Proceeding No.: I.08-11-006
Exhibit No.:
Witness: Gerry Akin

DIRECT TESTIMONY OF

GERRY AKIN

SAN DIEGO GAS & ELECTRIC COMPANY

(WITCH FIRE)

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA
June 5, 2009

SDGE

DIRECT TESTIMONY OF
GERRY AKIN
SAN DIEGO GAS & ELECTRIC COMPANY

Q: Please state your name and title.

A: Gerry Akin. Up until May 15, 2009, I was the Manager of the Transmission Engineering and Design group at SDG&E. I am now a Project Manager for the Sunrise Powerlink Project. My detailed qualifications are appended to this testimony.

Q: What were your responsibilities as the Manager of the Transmission Engineering and Design group?

A: I supervised a group of engineers, designers and support staff who are responsible for the design and engineering of SDG&E's transmission lines, including overhead and underground lines operating at 69kV, 138kV, 230kV, and 500kV. The Transmission Engineering and Design group designs the structures that support and carry the wires, as well as specify the wires and all the hardware used in the construction.

Q: What is the purpose of your testimony in these proceedings?

A: I am testifying regarding SDG&E's overhead transmission construction standards and their compliance with General Order 95 and the construction history of the span between SDG&E poles Z416675 and Z416676, which is part of Tie Line 637 ("TL637"). I am also testifying regarding the condition of the span after the extreme wind event of October 21, 2007 and the loss of tension in the C phase conductor observed at that time. Finally, I am testifying regarding the unavailability of evidence relevant to an analysis by SDG&E regarding the start of the Witch Fire on October 21, 2007.

Q: Cal Fire has indicated that the Witch Fire originated near the span between SDG&E poles Z416675 and Z416676 on TL637 – are you qualified to testify as to the design and construction of those lines and issues relating to General Order 95 compliance?

A: Yes. I have worked at SDG&E for 32 years and have experience in both transmission and distribution engineering. I am a registered professional engineer in the state of

California and have been involved with SDG&E's overhead design and construction (for both transmission and distribution) for approximately 10 years.

Q: Do you believe the SDG&E transmission facilities that, according to Cal Fire, were associated with the ignition of the Witch Fire were in compliance with General Order 95 prior to the wind event of October 21, 2007?

A: Yes. I have seen no evidence that the SDG&E facilities associated with the span between poles Z416675 and Z416676 were out of compliance with General Order 95 prior to the extreme wind event of October 21, 2007. A review of the original design documents confirms that the design was General Order 95 compliant and that conductor clearances in this span met or exceeded the clearance specified in General Order 95, Rule 38, Table 2. To my knowledge, there is no history of operational problems with this span, and only routine maintenance and repairs have been necessary since construction. In fact, the facilities were inspected as late as March 7, 2007 and were found to be in compliance – i.e., no unusual conditions or potential infractions were noted in connection with that inspection. Based on current information, I do believe that the extreme wind event on October 21, 2007 was the likely cause for a loss of tension in the C phase conductor in the subject span that was observed after the Witch Fire. And, as I describe in more detail below, modeling based on a survey done after the Witch Fire confirms that the subject span is in compliance with General Order 95 when the tension in the C phase conductor is increased to approximately that of phases A and B, as per the design.

Q: Can you describe the survey and modeling done after the fire?

A: A survey of poles Z416674, Z416675, Z416676, and Z416677 and the conductors in those spans was performed after the wind event on October 21, 2007. The intent of the survey was to determine the tension in the conductors, without using a direct means of mechanically measuring the tension. Because the tension in the conductors will vary depending on the electrical load, air temperature, wind speed, and sunlight, there is no single answer that describes the tension at all times, so the data collected from this survey was used to develop a PLS-CADD model of the pole structures and conductors. This model allows us to calculate the tensions in the conductors, based on the temperature at the time the survey measurements were taken. The

model indicated that the tension in phase C was 724 pounds, while phase A was 994 pounds and phase B was 1,049 pounds. Based on the original design, I would expect to see conductor tensions of about 1,050 pounds in the conductors between poles Z416675 and Z416676. The 50-pound difference in tension in phase A is not significant and can be caused by normal aging processes, but the tension in phase C was over 300 pounds less than expected. That would explain the increased sag in the C phase conductor and also the reduced clearance between the C phase and the other two phases.

Q: What was the state of the SDG&E facilities in the span between poles Z416675 and Z416676 as observed after the extreme wind event of October 21, 2007?

A: There was evidence of wind-induced pole motion at the butts of the poles. There was also evidence of possible movement of the insulators, or twisting of the poles. The hardware was all intact. The conductors were all connected to the insulator clamps, and there was no obvious mechanical failure except for the loss of tension in the phase C conductor. Based on the post-fire survey and modeling, the C phase conductor experienced a loss of tension that resulted in a reduction in conductor clearances in the span between poles Z416675 and Z416676. The tension of the C phase conductor was found to be at about two-thirds of the tension we would have expected per the design. Per the design, the C phase conductor should have been at the same tension as the A and B phases, and the vertical clearance between the conductors should have been at least four feet.

Q: Can you describe the transmission facilities at issue?

A: Tie Line 637, which includes poles Z416675 and Z416676, was installed in 1960. As of October 21, 2007, poles Z416675 and Z416676 were tangent wood pole structures with post-type insulators. (At the time that poles Z416675 and Z416676 were installed, both poles were of a cross-arm type of construction; prior to 1999, those poles were modified to conform to a post-type insulator construction.) Ground clearance of the lowest conductor is approximately 53 feet at pole Z416675 and approximately 58 feet at pole Z416676. The conductor configurations on poles Z416675 and Z416676 are different due to a transposition made for conductor phasing to balance impedance on each phase of the circuit. I am attaching photographs of the pole top

configurations and a diagram of the facilities as Exhibits 1 and 2 to this testimony and can also describe them. The configuration at pole Z416675 has the A phase conductor on the southeast side of the pole and the B and C phase conductors on the northwest side of the pole, with the C phase conductor on top. The configuration at pole Z416676 has the C and A phase conductors on the southeast side of the pole, again with the C phase on top, and the B phase on the northwest side of the pole.

Q: You have indicated that the conductor configurations are different at the poles due to a transposition. What is a transposition?

A: A transposition is essentially a change of conductor positions at intervals along a transmission line so that each conductor occupies the position of every other conductor for an equal distance in order to balance the inductance and electrical currents of the phases. It is a common utility industry practice to include transpositions in the design of transmission lines.

Q: How long is the span between poles Z416675 and Z416676?

A: About 613 feet.

Q: What type of conductors were in place in that span on October 21, 2007?

A: 3/0 Aluminum Conductor Steel Reinforced ("ACSR"), with a center strand of steel and 6 strands of aluminum on the outside.

Q: To your knowledge, how was the span between poles Z416675 and Z416676 designed?

A: SDG&E designs its overhead transmission systems in accordance with General Order 95 and SDG&E standards. SDG&E considers a number of factors in the design process, including conductor size and type, wind speed, sag and tension calculations and span length. SDG&E uses standard sag and tension tables to ensure adequate clearance above the ground and above foreign utilities.

Q: What wind speed was the subject span designed to withstand?

A: The spans were designed pursuant to General Order 95 and SDG&E standards, which take into account a wind pressure of 8 pounds per square foot of projected area on cylindrical surfaces and equates to a wind speed of 56 mph.

Q: Do you have any reason to believe that the subject span was not constructed to comply with General Order 95 when it was installed or maintained?

A: No, and design documents, the inspection history and modeling done based on the post-fire survey confirm that the subject span was in compliance with General Order 95 prior to the loss of tension in the C phase conductor observed after the wind event.

Q: To your knowledge, why would the tension of the C phase have been reduced as observed following the wind event?

A: The exact reasons are unknown at this time because the conductors and other relevant evidence have been unavailable to SDG&E to inspect and test. Without an opportunity to fully inspect and test all relevant evidence, we cannot rule out the possibility that there could have been some physical change to the facilities that could have impacted the tension of the C phase conductor. However, I believe the most likely explanation is that the winds associated with the extreme wind event on October 21, 2007 caused damage to the C phase conductor. This conductor is supported by the strength of the six outside aluminum strands and the strength of a single steel strand core. It is possible that the steel core was broken by the force of the winds on October 21, 2007, or that the winds induced slippage of the steel core. In either case, this would result in a reduction in tension, and a corresponding increase in sag similar to what was observed in the field after the wind event and during the evidence retrieval in June 2008.

Q: Is SDG&E able to provide testimony at this time regarding the likelihood of these different scenarios?

A: No, because SDG&E has not had an opportunity to inspect and test relevant physical evidence in the custody of Cal Fire, including the SDG&E conductors and attached hardware, the Z416676 and Z416675 pole tops and a splice from the span between poles Z416677 and Z416678.

Q: How did Cal Fire come to be in possession of this evidence?

A: In June 2008, the conductors, poles, insulators and guys associated with poles Z416674, Z416675 and Z416676 on TL637 were visually inspected and subjected to various measurements and tests in accordance with protocols established by Cal Fire. The conductors

were removed from the spans between poles Z416674, Z416675, and Z416676, and 15 feet past pole Z416676 (where the new conductor was spliced to the existing conductor), and the pole top of pole Z416675 was removed as was the associated equipment. These items were taken into custody by Cal Fire. The retrieval of this evidence was covered by a separate protocol established by Cal Fire.

Q: Does SDG&E have any information regarding when the loss of tension in the C phase conductor occurred?

A: Based on post-wind event observations and survey measurements, the reduced tension in the C phase conductor resulted in that conductor having a greater sag than the other two conductors. However, nothing was noted or reported regarding the C phase conductor prior to October 21, 2007. SDG&E transmission patrolmen and construction contractors were near that span in previous months. During inspections of the facilities at issue as late as March 2007, no infractions or suspected clearance issues were noted. Additionally, PAR Electric, a contractor for SDG&E, and an SDG&E Contract Administrator from Herman Weissker, Inc., did not report any issues with the tension or sag of the conductors at issue when pole Z416674 was replaced in June 2007.

Q: Is there anything else that leads you to believe the reduction in tension with the C phase did not occur prior to the wind events of October 2007?

A: Yes. Records dating back to June 6, 2000 confirm that there were no phase-to-phase faults involving the C phase conductor prior to October 21, 2007, except for one fault on February 10, 2002 with unknown phase records. The absence of the phase-to-phase faults involving C phase leads me to believe that the separation of the conductors was not reduced prior to October 21, 2007. Additionally, after TL 637 was re-energized to reestablish service to the Santa Ysabel substation, another phase-to-phase fault involving phase C occurred on November 12, 2007, during what I understand to be lower winds than those experienced on October 21, 2007. This is also a strong indication that the loss of tension in the C phase conductor and reduced conductor clearance did not exist prior to the extreme wind event on October 21, 2007. After November 12, 2007, the line was de-energized, and it remained so until after the evidence retrieval

in June of 2008. Altogether, the lack of phase-to-phase faults involving C phase prior to October 21, 2007, and the occurrence of these faults during the extreme wind event, along with the additional fault involving C phase within a few weeks of re-energizing TL637 in lower wind conditions all make a strong case that something happened on October 21, 2007 that changed the condition of the facilities.

Q: Are you aware that the Cal Fire report and the CPSD report state that the SDG&E conductors between poles Z416675 and Z416676 show evidence of burns and possible arcing between the conductors?

A: Yes, and I have observed the burn marks myself in photographs of the conductors and from the ground during a field inspection of the facilities in connection with the evidence retrieval in June 2008.

Q: Do you agree that the burn marks indicate that the conductors contacted each other, or came close enough to cause an electrical arc between the two conductors?

A: There are several marks on all three conductors, which indicate to me that the conductors may have experienced electrical arcing that caused the burn marks. However, I cannot verify whether these marks were caused by arcing on October 21, 2007, and I cannot rule out the possibility that the burn marks were caused by other means, such as lightning. The conductors have not yet been subjected to forensic investigation because they are in Cal Fire's possession and unavailable to SDG&E. Until such investigation occurs, SDG&E cannot make a determination regarding the age or the cause of the burn marks on the conductors.

Q: Has SDG&E been able to make a determination as to whether there is enough metal missing from the conductors to have started a fire in the area of origin identified by Cal Fire, which is 56 feet away horizontally from the conductors?

A: No. SDG&E cannot make such a determination until it has an opportunity to further examine the conductors and perform any necessary testing. I believe this is highly relevant because my understanding is that Cal Fire was unable to locate metal particles on the ground near the suspected area of origin.

Q: Are you aware that the CPSD has alleged that SDG&E failed to design, construct and maintain the transmission facilities at issue in accordance with General Order 95, Rule 31.1 and that SDG&E failed to maintain clearances between conductors required by General Order 95, Rules 31.1 and 38?

A: Yes, and I disagree.

Q: Did SDG&E comply with General Order 95, Rule 31.1?

A: Yes. Rule 31.1 requires electrical supply and communications circuits to be designed, constructed, and maintained for their intended use, regard being given to the conditions under which they are to be operated, to enable the furnishing of safe, proper, and adequate service. SDG&E's design and construction was in compliance with General Order 95, and the facilities at issue were designed to withstand a wind pressure of at least 8 pounds per square foot of projected area on these conductors (which equates to a wind speed of 56 miles per hour). As described in other testimony, the facilities are frequently and thoroughly inspected by experienced inspectors, and necessary maintenance is performed in a timely fashion.

Q: Do you agree with the CPSD's allegation that, based on the events of October 21, 2007, SDG&E failed to consider local conditions in the design of TL 637?

A: No. Rule 31.1 requires that lines be designed, constructed and maintained in accordance with accepted good practice for the given local conditions known at the time by those responsible for the design, construction, or maintenance of the lines and equipment. As I have described, the facilities were designed in accordance with General Order 95 and to withstand a wind speed of 56 miles per hour. My understanding is that the winds in this area were likely in excess of 80 mph on October 21, 2007. A wind event of that magnitude is extremely unusual and not a known local condition.

Q: Do you believe that SDG&E violated Rule 38 with respect to the transmission facilities at issue?

A: No. Rule 38 states that "Conductors may be deadended at the crossarm or have reduced clearances at points of transposition, and shall not be held in violation of Table 2, Cases 8-15, inclusive." This suggests that reduced clearances between conductors at points of

transposition, such as was observed in the span between poles Z416675 and Z416676 after the October 21, 2007 wind event, do not violate Rule 38. Even assuming that Rule 38 clearances are required with respect to points of transposition, I do not believe the reduced clearance resulting from the reduction in tension of the C phase conductor was a violation of Rule 38. As described above, I have not seen any indication that the conductors at issue were out of compliance with General Order 95 prior to the events of October 21, 2007, and the indications are that it was the extreme wind event on October 21, 2007 that likely caused the tension reduction in the C phase (as a result of conductor failure or otherwise). Furthermore, while Rule 38 expressly states that the requisite clearance cannot be reduced more than 10% as result of loading, the evidence indicates that the winds in the area on October 21, 2007 were in excess of 80 mph, far exceeding the loading requirements for the facilities at issue. Therefore, a resulting failure of the facilities would not constitute a violation of Rule 38.

QUALIFICATIONS

My name is Gerry Akin. My business address is 8330 Century Park Court, San Diego, California, 92123. I have been with San Diego Gas & Electric Company ("SDG&E") for almost 32 years, and I have experience in both transmission and distribution engineering. Until very recently, my title was Manager of the Transmission Engineering and Design group at SDG&E, and I supervised a group of engineers, designers and support staff who are responsible for the design and engineering of SDG&E's transmission lines. My current title is Project Manager for the Sunrise Powerlink Project. I have a Bachelors of Science Degree from New Mexico State University in Electrical Engineering, and I am a registered professional engineer in the state of California.