (most recent sample)					
		DGA TDCG Rate Interpretive Method: (two most recent sample)					
		DGA Cellulose (Paper) Insulation:					
Comment:							
General Oil Quality (GOQ)							
D-1533	**Moisture in Oil**	**(ppm):**	91		31		
D-971	**Interfacial Tension**	**(dynes/cm):**	27.44		27.0		
D-974	**Acid Number**	**(mg KOH/g):**	0.057		0.051		
D-1500	**Color Number**	**(Relative):**	L1.5		L1.5		
D-1524	**Visual Exam.**	**(Relative):**	CLR&SPRK		CLR&SPRK		
D-1524	**Sediment Exam.**	**(Relative):**	TRACE		ND		
D-877	**Dielectric Breakdown**	**(kV):**	**16**		32		
GOQ Diagnostics		**Moisture in Oil:**	Diagnostic not applicable.				
PER IEEE C57.106-2006		**Interfacial Tension:**	Acceptable for in-service oil (25 dynes/cm min).				
(most recent sample)		**Acid Number:**	Diagnostic not applicable.				
		Color Number and Visual:	Acceptable for in-service oil (2.0 max). Acceptable for in-service oil (Not CARBON).				
		Dielectric Breakdown D-877:	Exceeds limit for in-service oil (25 kV min).				
Comment:							
PCB		**Concentration (ppm):**	2.9 PPM		2.8 PPM		
EPA Method 8082		**PCB Type (Arocolor):**	1260		1260/42/54		
		Reporting Limit:	1.0		1.0		
Comment:							

Notations: 2. This test is conducted by a subcontracted laboratory. 3. Subcontracted laboratory has received ISO Standard 17025 accreditation for this test.

EXHIBIT IPL-Q7g(5)

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TEST REPORT
01-6376602-381861-00

INDIANAPOLIS POWER & LIGHT
1230 MORRIS STREET

INDIANAPOLIS, . 46221 US
ATTN: LARRY RUDOLF
PO#: BLANKET
Project ID:
Customer ID: BRSA407031

Serial#: 407031B
Location: CENTER W BUS TIE SIEMENS OCB B
Equipment: OCB
Compartment: OCB
Breathing: FB
Bank: **Phase:** B
Fluid: MIN **USGal:** 690
Model:

Mfr: SIEMENS
kV: 138
kVA:
Year Mf'd: 1982
Syringe ID:
Bottle ID: 2
Sampled By:

Control#: 6376602
Order#: 381861
Account: 396
Received: 01/05/2012
Reported: 04/09/2012

	Lab Control Number:	6376602	6236212	5445875	5399653	5391022
	Date Sampled:	01/05/2012	12/09/2010	05/03/2007	11/08/2006	10/13/2006
	Order Number:	381861	351866	181874	172429	170840
	Oil Temp:					
Dissolved Gas Analysis (DGA)	**Hydrogen (H2) (ppm):**				92	2
ASTM	**Methane (CH4) (ppm):**				27	4
D-3612	**Ethane (C2H6) (ppm):**				3	2
	Ethylene (C2H4) (ppm):				41	6
	Acetylene (C2H2) (ppm):				101	1
	Carbon Monoxide (CO) (ppm):				76	43
	Carbon Dioxide (CO2) (ppm):				653	512
	Nitrogen (N2) (ppm):				52977	64481
	Oxygen (O2) (ppm):				20941	24486
	Total Dissolved Gas (TDG) (ppm):				74911	89537
	Total Dissolved Combustible Gas (TDCG) (ppm):				340	58
	Equivalent TCG (%):				0.3581	0.0464
DGA Diagnostics	**DGA Keys Gas / Interpretive Method:** (most recent sample)					
	DGA TDCG Rate Interpretive Method: (two most recent sample)					
	DGA Cellulose (Paper) Insulation:					
Comment:						

General Oil Quality (GOQ)				
D-1533	**Moisture in Oil**	**(ppm):**	41	30
D-971	**Interfacial Tension**	**(dynes/cm):**	30.13	26.3
D-974	**Acid Number**	**(mg KOH/g):**	0.069	0.050
D-1500	**Color Number**	**(Relative):**	**L4.5**	L1.5
D-1524	**Visual Exam.**	**(Relative):**	**CARBON**	CARBON
D-1524	**Sediment Exam.**	**(Relative):**	TRACE	TRACE
D-877	**Dielectric Breakdown**	**(kV):**	37	44

GOQ Diagnostics	**Moisture in Oil:**	Diagnostic not applicable.
PER IEEE C57.106-2006	**Interfacial Tension:**	Acceptable for in-service oil (25 dynes/cm min).
(most recent sample)	**Acid Number:**	Diagnostic not applicable.
	Color Number and Visual:	Exceeds limit for in-service oil (2.0 max). Exceeds limit for in-service oil (Not CARBON).
	Dielectric Breakdown D-877:	Acceptable for in-service oil (25 kV min).
Comment:		

PCB	**Concentration (ppm):**	2.5 PPM	3.3 PPM
EPA Method 8082	**PCB Type (Arocolor):**	1260	1260/42/54
	Reporting Limit:	1.0	1.0
Comment:			

Notations: 2. This test is conducted by a subcontracted laboratory. 3. Subcontracted laboratory has received ISO Standard 17025 accreditation for this test.

EXHIBIT IPL-Q7g(6)

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TEST REPORT
01-6376603-381861-00

INDIANAPOLIS POWER & LIGHT	**Serial#:** 407031C	**Mfr:** SIEMENS	**Control#:** 6376603
1230 MORRIS STREET	**Location:** CENTER W BUS TIE SIEMENS OCB C	**kV:** 138	**Order#:** 381861
	Equipment: OCB	**kVA:**	**Account:** 396
INDIANAPOLIS, . 46221 US	**Compartment:** OCB	**Year Mf'd:** 1982	**Received:** 01/05/2012
ATTN: LARRY RUDOLF	**Breathing:** FB	**Syringe ID:**	**Reported:** 04/09/2012
PO#: BLANKET	**Bank:** **Phase:**	**Bottle ID:** 3	
Project ID:	**Fluid:** MIN **USGal:** 690	**Sampled By:**	
Customer ID: BRSA407031	**Model:**		

	Lab Control Number:	6376603	6236214	5445876	5399655	5391023
	Date Sampled:	01/05/2012	12/09/2010	05/03/2007	11/08/2006	10/13/2006
	Order Number:	381861	351866	181874	172429	170840
	Oil Temp:					
Dissolved Gas Analysis (DGA)	**Hydrogen (H2) (ppm):**				96	5
ASTM	**Methane (CH4) (ppm):**				26	6
D-3612	**Ethane (C2H6) (ppm):**				3	3
	Ethylene (C2H4) (ppm):				38	8
	Acetylene (C2H2) (ppm):				108	1
	Carbon Monoxide (CO) (ppm):				87	64
	Carbon Dioxide (CO2) (ppm):				751	588
	Nitrogen (N2) (ppm):				61665	58849
	Oxygen (O2) (ppm):				23416	14576
	Total Dissolved Gas (TDG) (ppm):				86190	74100
	Total Dissolved Combustible Gas (TDCG) (ppm):				358	87
	Equivalent TCG (%):				0.3301	0.0855
DGA Diagnostics	**DGA Keys Gas / Interpretive Method:** (most recent sample)					
	DGA TDCG Rate Interpretive Method: (two most recent sample)					
	DGA Cellulose (Paper) Insulation:					
Comment:						

General Oil Quality (GOQ)				
D-1533	**Moisture in Oil**	**(ppm):**	64	36
D-971	**Interfacial Tension**	**(dynes/cm):**	28.99	26.4
D-974	**Acid Number**	**(mg KOH/g):**	0.080	0.048
D-1500	**Color Number**	**(Relative):**	**L5.0**	L1.5
D-1524	**Visual Exam.**	**(Relative):**	**CARBON**	CARBON
D-1524	**Sediment Exam.**	**(Relative):**	TRACE	TRACE
D-877	**Dielectric Breakdown**	**(kV):**	**19**	37

GOQ Diagnostics	**Moisture in Oil:**	Diagnostic not applicable.
PER IEEE C57.106-2006	**Interfacial Tension:**	Acceptable for in-service oil (25 dynes/cm min).
(most recent sample)	**Acid Number:**	Diagnostic not applicable.
	Color Number and Visual:	Exceeds limit for in-service oil (2.0 max). Exceeds limit for in-service oil (Not CARBON).
	Dielectric Breakdown D-877:	Exceeds limit for in-service oil (25 kV min).
Comment:		

PCB	**Concentration (ppm):**	2.9 PPM	3.2 PPM
EPA Method 8082	**PCB Type (Arocolor):**	1260	1260/42/54
	Reporting Limit:	1.0	1.0
Comment:			

Notations: 2. This test is conducted by a subcontracted laboratory. 3. Subcontracted laboratory has received ISO Standard 17025 accreditation for this test.

EXHIBIT IPL-Q7g(7)

Hathaway Replay Plus
Record header for 9 at SOUTHWEST
==========

Station: SOUTHWEST
Device Type: IDM

Date: 1/16/2012 10:46:06.358088
Operation: Sensors: 10

ANNOTATION

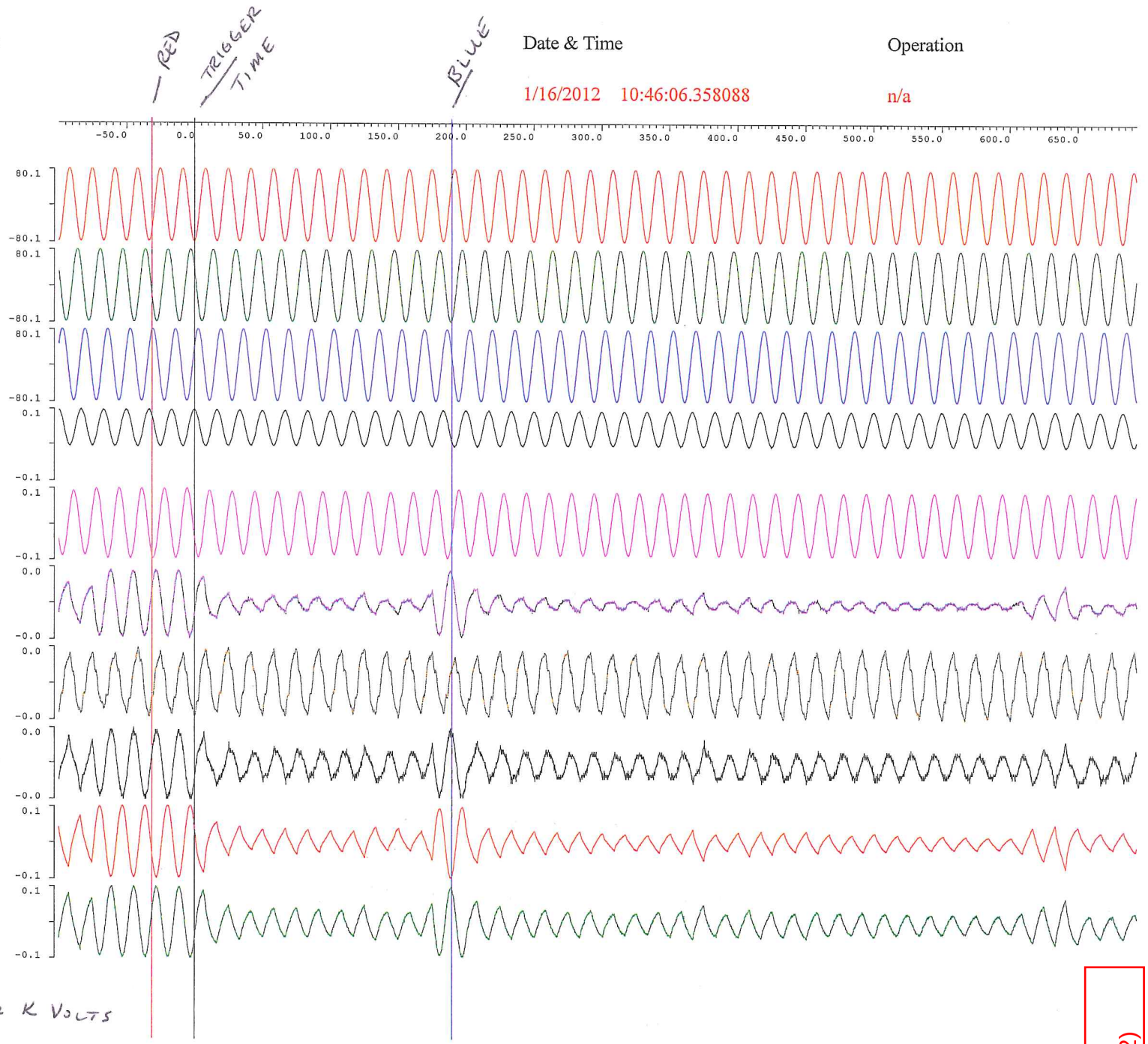
_Record imported\downloaded at 1/16/2012 11:38:31 AM.

Filename - PDM229090.dat

EXHIBIT - IPLQ7h(1)

Replay Plus Records:

Station name	Cause of Trigger	Date & Time	Operation
SOUTHWEST	Sensor	1/16/2012 10:46:06.358088	n/a



VALUE AT RED	VALUE AT BLUE	
79.965 R	80.051 RkV	138KV W BUS VA
79.925 R	79.955 RkV	138KV W BUS VB
80.049 R	80.008 RkV	138KV W BUS VC
0.104 R	0.104 RkA	132-02 LINE IA
0.136 R	0.132 RkA	132-02 LINE IC
0.037 R	0.035 RkA	132-02 LINE IN
0.035 R	0.029 RkA	132-04 LINE IA
0.021 R	0.020 RkA	132-04 LINE IN
0.119 R	0.114 RkA	132-10 LINE IN
0.089 R	0.086 RkA	132-74 LINE IN

VALUES ARE IN K AMPS OR K VOLTS

0.104 KA = 0.104 x 1000 = 104 AMPS

80.049 KV = 80.049 x 1000 = 80,049 VOLTS

TM = -31.4 ms TR = 189.4 ms TM-TR = -220.7 ms

EXHIBIT IPLQ7h(2)

Replay Plus Records:

Station name	Cause of Trigger	Date & Time	Operation
SOUTHWEST	Sensor	1/16/2012 10:46:06.358088	n/a

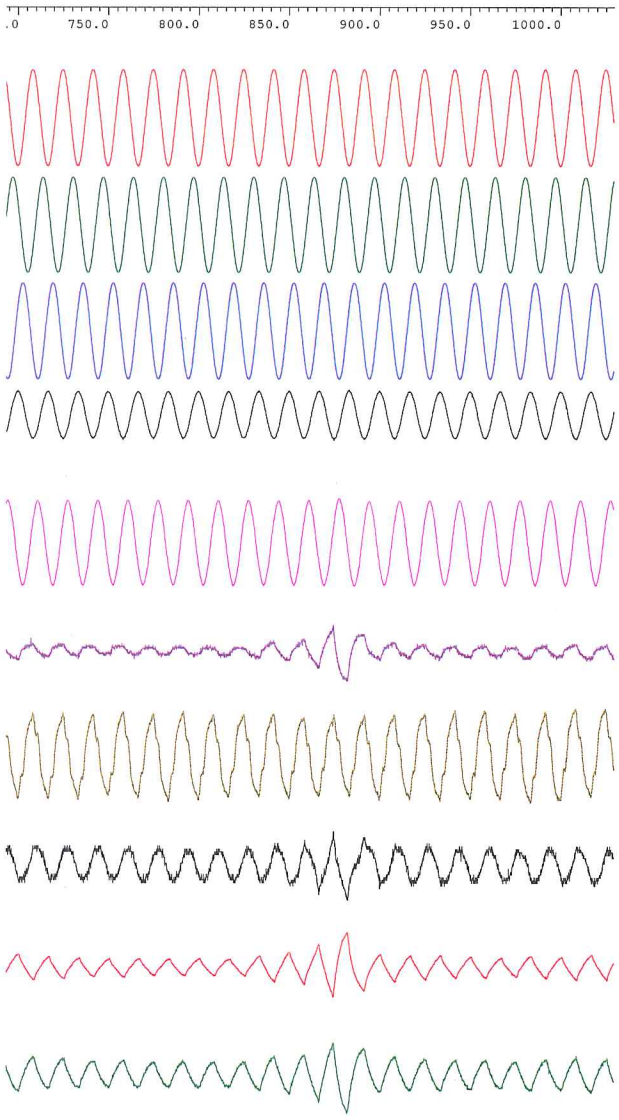


EXHIBIT - IPLQ7h(3)