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AWA Goodhue, LLC

Docket Nos.:	MPUC Docket No. IP6701/WS-08-1233 and OAH Docket 3-2500-21662-2
Response To:	Carol Overland, GWT
Date Received:	February 7, 2011 — Response Date: February 16, 2011

GENERAL OBJECTIONS

1. AWA Goodhue objects to each information request to the extent that it seeks information that is subject to the attorney-client privilege, work product privilege or other privilege on the ground that privileged matter is exempt from discovery.

2. AWA Goodhue objects to any and all instructions or definitions beyond the requirements imposed or permitted by the Minnesota Rules of Civil Procedure or Minnesota Rules Parts 1400 and 1405.

3. AWA Goodhue does not waive any of their general or particular objections in the event it furnishes information or documents coming within the scope of any such objections.

Without waiving the foregoing general objections, and pursuant to the Minnesota Rules of Civil Procedure and Minnesota Rules Parts 1400 and 1405, AWA Goodhue has enclosed responses to GWT's Information Request Nos. 36 – 45.

Response by:	Pete Malamen	List sources of information:
Title:	Vice President and Senior Project Manager	
Company:	Consulting Engineers Group	
Telephone:		

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Docket Nos.:	MPUC Docket No. IP6701/WS-08-1233 and OAH Docket 3-2500-21662-2		
Response To:	Carol Overland, GWT	Information Request No.	2
Date Received:	February 7, 2011	Response Date:	February 16, 2011

Request No.	
2.	Direct, p. 3, 1. 8-9, you state "Stray voltage is not caused by transmission lines, or by wind turbines, or the collection feeder lines that are part of a wind project because wind projects are entirely separate from the systems that provide electricity to nearby farms and do not use a grounded neutral conductor to carry any part of the normal load current."

a. Is it your testimony that stray voltage is not caused by a wind project because the wind project system is separate from the distribution system? Explain why or why not.

Response: Yes. They are separate circuits; each has a separate source and return for electric energy.

b. Is it your testimony that stray voltage is not caused by a wind project because it does not use a grounded neutral conductor to carry any part of the normal load current? Explain answer.

Response: Yes, each step up transformer at each turbine only has current flowing in the phase conductors. There is no ground return in the wind farm collection system. There are equipment ground conductors installed for safety purposes, but those ground conductors do not carry normal load current.

c. Will you guarantee that your project will not cause stray voltage? If no, why not?

Response: My business is to design and engineer electrical systems and to provide my reasoned opinions regarding those systems. It is not part of CEG's business practice to provide guarantees for projects we work on.

d. Is it your testimony that grounded neutral conductors carry normal load current? Please explain and include citations.

Response: Yes, in a grounded wye electrical distribution system where you have phase to neutral load (unlike a wind farm collection system), the grounded neutral conductor carries the unbalanced current.

e. Would you agree that stray voltage is "no-load" current? If not, explain.

Response: I do not understand the question. Voltage is not current.

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Docket Nos.: MPUC Docket No. IP6701/WS-08-1233 and OAH Docket 3-2500-21662-2

Response To: Carol Overland, GWT Information Request No. 3

Date Received: February 7, 2011 Response Date: February 16, 2011

Request No.	
3.	Direct, p. 4, 1. 5. and your Exhibit 4-A, would you agree that in your collector system as shown connects together at the wind farm substation? **Response:** Yes, the collector system connects together at the wind farm substation. a. Provide manufacturer installation and wiring instructions, manual, guides, etc. for each turbine contemplated. **Response:** See attached. b. Explain ways that your 34.5kV collection system is different from the 34.5kV distribution system. **Response:** The step up transformers at each wind turbine are connected phase to phase. In a 34.5 kV distribution system, all load is generally connected phase to ground. c. Explains ways that your 34.5kV collection system is the same as the 34.5kV distribution system. **Response:** Both have a grounded wye source at the substation. The insulated, underground 34.5 kV cable used for the wind farm collection system is also the same type of cable used for a 34.5 kV distribution system.

Response by: Pete Malamen

Title: Vice President and Senior Project Manager

Company: Consulting Engineers Group

Telephone:

List sources of information:

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Docket Nos.:	MPUC Docket No. IP6701/WS-08-1233 and OAH Docket 3-2500-21662-2		
Response To:	Carol Overland, GWT	Information Request No.	4
Date Received:	February 7, 2011	Response Date:	February 16, 2011

Request No.	
4.	Provide NESC citation and complete definition of “separately derived system” – a copy of a page of most current NESC will suffice. **Response:** NEC Article 100 has a definition of a “separately derived system” (see attached). The term was used in the testimony to indicate the wind farm collection feeder system is separate from the utility system in the area. Each system has a source of current and a return point for that current.

Response by:	Pete Malamen	List sources of information:
Title:	Vice President and Senior Project Manager	
Company:	Consulting Engineers Group	
Telephone:		

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Docket Nos.: MPUC Docket No. IP6701/WS-08-1233 and OAH Docket 3-2500-21662-2

Response To: Carol Overland, GWT — Information Request No. 5

Date Received: February 7, 2011 — Response Date: February 16, 2011

Request No.	
5.	Direct, p. 5, 1. 11, is "does not generate any ground or neutral currents like a normal electrical distribution system" part of the NESC definition? **Response:** No.

Response by:	Pete Malamen	List sources of information:
Title:	Vice President and Senior Project Manager	
Company:	Consulting Engineers Group	
Telephone:		

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Docket Nos.:	MPUC Docket No. IP6701/WS-08-1233 and OAH Docket 3-2500-21662-2		
Response To:	Carol Overland, GWT	Information Request No.	6
Date Received:	February 7, 2011	Response Date:	February 16, 2011

Request No.	
6.	Direct, p. 5, 1. 12-15, does the wind project collection system travel over or through a farm or farms? **Response:** Yes, the collection system will be located on agricultural land. a. Does the collector system travel over more than one farm? Please provide location on plat map identifying parcel ownership. **Response:** Yes, the collection system will travel under or along more than one farm. A conceptual depiction of the collection system was provided by AWA Goodhue in August 2010 (see Docket No. IP6701/WS-08-1233, eDockets document number 20108-53309-05). I do not have any information regarding parcel ownership. b. Would you agree that the collector system's electrical current will flow through farms to the extent that it is located on farmland? If no, please provide location on plat map identifying parcel ownership. **Response:** I would agree that electrical current will flow on buried insulated cables under or along agricultural land. c. Will the wind project substation and transformers be located on farmland? If no, please provide location on plat map identifying parcel ownership. **Response:** Yes.

Response by:	Pete Malamen	List sources of information:
Title:	Vice President and Senior Project Manager	
Company:	Consulting Engineers Group	
Telephone:		

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Docket Nos.:	MPUC Docket No. IP6701/WS-08-1233 and OAH Docket 3-2500-21662-2		
Response To:	Carol Overland, GWT	Information Request No.	7
Date Received:	February 7, 2011	Response Date:	February 16, 2011

Request No.	
7.	Direct, p. 5, 1. 18-19, "This equipment ground ties together all the groundings at each turbine that is part of the wind project." and p. 4, 1. 5, "the neutral or grounded conductors are all connected together at the service point." Please explain how this tying together/connection are different electrically. **Response:** They are the same. The general safety requirement is to tie/connect all the grounds to together at a location.

Response by:	Pete Malamen	List sources of information:
Title:	Vice President and Senior Project Manager	
Company:	Consulting Engineers Group	
Telephone:		

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Docket Nos.:	MPUC Docket No. IP6701/WS-08-1233 and OAH Docket 3-2500-21662-2
Response To:	Carol Overland, GWT — Information Request No. 8
Date Received:	February 7, 2011 — Response Date: February 16, 2011

Request No.	
8.	Direct, p. 5, 1. 22-23, how is the type of transformer related to generation of ground currents?

Response: The current in the transformers will flow from phase to phase, therefore, there will be no return current in the ground wire.

a. What type of transformer is specified?

   Response: They will be an industry standard pad mounted transformer with delta windings (phase to phase connections) on the high voltage side and a grounded wye connection on the low voltage side.

b. Provide manufacturers' spec sheets for this transformer, and any others contemplated.

   Response: It is my understanding that AWA Goodhue has not ordered any of this equipment yet given the current ALJ hearing process. The transformers will be specified and equipment ordered once the project receives its CON and site permit from the MPUC.

c. Regarding stray voltage related to transformers, identify:

   Response: I do not understand the question.

   i. Stray field in no-load operation.
   ii. Stray field from the terminal leads under load, low-voltage and high voltage sides.
   iii. Stray field from current-carrying windings.

Response by:	Pete Malamen	List sources of information:
Title:	Vice President and Senior Project Manager	
Company:	Consulting Engineers Group	
Telephone:		

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AWA Goodhue, LLC

Docket Nos.:	MPUC Docket No. IP6701/WS-08-1233 and OAH Docket 3-2500-21662-2		
Response To:	Carol Overland, GWT	Information Request No.	9
Date Received:	February 7, 2011	Response Date:	February 16, 2011

Request No.	
9.	Direct, p. 5, 1. 23 – p. 6, 1. 2, under normal operation, can there be unintentional current in the ground wire? **Response:** See 9a below. a. Under other than normal operation, can there be intentional current or unintentional current in the ground wire? **Response:** The only time when there could be current in the ground wire is if the cable would fault. This condition would only last a few electrical cycles (a fraction of a second) until the protective equipment at the substation would operate, disconnecting the underground cable from the substation, which in turn causes the turbines to shutdown. b. Is it your testimony that stray voltage is "intentional" current? **Response:** No. I gave a definition of stray voltage in my direct testimony on p. 3, l. 18-28.

Response by:	Pete Malamen	List sources of information:
Title:	Vice President and Senior Project Manager	
Company:	Consulting Engineers Group	
Telephone:		

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Docket Nos.:	MPUC Docket No. IP6701/WS-08-1233 and OAH Docket 3-2500-21662-2		
Response To:	Carol Overland, GWT	Information Request No.	10
Date Received:	February 7, 2011	Response Date:	February 16, 2011

Request No.	
10.	Direct, p. 6, l. 2-3, is it your testimony that there will be no current, intentional or unintentional, in the collector system ground wires? Please explain answer. **Response:** Yes, the transformers are connected phase to phase. All current flows in the insulated underground conductors unless there is a cable fault.

Response by:	Pete Malamen	List sources of information:
Title:	Vice President and Senior Project Manager	
Company:	Consulting Engineers Group	
Telephone:		

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Docket Nos.:	MPUC Docket No. IP6701/WS-08-1233 and OAH Docket 3-2500-21662-2		
Response To:	Carol Overland, GWT	Information Request No.	11
Date Received:	February 7, 2011	Response Date:	February 16, 2011

Request No.	
11.	Where the collector system is passing through farm fields, particularly near fence lines or irrigation, is their potential for stray induction? **Response:** The collection system cables carry a balanced, three-phase current and are placed in a trench in a triangular configuration and, therefore, the magnetic fields cancel each other. The cable itself is shielded (i.e. it has a layer of semi-conducting material that is grounded on the outside of the insulation) and, therefore, the electric field is confined. Based on my work experience with underground distribution systems, I have not heard of any issues with underground circuits and fences.

Response by:	Pete Malamen	List sources of information:
Title:	Vice President and Senior Project Manager	
Company:	Consulting Engineers Group	
Telephone:		

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Docket Nos.:	MPUC Docket No. IP6701/WS-08-1233 and OAH Docket 3-2500-21662-2		
Response To:	Carol Overland, GWT	Information Request No.	12
Date Received:	February 7, 2011	Response Date:	February 16, 2011

Request No.	
12.	Referring to Exhibit 4-A:

a. Is your collection system a multi-grounded wye system (NESC §9-096)?

Response: Yes.

b. Is your collection sufficiently grounded?

Response: Prior to commercial operation, a grounding study will be performed to ensure the system meets the IEEE definition of an "effectively grounded system." So yes, the system would be effectively grounded.

c. How do you determine sufficiency?

Response: See my response to 12(b) above.

d. Will you guarantee that your collection system has ground connections "of sufficiently low impedance and [ ] sufficient current-carrying capacity to limit the buildup of voltage to levels below that which may result in undue hazard to persons or to connected equipment" as referenced in NESC §2 (IEEE 2006)?

Response: It is not the business of CEG to provide guarantees for projects we work on.

Response by:	Pete Malamen	List sources of information:
Title:	Vice President and Senior Project Manager	
Company:	Consulting Engineers Group	
Telephone:		

Rainproof. Constructed, protected, or treated so as to prevent rain from interfering with the successful operation of the apparatus under specified test conditions.

See the commentary following the definition of *enclosure*.

Raintight. Constructed or protected so that exposure to a beating rain will not result in the entrance of water under specified test conditions.

The fine print note to Table 110.20 provides information on enclosure types that are considered to be raintight. For boxes and cabinets, see 300.6. Also see the commentary following the definitions of *location, wet* and *enclosure*.

Receptacle. A receptacle is a contact device installed at the outlet for the connection of an attachment plug. A single receptacle is a single contact device with no other contact device on the same yoke. A multiple receptacle is two or more contact devices on the same yoke.

Exhibit 100.13 shows one single and two multiple receptacles.

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

See Exhibit 100.13 and the commentary following 220.3(B)(9).

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

Exhibit 100.14 illustrates a remote-control circuit that starts and stops an electric motor.

Sealable Equipment. Equipment enclosed in a case or cabinet that is provided with a 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.

Separately Derived System. A premises wiring system whose power is derived from a source of electric energy or equipment other than a service. Such systems have no direct electrical connection, including a solidly connected grounded circuit conductor, to supply conductors originating in another system.

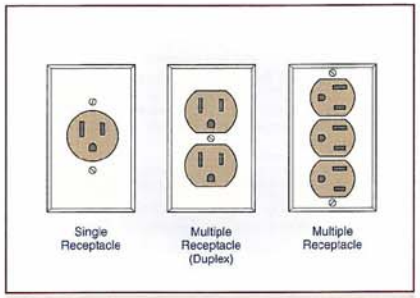

Exhibit 100.13 Receptacles.

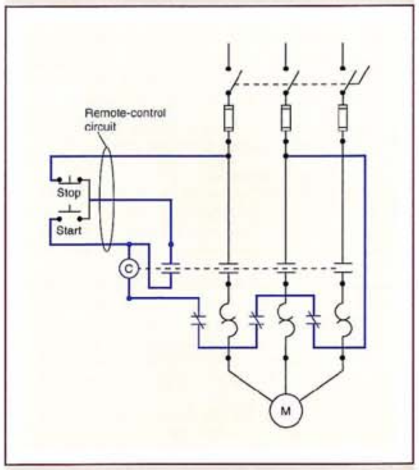

Exhibit 100.14 Remote-control circuit for starting and stopping an electric motor.

Some examples of a separately derived system may include a generator, a battery, converter windings, a transformer, and a solar photovoltaic system, provided they "have no direct electrical connection" to another source.

Service. The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

The definition of *service* includes the statement that electric energy to a service can be supplied only by the serving utility. If electric energy is supplied by other than the serving utility, the supplied conductors and equipment are considered feeders, not a service.

Service Cable. Service conductors made up in the form of a cable.

Service Conductors. The conductors from the service point to the service disconnecting means.

Service conductors is a broad term and may include service drops, service laterals, and service-entrance conductors. This term specifically excludes, however, any wiring on the supply side (serving utility side) of the service point. Simply put, the service conductors originate at the service point (where the serving utility ends) and end at the service disconnect. These service conductors may originate only from the serving utility.

If the utility has specified that the service point is at the utility pole, the service conductors from an overhead distribution system originate at the utility pole and terminate at the service disconnecting means.

If the utility has specified that the service point is at the utility manhole, the service conductors from an underground distribution system originate at the utility manhole and terminate at the service disconnecting means. Where utility-owned primary conductors are extended to outdoor pad-mounted transformers on private property, the service conductors originate at the secondary connections of the transformers only if the utility has specified that the service point is at the secondary connections.

See Article 230, Part VIII, and the commentary following 230.200 for service conductors exceeding 600 volts, nominal.

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.

In Exhibit 100.15, the overhead service-drop conductors run from the utility pole and connect to the service-entrance conductors at the service point. Conductors on the utility side of the service point are not covered by the *NEC*. The utility specifies the location of the service point. Exact locations of the service point may vary from utility to utility, as well as from occupancy to occupancy.

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.

See Exhibit 100.15 for an illustration of service-entrance conductors in an overhead system.

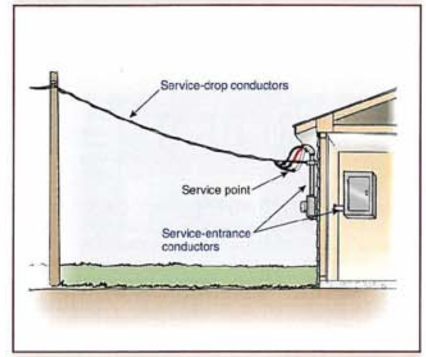

Exhibit 100.15 Overhead system showing a service drop from a utility pole to attachment on a house and service-entrance conductors from point of attachment (spliced to service-drop conductors), down the side of the house, through the meter socket, and terminating in the service equipment.

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

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

See Exhibit 100.16 for an illustration of service-entrance conductors in an underground system.

Service Equipment. The necessary equipment, usually consisting of a circuit breaker(s) or switch(es) and fuse(s) and their accessories, connected to the load end of service

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