TRI-COUNTY ELECTRIC
COOPERATIVE, INC.
EXHIBIT F

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STATE OF ILLINOIS
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TRI-COUNTY ELECTRIC COOPERATIVE, INC.,	)	
Complainant,	)	
vs.	)	Case No. 05-0767
ILLINOIS POWER COMPANY, d/b/a AMEREN IP,	)	
Respondent.	)	

PREPARED REBUTTAL TESTIMONY OF ROBERT C. DEW, JR. P.E.
IN SUPPORT OF TRI-COUNTY ELECTRIC COOPERATIVE, INC.

Q: Please state your name.

A: Robert C. Dew, Jr. P.E.

Q: Are you the same Robert C. Dew Jr. who has provided Prepared Direct Testimony in this docket filed September 29, 2009?

A: Yes.

Q: Have you had an opportunity to review the Prepared Direct Testimony and the Engineering Report of Keith Malmedal, Ph.D., P.E. filed in support of Illinois Power Company dba AmerenIP?

A: Yes.

Q: Have you also had an opportunity to review the Prepared Direct Testimony of Michael W. Tatlock, P.E., CPQ, filed in this docket on behalf of Illinois Power Company dba AmerenIP along with the documents that were attached as exhibits to that testimony?

1 A: Yes.

2 Q: With respect to the Prepared Direct Testimony of Michael W. Tatlock and the additional
3 documents regarding the Texas substation which were marked as Exhibit 1.1 and
4 characterized as Bills of Material with respect to the Texas substation, were you provided
5 any of these documents prior to being furnished a copy of Mr. Tatlock's Prepared Direct
6 Testimony?

7 A: No. All of the documents included in the AmerenIP Exhibit 1.1 are related to the
8 material that was utilized when making additions, revisions, or changes to the Texas
9 substation. These documents note the various materials utilized in those changes. Prior
10 to being furnished Mr. Tatlock's Direct Testimony and Exhibit 1.1, I had been furnished
11 numerous documents evidencing the plans that were the basis for the additions, revisions
12 and modifications to the IP Texas substation. However the documents IP furnished
13 during discovery regarding the Texas substation did not include the documents included
14 in the Tatlock Exhibit 1.1. The documents included in Exhibit 1.1 amplify and disclose
15 the materials used to accomplish the additions, revisions, and changes to the IP Texas
16 substation during the period of time in question.

17 A: Do the documents marked AmerenIP Exhibit 1.1 provided by Mr. Tatlock in his Prepared
18 Direct Testimony substantiate your conclusion that IP made multiple additions, revisions
19 or changes to the Texas substation during the period 1957 through May 2003?

20 Q: Yes.

21 Q: Is there anything provided in the documents by Michael Tatlock attached to his Prepared
22 Direct Testimony that would alter the conclusion that you came to with regard to the
23 changes and/or modifications by IP to the Texas substation during that time period?

1 A: No. The list of modifications to the Texas substation made by IP during the period from
2 August 1957 through May of 2003 as noted in my Prepared Direct Testimony and my
3 engineering report is not altered by any of the information provided by Michael Tatlock in
4 his Prepared Direct Testimony and the documents attached thereto. In fact, the
5 documents consisting of Bills of Material utilized with respect to the modification to the
6 Texas substation which are attached to Mr. Tatlock's Prepared Direct Testimony as
7 Exhibit 1.1 substantiate my conclusion that substantial modifications were made to the
8 Texas substation during the period August 1957 through May of 2003.
9 Q: Is Mr. Tatlock's Prepared Direct Testimony correct at page 4, lines 15 through 20, when
10 he states there have been no phases of electric energy added to the IP Texas substation at
11 any time and that therefore, there has been no modification or change to the Texas
12 substation in terms of the Service Area Agreement between the parties?
13 A: Mr. Tatlock's testimony is correct in the fact that the Texas substation when first
14 constructed brought three phases of electric energy to the substation from IP's 69,000 kV
15 transmission line feeding the substation and distributed three phases of electric energy
16 through all of the circuits emanating from the Texas substation to provide electric service
17 to IP customers. This included Citation Oil & Gas Corporation who was a customer of
18 IP served through the Texas substation. The electric service delivered by IP from the
19 Texas substation to Citation Oil & Gas Corporation is three phase. In fact, all of the
20 electric energy delivered to any customer utilizing three phase electricity for the
21 customer's motors and equipment will be three phase.
22 Q: In the electric utility industry, how many phases of electric current are there?
23 A: There can be single phase electric service which supplies electric service to small motors

1 and a normal household. There is two phase, or V phase which provides electric service
2 to larger motors and equipment. In addition, three phase electric service is also provided
3 to customers who have equipment that operates only on three phases of electric service.
4 However, the voltage may be different in each case.
5 Q: Are all substations, similar to the Texas substation and the Tri-County Salem substation,
6 three phase substations?
7 A: Yes. I know of no substation constructed by an electric utility that contains only single
8 phase or two phase electric current. All these substations are constructed to handle three
9 phase electric current.
10 Q: Why are substations constructed to handle three phases of electric current?
11 A: Electric utilities construct substations to handle three phases of electric current because
12 substations are the heart of an electric supplier's distribution system for separate
13 geographic areas of the electric supplier's system. The electric supplier transmits electric
14 current from a generating station across 34.5 kV or 69kV transmission lines to the
15 substations where the current is reduced to a lower voltage such as 12.47 kV as in the
16 instant case to be transmitted to distribution lines at 12.47 kV or a similar voltage.
17 Individual customers are then served from the 12.47 kV distribution lines via step down
18 transformers as in this case. Because some of these customers will need three phase
19 electric service as compared to single phase or two phase service each substation is
20 constructed in the first instance to handle three phases of electric service.
21 Q: Is the conclusion put forth by Mr. Tatlock that since the Texas substation has always been
22 three phase, there has been no change or modification in the Texas substation that would
23 cause the Texas substation to become a new point of delivery under the Service Area

1 Agreement between Tri-County and IP?

2 A: If, Mr. Tatlock's conclusion is correct and if the substations of Tri-County and IP are
3 intended to be considered as delivery points under the Service Area Agreement for each
4 of their respective customers served through a substation, then any modification or
5 change to that substation to allow the electric supplier to serve additional electric load
6 required by their customers would not constitute a change or modification to the
7 substation delivery point under the Service Area Agreement because substations are
8 initially constructed with the maximum number of phases utilized in our electric utility
9 industry, that is three phases of electric energy. Using Mr. Tatlock's conclusion, Section
10 1(d) would have no meaning in the Service Area Agreement and each electric supplier
11 could continue to increase the size of its three phase substation to provide for additional
12 load required of customers in the area without creating a change in the substation
13 sufficient to create a new point of delivery.

14 Q: Have there in fact been modifications to the Texas substation that allow IP to serve
15 additional electric loads of its customers?

16 A: Yes. I have outlined in my prepared Direct Testimony starting at page 8 lines 16 through
17 page 12 line 10 all of the modifications and changes made during the period of August
18 1957 through May of 2003 to the Texas substation by IP that allowed IP to serve
19 additional electric load.

20 Q: Has either Mr. Tatlock or Mr. Malmedal contradicted your conclusion that the
21 modifications and changes to the Texas substation over that period of time allowed IP to
22 serve additional electric load of its customers including Citation from the Texas
23 substation?

1 A: No. They have not and I take their failure to contest that point as an admission that in
2 fact IP's modifications to the Texas substation over the period of time in question
3 increased the capacity of the substation to provide additional electric service to the IP
4 customers, including Citation, who are served through the Texas substation.
5 Q: Are there ever instances in the electric utility industry where a customer requires a change
6 in the phase of electric current provided to the customer?
7 A: Yes. Quite often, the customer will have single phase service because such service is
8 adequate to provide the necessary electric current to operate the customer's residence,
9 garage, motors and equipment. Later, the customer finds there is a need to acquire larger
10 motors which operate more efficiently on three phases of electric current. The addition
11 of three phase electric motors generally increases the size of the electric load and capacity
12 requirements of the customer. As a result, the customer will require a three phase
13 transformer to be installed at the customer's location and replacing the customer's single
14 phase transformer along with associated equipment necessary to provide for the
15 additional electric load and capacity required to operate three phase motors and
16 equipment. The voltage carried by the distribution line to the customer's location will
17 generally still be the same but with two additional primary phases of electric current
18 added. However, a new three phase transformer and associated equipment will have to
19 be installed in order to step the voltage down to the appropriate voltage to safely operate
20 the customer's motors and equipment with three phase electric current.
21 Q: Does Section 1(d) of the Service Area Agreement between IP and Tri-County provide that
22 in such an instance the existing delivery point consisting of a single phase transformer
23 becomes a new delivery point because of the modifications made?

1 A: Yes. It clearly does. The modification consisted of a transformer to step the voltage
2 down from the distribution line to a voltage usable by the motors and equipment of the
3 customer along with necessary upgrading of the distribution line to provide three phases
4 of current rather than one phase or single phase current to the customer's location.
5 Q: What if any difference is there in the previous example of a change to the customer's
6 delivery point and the changes and modifications made by IP to the Texas substation in
7 this docket?
8 A: The changes in the immediate preceding example constitute an increase in both the
9 capacity to serve as well as adding additional phases to the delivery point. However, the
10 most important part of the modification is the increase in the capacity of the electric
11 supplier to provide the additional electric energy to the customer. The additional
12 capacity is provided by reason of modifications or changes to the distribution line to
13 handle the additional capacity as well as changes in the transformer and other associated
14 equipment where the voltage is stepped down from the distribution voltage to the voltage
15 that is usable by the customer's motors and equipment.
16 Q: Do these types of changes in providing electric service to a customer at the customer's
17 location happen frequently?
18 A: Yes. They happen frequently due to changes in the customer's operations or additions of
19 other facilities by the customer requiring electric energy.
20 Q: Utilizing the interpretation of Michael Tatlock that the Texas substation can only be
21 modified by IP if additional phases of electric energy are added to the substation, are there
22 as a practical matter any changes or modifications that IP could make to the Texas
23 substation that would create a new delivery point at the Texas substation?

1 A: No, there is not if you use Mr. Tatlock's interpretation that a change or modification to
2 the Texas substation occurs only if a phase of electric current is added or taken away.
3 Q: What conclusion does this lead you to?
4 A: It leads me to the conclusion that the parties did not intend substations to be "delivery
5 points" within the meaning of the Service Area Agreement. It further leads me to the
6 conclusion that the parties intended a "delivery point", as utilized in the agreement, to
7 mean the location for the installation of step down transformers, whether it is a single
8 phase transformer, two phase transformer, or a three phase transformer, and associated
9 equipment that are installed at customers' locations and utilized to reduce the voltage
10 delivered by the distribution line to a voltage usable by the customers at the location
11 where the electricity is actually utilized by the customer's motors and equipment.
12 Further, adding new transformers where none existed to serve a customer's new or
13 additional electric load or changing a customer's electric service from single phase to two
14 phase or three phase electric service because of a customer's need to increase the quantity
15 or type of electric service are the most common changes in an electric supplier's point of
16 delivery of electric service to a customer.
17 Q: Have you had an opportunity to review the Prepared Direct Testimony of Keith
18 Malmedal?
19 A: Yes.
20 Q: Is the conclusion of Mr. Malmedal that the Texas substation is the IP delivery point to the
21 Citation Oil & Gas Corporation Salem oil field and therefore the adding of additional step
22 down transformers and other apparatus at the location of the gas plant and the new gas
23 compressor sites located in Tri-County's service territory do not constitute delivery points

1 within the meaning of the Service Area Agreement accurate in your opinion?

2 A: No.

3 Q: Why not?

4 A: If the Texas substation is in fact the delivery point for the utilization of electricity by
5 Citation Gas & Oil Corporation in the Salem oil field, then all Citation would have to do
6 is disconnect its distribution line from IP's Texas substation and connect it to the
7 Tri-County Salem substation located a very short distance away. The Tri-County Salem
8 substation would then become the delivery point for the Citation Salem oil field and that
9 delivery point would be located in Tri-County's service territory under the Tri-County/IP
10 Service Area Agreement. This would result in a switch in the electric service used by
11 Citation from IP to Tri-County and would not be in keeping with my understanding of the
12 intent of the Service Area Agreement between the parties. Further, the basis for Mr.
13 Malmedal's conclusion that the Texas substation is the delivery point is that IP has no
14 ownership in the Citation Oil & Gas Corporation distribution line utilized to carry the
15 electricity to the transformer which in turn is used to make the connection between the
16 distribution line and the Citation gas plant for operation of the motors and equipment at
17 that location. This ignores the generally understood meaning of "delivery point" within
18 the electric supplier industry that the transformer and associated equipment used to
19 reduce the voltage delivered at the location of the end use of the electricity is the general
20 location for the delivery point between the electric supplier and the customer.

21 Q: Does Mr. Malmedal discuss any of the changes that were made by Citation to the Citation
22 Oil & Gas Corporation 12.47 kV distribution line running from the Texas substation to
23 the various gas compressor sites and the gas plant as shown on Tri-County's map marked

1 Exhibit A-3 attached to the Prepared Direct Testimony of Marcia K. Scott and as shown
2 on Tri-County Exhibit A-6 attached to the Prepared Testimony of Marcia K. Scott.
3 A: No. The distribution line of Citation Oil & Gas Corporation running from the IP Texas
4 substation to the Citation gas plant was extensively modified as pointed out in
5 Tri-County's prepared direct testimony. In addition, 4,119 feet of NEW three phase
6 distribution line consisting of 2/0 ACSR conductor was constructed in order to bring the
7 IP electric current from the Texas substation to the three phase step down transformer and
8 associated equipment installed at the site of the Citation gas plant so that Citation
9 equipment and motors could utilize the IP electric current.
10 Q: Does Mr. Malmedal correctly rely upon the National Electrical Code for a definition of
11 electric service delivery point?
12 A: No. Mr. Malmedal refers to the 2008 National Electrical Code in the last paragraph on
13 page 6 and at the top of page 7 of his engineering report attached to his Prepared Direct
14 Testimony. In so doing, he states that the National Electrical Code covers most types of
15 electrical installations including the electrical installations comprising Citation's Salem
16 oil field. However, the National Electrical Code of 2008 was not in existence when the
17 1968 Service Area Agreement between Tri-County and IP became effective. At that
18 time, the 1965 edition of the National Electric Code, a copy of which is attached hereto as
19 Exhibit F-1, was in effect and did not define "delivery point" but did define "service",
20 "service conductors", and "service drop" at page 13 thereof as follows:

21 Service: "The conductors and equipment for delivering energy from the electricity supply
22 system to the wiring system of the premises served."
23 Service Conductors: "The supply conductors which extend from the street main, or from
24 transformers to the service equipment of the premises supplied.
25 In an overhead distribution system, the service conductors begin at the line pole where
26 connection is made. If a primary line is extended to transformers installed outdoors on

private property, the service conductors begin at the secondary terminals of the transformers.
Where the supply is from an underground distribution system, the service conductors begin at the point of connection to the underground mains.
In every case the service conductors terminate at the service equipment.
Service Drop: The overhead service conductors between the last pole or other aerial support and the first point of attachment to the building or other structure."

Further, the National Electrical Code of 1968, a copy of which is attached hereto as Exhibit F-2, did not define "delivery point" but does at page 70-10 define "service", "service drop", "service-entrance conductors, overhead system", and "service-entrance conductors underground system" as follows:

"Service: The conductors and equipment for delivering energy from the electricity supply system to the wiring system of the premises serviced.
Service Drop: The overhead service conductors from the last pole or other aerial support to and including the splices, if any connecting to the service entrance conductors at the building or other structure.
Service-Entrance Conductors, Overhead System: The service conductors between the terminals of the service equipment and a point usually outside the building, clear of building walls, where joined by tap or splice to the service drop.
Service-Entrance Conductors, Underground System: The service conductors between the terminals of the service equipment and the point of connection to the service lateral."

Q: Mr. Malmedal refers to the 2007 National Electrical Safety Code (NESC) in the next to last paragraph on page 6 of his engineering report attached to his Prepared Direct Testimony and implies that the definition for "service point" and "service" codified by the NESC is applicable to the case in this docket. Is this conclusion accurate?

A: Mr. Malmedal's conclusion is not exactly accurate. In the first place, the 2007 National Electrical Safety Code (NESC) was not published in 1968 when the Tri-County and IP Service Area Agreement became effective. Secondly, the NESC does not define "delivery point". However, referencing the 1961 edition of the National Electrical Safety Code, Definition Section, a copy of which is attached hereto as Exhibit F-3, there is a definition for "service" at page 10, Item No. 63 which is defined as follows:

"Service means the conductors and equipment for delivering electric energy from the secondary distribution or street main, or other distribution feeder, or from the transformer, to the wiring system of the premises served. For overhead circuits, it includes the conductors from the last line pole to the service switch or fuse. The portion of an overhead service between the pole and building is designated as "service drop"."

Starting in 1972, the IEEE published a dictionary called the "IEEE Standard Dictionary of Electrical and Electronic Terms." It was designated as IEEE Std. 100-1972 and a copy of the relevant portions are attached hereto as Exhibit F-4. It contains the following definitions at pages 523 and 524: service, service conductors, service drop, service entrance conductors.

"service (1) (electric systems). The conductors and equipment for delivering electric energy from the secondary distribution or street main, or other distribution feeder, or from the transformer, to the wiring system of the premises served. *Note*: For overhead circuits, it includes the conductors from the last line pole to the service switch or fuse. The portion of an overhead service between the pole and building is designated as service drop."

"service conductors. That portion of the supply conductors that extends from the street mains or feeder or transformer to the service equipment of the premises served. For an overhead system it includes the conductors from the last line pole to the service equipment."

"service drop. That portion of overhead service conductors between the last pole and the premises served, extending from the pole to the junction with the service entrance conductors."

"service entrance conductors (electric system) (1) (overhead system). The service conductors between the terminals of the service equipment and a point usually outside the building, clear of building walls, where joined by tap or splice to the service drop. (2) (underground system). The service conductors between the terminals of the service equipment and the point of connection to the service lateral. *Note:* Where service equipment is located outside the building walls, there may be no service-entrance conductors, or they may be entirely outside the building."

However, Substation, Service Point, Delivery Point, or Premises Wiring are not defined.

In subsequent editions of the IEEE Dictionary published as the "Authoritative Dictionary of IEEE Standard Terms, Seventh Edition", (IEEE) dated 2000, a copy of which is

attached hereto as exhibit F-5, the following definitions appear at pages 860, 1031-1032 and 1033, regarding "premises wiring (system)"; "entrance conductors (1)(electric systems) (overhead system)"; and "service-point":

"premises wiring (system) That interior and exterior wiring, including power, lighting, control, and signal circuit wiring together with all of its associated hardware, fittings, and wiring devices, both permanently and temporarily installed, which extends from the load end of the service drop, or load end of the service lateral conductors to the outlet(s). Such wiring does not include wiring internal to appliances, fixtures, motors, controllers, motor control centers, and similar equipment."

"service (1) (electric systems). The conductors and equipment for delivering electric energy from the secondary distribution or street main, or other distribution feeder, or from the transformer, to the wiring system of the premises served. Note: For overhead circuits, it includes the conductors from the last line pole to the service switch or fuse. The portion of an overhead service between the pole and building is designated as service drop."

"service entrance conductors (1) (electric Systems) (overhead system) The service conductors between the terminals or the service equipment and a point usually outside the building, clear of building walls, where joined by tap or splice to the service drop."

"service-point The point of connection between the facilities of the serving utility and the premises' wiring. Note: For clearances of conductors of over 600 V, see the National Electrical Safety Code."

Mr. Malmedal does not properly acknowledge that each of the definitions regarding "service" or "service point" refers to the connection of the medium voltage (12.47kV) electric distribution line with the customer's place of usage of the electricity. At that point of delivery, there is a step down transformer and associated attachments allowing the reduction of the distribution line voltage to a voltage level capable of being utilized by the customer's motors and equipment. Thus, one can only properly conclude from the definitions of "service-point" or "service" in the National Electrical Safety Code publications and the National Electrical Code publications refers to the point where the distribution line voltage is stepped down by a transformer to a voltage level capable of

being used by the customer's motors and equipment at the location for the end usage of the electric current. Additionally, the definition of premises wiring (system) both in IEEE 100 The Authoritative Dictionary of IEEE Standard Terms (2000) at page 860 and the National Electrical Code 2002 Handbook at page 34, a copy being attached to my Rebuttal Testimony as Exhibit F-6 states as follows:

> Premises Wiring (System). That interior and exterior wiring, including power, lighting, control and signal circuit wiring together with all their associated hardware, fittings, and wiring devices, both permanently and temporarily installed, that extends from the service point or source of power, such as a battery, a solar photovoltaic system, or a generator, transformer, or converter windings, to the outlet(s). Such wiring does not include wiring internal to appliances, luminaries (fixtures), motors, controllers, motor control centers, and similar equipment.

Both the 2000 IEEE 100 Authoritative Dictionary and the 2002 NEC Handbook talk about the premises wiring, and thus the premises, being located at the load end of the service drop from a transformer to the electrical outlets. Therefore, clearly a premise is a house or a building, or a factory, etc. and not a several thousand acre oil field with individual wells scattered about.

Q: Is the National Electrical Code even applicable to the electric facilities of Tri-County, IP or Citation Oil & Gas Corporation?

A: The National Electrical Code is sponsored by the National Fire Protection Association and was first published in 1897 and every three years thereafter as a standard to help guard against loss of life and property. It is not generally applicable to the facilities of an electric utility. The National Electrical Safety Code sets forth the standards followed by electric utilities such as Tri-County and IP and it is the Code followed by electric utility engineers.

Q: Are the step down transformers used to reduce the distribution line voltage of the Citation

12.47 kV distribution line to a voltage capable of being used by the Citation gas plant electric motors and equipment located at the point where the Citation 12.47 kV distribution line is connected to the Texas IP substation or at the point where the gas plant is connected to the Citation 12.47 kV distribution line?

A: The transformers and related equipment used to reduce the voltage to a level usable by the Citation gas plant motors and equipment are located where the Citation gas plant is situated which is several miles from the IP Texas substation.

Q: Can the Citation gas plant motors and equipment be connected directly to the connection between the Citation 12.47 kV distribution line and the Texas IP substation?

A: No. If you tried that, you would burn up Citation's electrical equipment used at the Citation gas plant. The only way you could connect those Citation gas plant motors and equipment to the IP Texas substation is to utilize step down transformers at that location. However, in this case, those transformers and associated equipment are properly located directly next to the Citation gas plant and at each of the eight Citation gas compressor sites.

Q: Is Mr. Malmedal's statement in the first full paragraph on page 7 of his engineering report attached to his Prepared Direct Testimony that the "point of delivery" is the place where the utility meters the electricity being supplied to the customer correct?

A: No. Mr. Malmedal implies that the location of the utility meters used to measure the amount of electricity used by the customer is an indicator of the "point of delivery". However, this assertion is not supported by any of the definitions of "service" or "service point" as used in the National Electrical Safety Code or the National Electrical Code that was in effect at the time the Service Area Agreement was entered into. Rather, the

1 location of the meters is determined by which of the two, the electric utility or the
2 customer, will assume the line loss that occurs when electricity is transported across
3 distribution lines for delivery to the actual point of use of the electricity. That location is
4 generally negotiated between the customer and the electric utility. As a general practice,
5 the utility meters are located where the step down transformers are located. However,
6 that is not always the case. Instead, the generally common practice in the utility industry
7 is to consider the "point of delivery" of electrical current to the customer as being the
8 point where the electric distribution line voltage is stepped down by a transformer and
9 associated equipment to a voltage that can be used by the customer's electric motors and
10 equipment. That location is uniformly the place where the end use of the electricity
11 occurs, which is the location of the customer's electric motors and equipment.
12 Q: Is Mr. Malmedal correct in his conclusion that the "point of delivery" as between Citation
13 and IP can only be at the connection of the Citation 12.47 kV distribution line to the IP
14 Texas substation because Citation rather than IP owns the 12.47 kV distribution line and
15 the step down transformers and associated equipment used to reduce the distribution line
16 voltage to a voltage usable by the gas plant, motors and equipment and the compressor
17 site motors and equipment?
18 A: No. Neither the National Electrical Safety Code nor the National Electrical Code
19 definitions of "service" or "service point" depend upon ownership of the facilities
20 because ownership of the facilities can vary depending upon the negotiated arrangements
21 between the electric utility and the customer. Further, if the "point of delivery' depended
22 upon which of the customer or electric utility owned the facilities necessary to distribute
23 the electric current to the customer's point of usage and reduce the voltage so it could be

1 used by the customer's equipment, then the customer could always dictate who its electric
2 provider would be under the Tri-County/IP Service Area Agreement since those service
3 rights are dependent upon where the "delivery point" is situated in reference to the
4 territorial boundary lines negotiated between Tri-County and IP. Such a definition for
5 "point of delivery" would be subject to manipulation by the customer and/or utility
6 without regard to the rights of either electric supplier under the service area agreement in
7 question or the territorial boundaries established by the service area agreement.
8 Q: Why is it customary for electric suppliers to distribute electric energy from each electric
9 supplier's substation along distribution lines at a higher voltage, as in this case at 12.47
10 kV, than is necessary for operation of a customer's electrical motors and other
11 equipment?
12 A: The electric supplier must distribute electric energy from its substation to customers
13 along distribution lines at a much higher voltage than can be used by the customer's
14 equipment in order to provide enough electric voltage at the actual point of usage of the
15 electricity sufficient to run the customer's motors and equipment. In order to accomplish
16 this, transformers and associated equipment must be installed at the point of the
17 customer's use of electricity in order to step the distribution line voltage down to a
18 voltage level than can be utilized by the customer's motors and equipment. This is the
19 standard by which all electric suppliers operate. It is also why all editions of the
20 National Electrical Safety Code and the National Electrical Code define "service" and
21 "service point" as the point where the electric usage occurs.
22 Q: Is this the definition placed upon "service" or "service point" or "point of delivery" by
23 Mr. Malmedal in his direct testimony and his engineering report attached thereto?

1 A: No. His definition of "service", "service point", and "point of delivery" is not the point
2 where the electricity is actually used, but rather the point of connection that is negotiated
3 between the customer and the electric utility for connection of a customer owned
4 distribution line. That is not the common practice or general meaning of "point of
5 delivery" within the utility industry.
6 Q: Is Mr. Malmedal correct in referring to the connection of Citation's gas plant and its eight
7 gas compressor sites with their accompanying step down transformers and associated
8 equipment to the Citation 12.47 kV distribution line as being merely the installation of
9 additional electrical facilities by Citation downstream from the connection of the Citation
10 12.47 kV distribution line to the IP Texas substation?
11 A: No. Such characterization does not properly consider the need for an electric utility
12 engineer to consider the need to maintain voltage on a distribution line, whether it is a
13 customer owned distribution line or the electric utility's distribution line, at a voltage
14 level sufficient to deliver voltage and current to the customer's actual point of usage of
15 the electric current. In order to accomplish that, the distribution line in the instant case
16 must be maintained at a level of 12.47 kV so that when the voltage reaches the actual
17 point of usage, step down transformers and associated equipment must be installed to
18 allow the electric current to be used to operate the customer's (Citation's) electric motors
19 and equipment. Ownership of the 12.47 kV distribution line has nothing at all to do with
20 this electric utility concept. This electric utility concept must be complied with by all
21 electric utilities and customers in order for the customer to be able to adequately operate
22 the customer's equipment at the point of electric usage.
23 Q: Is Mr. Malmedal accurate in his use of the example found on page 8, paragraph 3 of his

1 engineering report attached to his Prepared Direct Testimony in which he compares a
2 home owner adding an additional electrical receptacle in his home to run new equipment
3 inside the house to the situation we find in this docket where Citation has added the gas
4 plant with additional electric motors and eight additional compressor sites to Citation's
5 electric facilities?
6 A: No. In Mr. Malmedal's example the home owner's house is a compact area in which all
7 the electrical receptacles are operated at the same voltage level (i.e. 120V), that is the
8 voltage level to which the distribution line voltage is reduced by a transformer located
9 next to the home before the electric current enters the home, and where all of the
10 electrical receptacles are located in close proximity to the step down transformer. In the
11 instant docket, Citation has added the gas plant and eight compressor sites with
12 accompanying stepped down transformers and associated equipment at varying miles
13 from the IP Texas substation. The actual oil field covers several thousand acres and is
14 quite large. Those distances are sufficient to require a distribution line of at least two
15 miles in length carrying voltage of 12.47 kV from the Texas IP substation to the point of
16 usage of the electric current. At each of those separate gas compressor sites and the gas
17 plant, step down transformers are required to be installed so that the voltage at the end of
18 the distribution line is reduced to a voltage level that can be utilized by the electric motors
19 and equipment in question. Citation has nine different "points of delivery", none of
20 which are located in close proximity to the IP Texas substation and with eight out of the
21 nine located in Tri-County's electric service territory. While the homeowner in Mr.
22 Malmedal's example has only one house located adjacent to the step down transformer
23 utilized to reduce the distribution line voltage to a level that can be utilized by each of the

1 pieces of electrical equipment in the home owner's house.

2 Q: Is Mr. Malmedal correct in his statement found in paragraph 4 on page 8 of his engineer's
3 report attached to his Prepared Direct Testimony in which he compares the addition of
4 new receptacles by the home owner in the home owner's house to power new electrical
5 appliances to the addition by Citation of the gas plant and eight compressor sites at a mile
6 or more distant from the connection of the Citation 12.47 kV distribution line with the IP
7 Texas substation?

8 A: No. In making that comparison, Mr. Malmedal states in paragraph 4 on page 8 of his
9 engineering report attached to his Prepared Direct Testimony, the following:

10 "The exact same type of load addition was made in this case of the additions by Citation
11 on their premises. They added new loads to their own premises wiring system, but did
12 not create any new services or points of delivery from the utility. The only differences
13 between this case and the analogy of the house are the size of the premises and the
14 voltage of the systems."
15
16 Mr. Malmedal's analogy is like comparing apples to oranges. The addition of new
17 receptacles within the home owner's house are all added to the internal wiring system of
18 the home at the same voltage and are adjacent to the transformer which is utilized to step
19 down the distribution line voltage, by which the electric energy has been brought to the
20 homeowner's home, to a voltage that is usable by the homeowner's appliances within the
21 home. All of the receptacles are in close proximity to that step down transformer. In
22 the case of Citation, Citation had to transmit the current voltage of 12.47kV more than
23 two miles from the connection of the Citation 12.47 kV distribution line at the IP Texas
24 substation and only then could the new step down transformers and associated equipment
25 be installed to reduce the voltage at the location where the electric current from the IP
26 Texas substation would be utilized to run the Citation motors and equipment at the gas

1 plant and eight compressor sites. None of the eight compressor sites or the gas plant is
2 in close proximity to the connection of the Citation 12.47 kV distribution line with the IP
3 Texas substation. In addition, step down transformers had be used at each of the eight
4 gas compressor sites and the gas plant to reduce the 12.47 kV distribution line voltage to
5 a voltage level which the electric motors and equipment could use at each of the gas
6 compressor sites and the gas plant. In Mr. Malmedal's analogy, the home owner did not
7 have to reduce the voltage after it was brought into his home or premises before the
8 voltage could be utilized by any of the homeowner's electrical equipment through any of
9 the new electrical receptacles added to the homeowner's home.
10 Q: Is the assertion correct by Mr. Malmedal in the last two paragraphs on page 8 and the first
11 paragraph on page 9 of Mr. Malmedal's engineering report attached to his Prepared
12 Direct Testimony that the only way the connection of Citation's gas plant and the eight
13 compressor sites to the Citation 12.47 kV distribution line would be a "delivery point" is
14 when IP owns all of the equipment up to the gas plant and compressor sites including the
15 distribution lines, transformers, fuses, etc.?
16 A: No. Neither the National Electrical Safety Code (NESC) or the National Electrical Code
17 (NEC) mention ownership of facilities when defining "service" or "service-point".
18 Rather, the NESC and the NEC talk about "service" or "service-point" as the location of
19 conductors and equipment necessary for delivery of electric energy from the secondary
20 distribution or the street main, or from transformers to the service equipment of the
21 premises supplied. These definitions support the conclusion that electric current
22 delivered at distribution voltage by secondary distribution lines or street mains to
23 transformers that reduce the distribution voltage to a voltage level that can be utilized by

electric motors and equipment at the site of the electric usage are service connections which in turn conforms with the standard understanding of the electric utility industry for "point of delivery" of electric service.

Q: Is the statement correct by Mr. Malmedal in the first paragraph on page 10 of his engineering report attached to his Prepared Direct Testimony that a "point of delivery" or a "service" is not the connection between the distribution line and the step down transformers used to reduce the distribution line voltage to a level that can used by the customer's motors and equipment unless the electric utility owns the distribution line?

A: No. As noted earlier, nothing in the National Electrical Safety Code or the National Electrical Code or in the Service Area Agreement between Tri-County and IP specifies that either IP or Tri-County must own the electric distribution line utilized to bring the electric current to the customer's location. Further, there is no standard in the electric utility industry that defines "point of delivery" or "service" in that manner. Ownership of a distribution line simply does not enter into the general understanding of a "point of delivery" or "service" within the electric utility industry. If this assertion by Mr. Malmedal that ownership of the distribution line for purposes of distributing electricity from the electric supplier's substations to the point of actual use of the electricity by the customer determines where the point of delivery is, then any customer could determine who its electric supplier is under the Tri-County-IP Service Area Agreement by building its own 12.47 kV distribution line from the substation to the actual location of use of the electricity. If the location of the customer's electric motors is in Tri-County's service area under the agreement, the customer owned distribution line would allow IP to serve the electric load. On the other hand, it is obvious under the Service Area Agreement, IP

1 could not build the 12.47 kV distribution line from IP's substation to the customer's
2 electric load in Tri-County's service area and provide the electric service. Thus, Mr.
3 Malmedal's interpretation of delivery point would simply render the Service Area
4 Agreement meaningless.
5 Q: Is Mr. Malmedal's statement correct in paragraph 1 on page 10 of his engineering report
6 attached to his Prepared Direct Testimony when he states: "a point of delivery and a
7 service is limited in definition to the place where ownership changes between the utility
8 and the customer."?
9 A: No. Ownership of the electric energy is a matter which is negotiated between the
10 customer and the electric utility providing the electric service. The place where the
11 ownership of the electric energy changes between the electric utility and the customer is
12 not considered an element in the definition of "service" or "service-point" as provided in
13 the National Electrical Safety Code or the National Electrical Code. Neither is the point
14 at which ownership of the electric energy changes from the electric utility providing the
15 electric energy to the customer utilized in the Service Area Agreement between
16 Tri-County and IP to define the "point of delivery". If the place where the ownership of
17 the electric energy changes from the electric utility to the customer is the definition of a
18 "point of delivery" of electric energy or of a "service" or of a "service-point", then the
19 meaning of "point of delivery", "service", and "service-point", would always be changing
20 in accordance with the definition negotiated between the customer and the electric utility.
21 Those definitions would always be based upon the needs of the individual electric utility
22 and the individual customer and not take into account the broader picture of providing
23 electric utility services to all customers of electric utilities. Such a definition of "point of

1 delivery" would not provide any stability in the electric utility industry and would make
2 the Service Area Agreement between Tri-County and IP meaningless.
3 Q: Is Mr. Malmedal correct when he states at paragraphs 2 and 3 on page 10 of his
4 engineering report attached to his Prepared Direct Testimony that the place where the
5 voltage is reduced to a level that can be utilized by the customer's equipment at a
6 particular location or that the proximity of electrical loads to the "point of delivery" has
7 no bearing on the electric utility industry meaning of a "point of delivery", "service", or
8 "service-point" correct?
9 A: No. Again, both the National Electrical Safety Code and the National Electrical Code
10 define "service", and "service-point" in terms of the point at which electrical energy is
11 delivered by a secondary distribution line or street main or transformers to the service
12 equipment of the customer at the premises. As I have noted earlier, the Citation motors
13 and equipment at the gas plant and at each of the eight gas compressor sites cannot utilize
14 the IP electrical energy from the Texas substation delivered through the Citation 12.47 kV
15 distribution line without the installation of step down transformers. At the gas plant site
16 and each of the eight gas compressor sites, Citation installed the necessary step down
17 transformers to reduce the IP electrical current delivered across the Citation 12.47 kV
18 distribution line to a voltage level that the electrical motors could utilize to perform their
19 functions at each of those locations. This is the classic meaning and understanding of a
20 "point of delivery" within the electric utility industry and it applies to all loads whether
21 large industrial sites and oil fields or smaller loads.
22 Q: Is Mr. Malmedal correct when he states in the last two paragraphs on page 10 of his
23 engineering report attached to his Prepared Direct Testimony that there have been no

1 modifications to the "electric service connection" of the Citation 12.47 kV distribution
2 line and the IP Texas substation?
3 A: No. Mr. Malmedal seems to be implying that the "electric service connection" is the
4 actual physical connection of the Citation 12.47 kV distribution line to the IP Texas
5 substation. That physical connection occurs at the low side of the IP Texas substation
6 that is the side of the IP Texas substation from which the electric voltage is distributed at
7 12.47 kV. The physical connection between the Citation 12.47 kV distribution line and
8 the low side of the IP Texas substation consists only of the breaker station and associated
9 insulators, conductors and other apparatus necessary to complete the physical electrical
10 connection. However, that physical connection is not the "delivery point" referred to by
11 Mr. Tatlock in his Prepared Direct Testimony at page 4, lines 15 through 23, and page 5,
12 lines 1 through 3, where Mr. Tatlock asserts that the IP Texas substation is the delivery
13 point for electric service to Citation for use in the Salem oil field. Mr. Tatlock does not
14 present the view in his Prepared Direct Testimony that the point of delivery is the actual
15 physical connection between the Citation 12.47 kV distribution line and the IP Texas
16 substation. Thus, I can only conclude that Mr. Malmedal's contention that the "electric
17 service connection" between Citation and IP is the physical connection of the Citation
18 12.47 kV distribution line to the IP Texas substation is incorrect.
19 Q: Is Mr. Malmedal correct in his assertion in the last paragraph on page 10 of his
20 engineering report attached to his Prepared Direct Testimony that "Since no
21 modifications of any kind were ever made to the electric service connection, and certainly
22 no additional phases of electric current were ever added (it has always been and still is a
23 three-phase service connection) no new points of delivery were ever created. And any

1 past work in the substation to maintain the quality of power being delivered to Ameren's
2 customers, or to replace obsolete equipment, is not in any way relevant to the creation of
3 a service or point of delivery."?
4 A: No. In the first place, any assertion by Mr. Malmedal in his engineering report or direct
5 testimony to the affect that no modification has taken place to the IP Texas substation is
6 contrary to his sworn testimony in his deposition taken December 2, 2009 in which he
7 stated at page 102, lines 12-25 and page 103, lines 1-7 (a copy of the relevant pages being
8 attached to my Prepared Rebuttal Testimony as Exhibit F-7) that the modifications I listed
9 in my engineering report very likely did have an effect upon increasing the capacity of the
10 IP Texas substation to allow additional load. In addition, Mr. Malmedal is incorrect in
11 stating in the last paragraph on page 10 of his engineering report attached to his Prepared
12 Direct Testimony that the IP Texas substation has always been and still is a three-phase
13 substation and since there are no additional phases beyond three phase service in the
14 electric utility industry, there can be no physical increase in the number of phases of
15 service at the IP Texas substation. This assertion by Mr. Malmedal is incorrect because
16 originally in 1965, IP had three single phase transformers of 1958 vintage at the Texas
17 substation. On October 3, 1978, IP installed a new Westinghouse three phase
18 transformer with manufacturer stamp date of 1969 which caused extensive modification
19 to the Texas substation. The addition of the 3 phase transformer allowed IP to add
20 additional kVA capacity to the substation. In addition, IP made several modifications to
21 the Texas substation, all of which I have documented in my Prepared Direct Testimony
22 starting at page 9 line 5 through page 12 line 14, and in my engineering report at pages 9
23 through 12 attached to my Prepared Direct Testimony as Exhibit D-2. The results of

1 these modifications have the same effect as adding additional phases of electric current to
2 the Texas substation in that IP's ability to provide additional electric load for customers
3 including Citation have been increased significantly as a result of those modifications.
4 To the extent "point of delivery" or "existing point of delivery" as referred to in Section 1
5 of the Service Area Agreement between Tri-County and IP is intended to include the
6 Texas substation as a "point of delivery", then it is simply unrealistic not to take into
7 account such changes or additions to the Texas substation when determining if the Texas
8 substation has been modified within the meaning of Section 1 of the Tri-County/IP
9 Service Area Agreement. To the extent Section 1 of the Tri-County/IP Service Area
10 Agreement is not intended to apply to utility substations like the Texas substations, but
11 only to the delivery point where electricity is actually delivered for use by the customer's
12 motors and equipment such as at the gas plant and eight compressor sites, then in that
13 instance, the modifications to the Texas substation by IP would have no bearing on this
14 case.
15 Q: Is Mr. Malmedal correct when he asserts in the first four paragraphs on page 11 of his
16 engineering report attached to his Prepared Direct Testimony that adding phases does not
17 equate to adding capacity?
18 A: No. Mr. Malmedal in fact does concede in the first paragraph on page 11 of his
19 engineering report that adding phases can add capacity. However, he attempts to refute
20 his own admission by using the analogy that capacity is not increased when changing a 5
21 horsepower single phase motor to a three phase 5 horsepower motor. That analogy
22 however is not very practical since in the electric utility industry, most small horsepower
23 motors are single phase while larger horsepower motors are three phase and generally

1 when you upgrade to a larger horsepower motor, additional capacity is required to operate
2 the motor along with the addition of a three phase circuit. Simply stated, if the adding of
3 an additional phase or phases of electric current which in turn almost invariably adds
4 capacity to provide electric service to a customer constitutes a modification under Section
5 1 of the Tri-County/IP Service Area Agreement then by direct analogy the adding of
6 capacity without adding additional phases of current constitutes a modification under
7 Section 1 also.
8 Q: Is Mr. Malmedal correct when in paragraphs 2, 3 and 4 of page 11 of his engineering
9 report attached to his Prepared Direct Testimony he states that no additional phases were
10 added to the IP Texas substation when capacitors were added causing the three phases of
11 current at the substation to become leading current instead of lagging current?
12 A: No. You can have more than three phases of current at a substation or at a point of
13 delivery. For instance, at the Texas substation, IP had three phases of lagging current.
14 Adding the capacitors enabled IP to have additional three phases of leading current
15 instead of all lagging current which is in effect AC power. Simply stated, the standard
16 three phase commercial system used in the United States can be altered by use of
17 capacitors so that you have three phases of lagging power and in addition, three phases of
18 leading power which when added together results in three phases of lagging current or
19 three phases of leading current. This is what IP did to the Texas substation by making
20 many of the modifications I have listed in my engineering report and in my Direct
21 Prepared Testimony.
22 Q: Did IP add additional phases of current to its Texas substation by making certain of its
23 modifications?

1 A: Yes.

2 Q: What were those modifications that would have added additional phases of current to the

3 Texas substation?

4 A: Based upon the drawings and my physical inspection, it is my opinion that the Texas

5 Substation was originally a radially fed substation where the three phase transmission line

6 dead-ended or stopped at the substation. In subsequent years, another high side bay was

7 added to the substation and another three phase transmission line was brought into the

8 substation from a different direction, i.e., three new phases of electricity were added to

9 the substation. These three new phases of electricity were the same electrically (voltage

10 and rotation) as the existing transmission line but physically three new phase conductors

11 were added to the substation. This addition increased the reliability of the substation and

12 probably increased the capacity (kW) of electricity that the substation could deliver if

13 needed.

14 Q: Is Mr. Malmedal correct in his assertion in the last paragraph on page 11 and the first

15 paragraph on page 12 of the engineering report attached to his Prepared Direct Testimony

16 that modifications to the IP Texas substation that created both leading three phase current

17 and lagging three phase current does not add additional phases because you still have

18 three phases of current?

19 A: No. As I have explained above, you have added additional phases of current, one being

20 three phase leading and one being three phase lagging, which in turn has increased the

21 capacity of the IP Texas substation to serve electrical load of its customers from that

22 substation. This is the purpose for adding capacitor banks to substations in the first

23 instance. That is why I concluded that the adding of capacitors to the substation creates

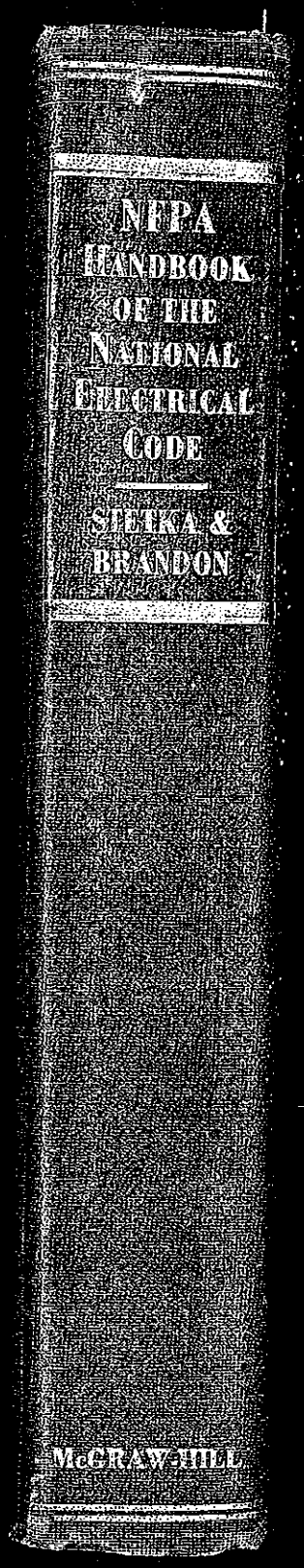
1 additional phases of current making the substation available to serve additional capacity
2 and thus constitutes a modification within the meaning of Section 1 of the Tri-County/IP
3 Service Area Agreement.
4 Q: Does Mr. Malmedal concede in paragraphs 3 and 4 on page 12 of his engineering report
5 attached to his Prepared Direct Testimony that the modifications you have described in
6 your own Prepared Direct Testimony and in you engineering report attached as Exhibit
7 D-2 to your Prepared Direct Testimony have increased the ability of IP to serve additional
8 customers and the additional electrical loads of current customers from the IP Texas
9 substation?
10 A: Yes. Mr. Malmedal concedes that there has been increased electricity usage within the
11 United States generally and that the modifications made by IP to the Texas substation
12 would be necessary to both maintain electric service to the existing IP customers served
13 by that substation as well to provide sufficient capacity to serve the normal load growth
14 requirements imposed upon the Texas substation. This was simply another way of
15 saying there has been a need by IP to modify its IP Texas substation sufficiently to meet
16 the additional electric service requirements of the customers served by that substation.
17 Q: Referring to the Prepared Direct Testimony of Mr. Jeffrey Lewis of Citation Oil & Gas
18 Corporation and to the letter dated July 8, 2005 that Mr. Lewis wrote to Mr. Todd Masten
19 of IP and attached to Mr. Lewis' Prepared Direct Testimony as Exhibit 4.1, a copy of
20 which is attached hereto for convenience as Exhibit 4.1, is the assertion correct by Mr.
21 Lewis that it is necessary for Citation to have the same electric supplier provide electric
22 power to both the Citation gas plant and the eight gas compressor sites in order to prevent
23 harm to the equipment at the gas plant?

1 A: No. Two different electric suppliers can be used to provide electric power to the Citation
2 gas plant and the gas compressor sites. Automated switches can be installed so that if a
3 power failure occurs at the gas plant, the power to the compressor sites can be terminated
4 and should power to the compressor sites fail, power can be shut down at the gas plant to
5 prevent any damage to motors and equipment. In fact, having two separate electric
6 suppliers available to supply power to the Citation gas plant and gas compressor sites
7 would provide more safety and reliability since there are two substations in the area and
8 each should be able to provide sufficient power to allow the back feeding of electricity
9 from one electric supplier to the Citation gas plant or gas compressor sites should power
10 be lost by the electric supplier providing power to those facilities. This arrangement
11 would in fact prevent interruptions from occurring in the gas operation and allow for
12 more reliability which most customers find highly desirable. Furthermore, Citation
13 currently has four 12.47 kV circuits covering the oil field. It appears that the gas plant is
14 on one circuit and the gas wells are on different circuits. Therefore, Mr. Lewis'
15 argument is not credible because the gas plant circuit could be energized, but one or more
16 of the other existing circuits could, because of storms or other causes, be de-energized or
17 vice-versa.
18 Q: On page two of the July 8, 2005 letter by Mr. Lewis to Mr. Todd Masten attached as
19 Exhibit 4.1 to Mr. Lewis' Prepared Direct Testimony, the reference is made to the fact
20 that Citation had a south circuit located approximately 500 feet from the Citation gas
21 plant. During the investigation of the Salem oil field, did you observe the location of
22 that circuit called the south circuit by Mr. Lewis?
23 A: Yes. That circuit is identified on the map attached as Exhibit A-6 to the Prepared Direct

Testimony of Marcia K. Scott and is identified on that map as "Option 1" and a copy of Exhibit A-6 is attached hereto for convenience. That circuit however was not utilized by Citation in providing electric power to the gas plant. Instead, Citation constructed 4,119 feet of NEW distribution lines consisting of 2/0 ACSR conductors and upgrading 1,161 feet of existing Citation distribution line from No. 4 copper to 2/0 ACSR conductors in order to provide electric service to the gas plant and the compressor sites. I assume Citation did not utilize the south circuit to provide service to the gas plant because it was not feasible and thus it was necessary to construct new distribution lines and upgrade the existing distribution line to provide such electric service.

Robert C. Dew, Jr. P.E.

Tricountydewsurrebuttaltestimony/jtelec



1965 NEC

EXBHIT F-1

NFPA HANDBOOK OF THE NATIONAL ELECTRICAL CODE

Based on the 1965 Edition of The National Electrical Code

FRANK STETKA

MERWIN M. BRANDON

SPONSORED BY THE NATIONAL FIRE PROTECTION ASSOCIATION

McGRAW-HILL BOOK COMPANY

New York San Francisco Toronto London Sydney

CHAPTER ONE

General

ARTICLE 100. DEFINITIONS

General guides for this Article on Definitions include: (1) for simplicity, only definitions essential to the proper use of this Code are included; (2) only those terms used in two or more Articles are defined in full in Article 100, other definitions being defined in the individual Article where they apply; (3) in general, NEC definitions will be the same as definitions in the latest revision of ASA C-42, "Definitions of Electrical Terms," and are so identified by an asterisk*.

***Accessible:** (As applied to wiring methods.) Not permanently closed in by the structure or finish of the building; capable of being removed without disturbing the building structure or finish. (See "Concealed" and "Exposed.")

▶ Exposed wiring is obviously accessible and concealed wiring is not accessible; but, wires in any raceway are judged accessible if they can be withdrawn.

***Accessible:** (As applied to equipment.) Admitting close approach because not guarded by locked doors, elevation or other effective means. (See "Readily Accessible.")

▶ Attics that can be entered would be accessible.

Ampacity: Current-carrying capacity expressed in amperes.

Anesthetizing Location: See Section 517-1(b).

Appliance: An appliance is utilization equipment, generally other than industrial, normally built in standardized sizes or types, which is installed or connected as a unit to perform one or more functions such as clothes washing, air conditioning, food mixing, deep frying, etc.

Oven, Wall-Mounted: A domestic oven for cooking purposes designed for mounting in or on a wall or other surface.
Panelboard: A single panel or group of panel units designed for assembly in the form of a single panel; including buses, and with or without switches and/or automatic overcurrent protective devices for the control of light, heat or power circuits of small individual as well as aggregate capacity; designed to be placed in a cabinet or cutout box placed in or against a wall or partition and accessible only from the front. (See "Switchboard.")

▶ It is difficult to write definitions which will clearly distinguish between panelboards and switchboards. Usually, panelboards are the smaller class of devices.

Projector, Nonprofessional: See Section 540-30.
Projector, Professional: See Section 540-10.
Qualified Person: One familiar with the construction and operation of the apparatus and the hazards involved.
Raceway: Any channel for holding wires, cables or busbars, which is designed expressly for, and used solely for, this purpose.

Raceways may be of metal or insulating material and the term includes rigid metal conduit, rigid nonmetallic conduit, flexible metal conduit, electrical metallic tubing, underfloor raceways, cellular concrete floor raceways, cellular metal floor raceways, surface metal raceways, structural raceways, wireways and busways.

***Raintight:** So constructed or protected that exposure to a beating rain will not result in the entrance of water.

▶ In Sections **230-52** and **730-23**, *raintight* is applied to raceways on the exterior of buildings.

***Readily Accessible:** Capable of being reached quickly, for operation, renewal, or inspections, without requiring those to whom ready access is requisite to climb over or remove obstacles or to resort to portable ladders, chairs, etc. (See "Accessible.")

▶ The term *readily accessible* implies a need for performing promptly an indicated act, for example, to reach quickly a disconnecting switch or circuit breaker without the use of ladders, chairs, etc. The installation of such a switch or circuit breaker at a height above 7 ft from a standing level is not considered "readily accessible."

Receptacle (Convenience Outlet): A receptacle is a contact device installed at an outlet for the connection of an attachment plug and flexible cord.
***Receptacle Outlet:** An outlet where one or more receptacles are installed.
Refrigeration Compressor, Sealed (Hermetic Type): See Section 430-2.
Remote-Control Circuit: Any electrical circuit which controls any other circuit through a relay or an equivalent device.
Sealable Equipment: Equipment enclosed in a case or cabinet that is provided with means of sealing or locking so that live parts cannot be made accessible

without opening the enclosure. The equipment may or may not be operable without opening the enclosure.

▶ See Section **230-62.**

Sealed (Hermetic Type) Refrigeration Compressor: A mechanical compressor consisting of a compressor and a motor, both of which are enclosed in the same sealed housing, with no external shaft nor shaft seals, the motor operating in the refrigerant atmosphere.
Service: The conductors and equipment for delivering energy from the electricity supply system to the wiring system of the premises served.
***Service Cable:** The service cable is the service conductors made up in the form of a cable.
Service Conductors: The supply conductors which extend from the street main, or from transformers to the service equipment of the premises supplied.

▶ In an overhead distribution system, the service conductors begin at the line pole where connection is made. If a primary line is extended to transformers installed outdoors on private property, the service conductors begin at the secondary terminals of the transformers.
Where the supply is from an underground distribution system, the service conductors begin at the point of connection to the underground mains.
In every case the service conductors terminate at the service equipment.

Service Drop: The overhead service conductors between the last pole or other aerial support and the first point of attachment to the building or other structure.
Service-Entrance Conductors, Overhead System: The service conductors between the terminals of the service equipment and a point usually outside the building, clear of building walls, where joined by tap or splice to the service drop.
Service-Entrance Conductors, Underground System: The service conductors between the terminals of the service equipment and the point of connection to the service lateral.

Where service equipment is located outside the building walls, there may be no service-entrance conductors, or they may be entirely outside the building.

Service Equipment: The necessary equipment, usually consisting of circuit-breaker or switch and fuses, and their accessories, located near point of entrance of supply conductors to a building and intended to constitute the main control and means of cutoff for the supply to that building.

▶ A meter is not considered a part of the service equipment.

Service Lateral: The underground service conductors between the street main, including any risers at a pole or other structure or from transformers, and the first point of connection to the service entrance conductors in a terminal box inside or outside the building wall. Where there is no terminal box, the point of connection shall be considered to be the point of entrance of the service conductors into the building.

NATIONAL ELECTRICAL CODE 1968

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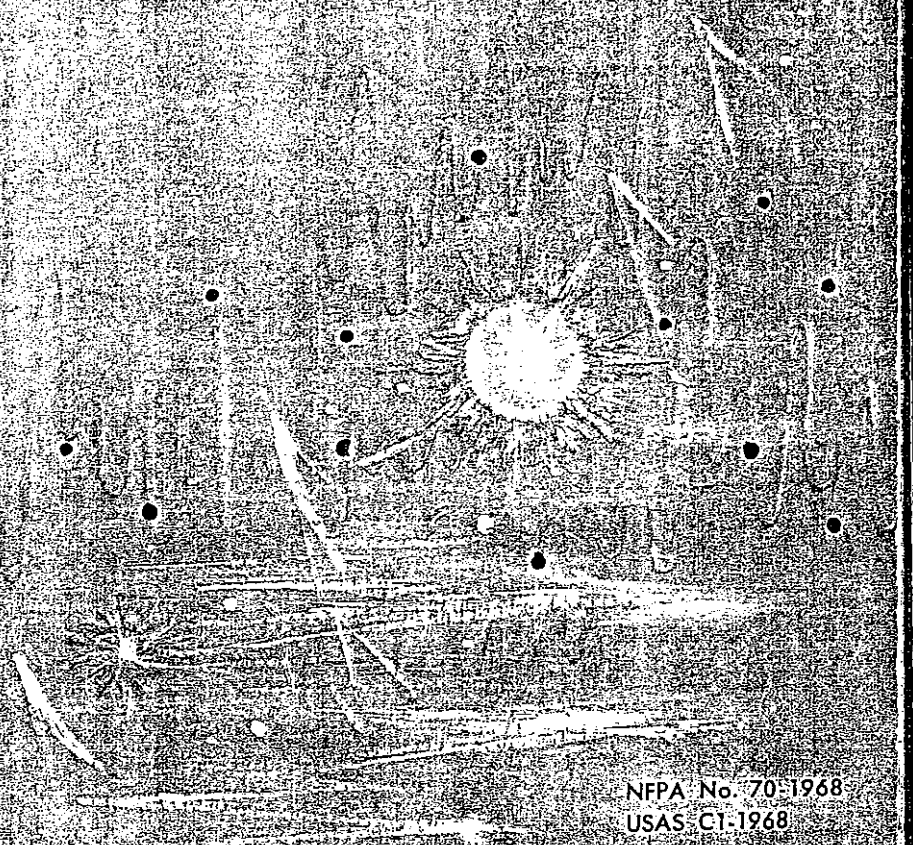

NFPA No. 70-1968
USAS C1-1968

1968 NEC

EXHIBIT F-2

Chapter 1. General

ARTICLE 100 — DEFINITIONS

General guides for this Article on Definitions include: (1) for simplicity, only definitions essential to the proper use of this Code are included; (2) only those terms used in two or more Articles are defined in full in Article 100, other definitions being defined in the individual Article where they apply; (3) in general, NEC definitions will be the same as definitions in the latest revision of USAS C-42 series, "Definitions of Electrical Terms," and are so identified by an asterisk*.

***Accessible:** (As applied to wiring methods.) Not permanently closed in by the structure or finish of the building; capable of being removed without disturbing the building structure or finish. (See "Concealed" and "Exposed.")

***Accessible:** (As applied to equipment.) Admitting close approach because not guarded by locked doors, elevation or other effective means. (See "Readily Accessible.")

Ampacity: Current-carrying capacity expressed in amperes.

Anesthetizing Location: See Section 517-1(b).

Appliance: An appliance is utilization equipment, generally other than industrial, normally built in standardized sizes or types, which is installed or connected as a unit to perform one or more functions such as clothes washing, air conditioning, food mixing, deep frying, etc.

Appliance — Fixed: An appliance which is fastened or otherwise secured at a specific location.

Appliance — Portable: An appliance which is actually moved or can easily be moved from one place to another in normal use.

Appliance — Stationary: An appliance which is not easily moved from one place to another in normal use.

Approved: Acceptable to the authority enforcing this Code.

***Askarel:** A synthetic nonflammable insulating liquid which, when decomposed by the electric arc, evolves only nonflammable gaseous mixtures.

***Attachment Plug (Plug Cap) (Cap):** An attachment plug is a device which, by insertion in a receptacle, establishes connection between the conductors of the attached flexible cord and the conductors connected permanently to the receptacle.

***Automatic:** Automatic means self-acting, operating by its own mechanism when actuated by some impersonal influence, as for example, a change in current strength, pressure, temperature, or mechanical configuration. (See "Nonautomatic.")

Block (City, Town, or Village): See Section 800-2.

Bonding Jumper: A reliable conductor to assure the required electrical conductivity between metal parts required to be electrically connected.

Bonding Jumper, Circuit: The connection between portions of a conductor in a circuit to maintain required ampacity of the circuit.

Bonding Jumper, Equipment: The connection between two or more portions of the equipment grounding conductor.

Bonding Jumper, Main: The connection between the grounded circuit conductor and the equipment grounding conductor at the service.

***Branch Circuit:** A branch circuit is that portion of a wiring system extending beyond the final overcurrent device protecting the circuit.

A device not approved for branch circuit protection such as a thermal cutout or motor overload protective device is not considered as the overcurrent device protecting the circuit.

***Branch Circuit—Appliance:** An appliance branch circuit is a circuit supplying energy to one or more outlets to which appliances are to be connected; such circuits to have no permanently connected lighting fixtures not a part of an appliance.

Branch Circuit — General Purpose: A branch circuit that supplies a number of outlets for lighting and appliances.

Branch Circuit — Individual: A branch circuit that supplies only one utilization equipment.

Branch Circuit, Multiwire: A multiwire branch circuit is a circuit consisting of two or more ungrounded conductors having a potential difference between them, and an identified grounded conductor having equal potential difference between it and each ungrounded conductor of the circuit and which is connected to the neutral conductor of the system.

Building: A structure which stands alone or which is cut off from adjoining structures by fire walls with all openings therein protected by approved fire doors.

***Cabinet:** An enclosure designed either for surface or flush mounting, and provided with a frame, mat or trim in which swinging doors are hung.

Cell (As Applied to Raceways): See Sections 356-1 and 358-1.

Circuit Breaker: A device designed to open and close a circuit by nonautomatic means, and to open the circuit automatically on a predetermined overload of current, without injury to itself when properly applied within its rating.

Communication Circuit: See Section 800-1.

***Concealed:** Rendered inaccessible by the structure or finish of the building. Wires in concealed raceways are considered concealed, even though they may become accessible by withdrawing them.

Conductor:

BARE: A bare conductor is one having no covering or insulation whatsoever. (See "Conductor, Covered.")

Raceways may be of metal or insulating material and the term includes rigid metal conduit, rigid nonmetallic conduit, flexible metal conduit, electrical metallic tubing, underfloor raceways, cellular concrete floor raceways, cellular metal floor raceways, surface raceways, structural raceways, wireways and busways.

***Raintight:** So constructed or protected that exposure to a beating rain will not result in the entrance of water.

***Readily Accessible:** Capable of being reached quickly, for operation, renewal, or inspections, without requiring those to whom ready access is requisite to climb over or remove obstacles or to resort to portable ladders, chairs, etc. (See "Accessible.")

Receptacle (Convenience Outlet): A receptacle is a contact device installed at an outlet for the connection of an attachment plug and flexible cord.

***Receptacle Outlet:** An outlet where one or more receptacles are installed.

Remote-Control Circuit: Any electrical circuit which controls any other circuit through a relay or an equivalent device.

Sealable Equipment: Equipment enclosed in a case or cabinet that is provided with means of sealing or locking so that live parts cannot be made accessible without opening the enclosure. The equipment may or may not be operable without opening the enclosure.

Sealed (Hermetic Type) Motor Compressor: A mechanical compressor consisting of a compressor and a motor, both of which are enclosed in the same sealed housing, with no external shaft nor shaft seals, the motor operating in the refrigerant atmosphere.

Service: The conductors and equipment for delivering energy from the electricity supply system to the wiring system of the premises served.

***Service Cable:** The service cable is the service conductors made up in the form of a cable.

Service Conductors: The supply conductors which extend from the street main, or from transformers to the service equipment of the premises supplied.

Service Drop: The overhead service conductors from the last pole or other aerial support to and including the splices, if any, connecting to the service entrance conductors at the building or other structure.

Service-Entrance Conductors, Overhead System: The service conductors between the terminals of the service equipment and a point usually outside the building, clear of building walls, where joined by tap or splice to the service drop.

Service-Entrance Conductors, Underground System: The service conductors between the terminals of the service equipment and the point of connection to the service lateral.

Where service equipment is located outside the building walls, there may be no service-entrance conductors, or they may be entirely outside the building.

Service Equipment: The necessary equipment, usually consisting of circuit-breaker or switch and fuses, and their accessories, located near point of entrance of supply conductors to a building and intended to constitute the main control and means of cutoff for the supply to that building.

Service Lateral: The underground service conductors between the street main, including any risers at a pole or other structure or from transformers, and the first point of connection to the service entrance conductors in a terminal box or meter or other enclosure with adequate space, inside or outside the building wall. Where there is no terminal box, or meter or other enclosure with adequate space, the point of connection shall be considered to be the point of entrance of the service conductors into the building.

Service Raceway: The rigid metal conduit, electrical metallic tubing, or other raceway, that encloses the service entrance conductors.

Setting: (Of Circuit-breaker.) The value of the current at which it is set to trip.

Show-Window: A show-window is any window used or designed to be used for the display of goods or advertising material, whether it is fully or partly enclosed or entirely open at the rear, and whether or not it has a platform raised higher than the street floor level.

Sign: See "Electric Sign."

Signal Circuit: Any electrical circuit which supplies energy to an appliance which gives a recognizable signal.

Such circuits include circuits for door bells, buzzers, code-calling systems, signal lights, and the like.

Special Permission: The written consent of the authority enforcing this Code.

Switches:

*GENERAL USE SWITCH: A general use switch is a switch intended for use in general distribution and branch circuits. It is rated in amperes, and it is capable of interrupting its rated current at its rated voltage.

GENERAL USE SNAP SWITCH: A form of general use switch so constructed that it can be installed in flush device boxes, or on outlet box covers, or otherwise used in conjunction with wiring systems recognized by this Code.

AC GENERAL USE SNAP SWITCH: A form of general use snap switch suitable only for use on alternating current circuits for controlling the following:

(a) Resistive and inductive loads (including electric discharge lamps) not exceeding the ampere rating at the voltage involved.

(b) Tungsten filament lamp loads not exceeding the ampere rating at 120 volts.

(c) Motor loads not exceeding 80 per cent of the ampere rating of the switches at the rated voltage.