PUBLIC VERSION

UNITED STATES INTERNATIONAL TRADE COMMISSION

Washington, D.C.

In the Matter of **CERTAIN VARIABLE SPEED WIND TURBINE GENERATORS AND COMPONENTS THEREOF**	**INV. NO. 337-TA-1218**

INITIAL DETERMINATION ON VIOLATION OF SECTION 337 AND RECOMMENDED DETERMINATION ON REMEDY AND BOND

Administrative Law Judge Clark S. Cheney

(September 10, 2021)

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Table of Abbreviations

CC Tr.	Transcript of claim construction hearing
CDX	Complainant's demonstrative exhibit
CIB	Complainant's initial post-hearing brief
CPB	Complainant's pre-hearing brief
CPX	Complainant's physical exhibit
CRB	Complainant's responsive post-hearing brief
CX	Complainant's exhibit
Depo.	Deposition
JX	Joint Exhibit
RDX	Respondents' demonstrative exhibit
RIB	Respondents' initial post-hearing brief
RPB	Respondents' pre-hearing brief
RPX	Respondents' physical exhibit
RRB	Respondents' responsive post-hearing brief
RX	Respondents' exhibit
Stip.	Stipulation of the parties
Tr.	Transcript

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Administrative Law Judge Clark S. Cheney

(September 10, 2021)

Pursuant to the Notice of Investigation, 85 Fed. Reg. 55492 (Sept. 8, 2020), and 19 C.F.R. §§ 210.10(b), 210.42(a)(1)(i), this is the final initial determination in the matter of *Certain Variable Speed Wind Turbine Generators and Components Thereof*, Investigation No. 337-TA-1218.

For the reasons stated herein, I have determined that a violation of section 337 of the Tariff Act of 1930, as amended, has occurred in the importation into the United States and the sale within the United States after importation of certain variable speed wind turbine generators and components thereof based on infringement of U.S. Patent No. 6,921,985.

I. INTRODUCTION

A. Procedural History

On July 31, 2020, complainant General Electric Company ("GE" or "Complainant") filed a complaint alleging violations of section 337 based on the importation into the United States, the sale for importation, and the sale within the United States after importation of certain variable speed wind turbine generators and components thereof. 85 Fed. Reg. 47810 (Aug. 6, 2020); *see* EDIS Doc. ID 716110. GE submitted a letter supplementing the complaint on August 21, 2020. 85 Fed. Reg. 55492 (Sept. 8, 2020); *see* EDIS Doc. ID 717829.

On September 8, 2020, the Commission instituted Investigation No. 337-TA-1218 to determine:

> [W]hether there is a violation of subsection (a)(1)(B) of section 337 in the importation into the United States, the sale for importation, or the sale within the United States after importation of certain products identified in paragraph (2) by reason of infringement of one or more of claims 1, 3, 6, 7, 12, 21–24, 29, 30, and 33–38 of the '985 patent [U.S. Patent No. 6,921,985] and claim 1 of the '705 patent [U.S. Patent No. 7,629,705]; and whether an industry in the United States exists as required by subsection (a)(2) of section 337.

85 Fed. Reg. 55492 (Sept. 8, 2020) ("Notice of Investigation").

The plain language description of the accused products in the complaint defines the scope of the investigation. 19 C.F.R. § 210.10(b)(1). The products are described as "variable speed wind turbine generators having low and zero voltage ride through capability and components thereof, namely generators, power converters, uninterruptible power supplies, turbine controllers, blade pitch control systems, and converter controllers." Notice of Investigation.

The Notice of Investigation named the following entities as respondents: Siemens Gamesa Renewable Energy Inc., Siemens Gamesa Renewable Energy A/S, and Gamesa Electric, S.A.U. (collectively, "SGRE" or "Respondents"). *Id.*

The Office of Unfair Import Investigations is not a party to this investigation. *Id.*

On September 22, 2020, I set the target date for this investigation at sixteen months, which makes this final initial determination due no later than September 10, 2021. Order No. 5 (Sept. 22, 2020).

On October 22, 2020, SGRE filed a motion seeking summary determination that claim 1 of the '705 patent is directed to unpatentable subject matter under 35 U.S.C. § 101. Motion Docket No. 1218-003. GE filed an opposition brief on November 12, 2020. SGRE subsequently filed a motion for leave to reply on November 19, 2020, and GE filed an opposition brief on November 30, 2020. Motion Docket No. 1218-007. I address the issues raised in these motions below in Section VII.G. In view of my findings there, Motion Nos. 1218-003 and -007 are denied as moot.

On December 2, 2020, I granted a motion from GE seeking leave to amend the complaint and notice of investigation to add allegations of infringement of claims 15, 16, and 21-24 of the '985 patent and claim 2 of the '705 patent. Order No. 10 (Dec. 2, 2020); *unreviewed,* Comm'n Notice (Dec. 21, 2020); *see also* 85 Fed. Reg. 85663 (Dec. 29, 2020). GE subsequently filed an amended complaint ("Am. Compl."). EDIS Doc. ID 729159.

In accordance with the procedural schedule issued as Order No. 6 on October 2, 2020, the parties submitted a joint chart of proposed claim constructions on December 3, 2020. The parties submitted opening claim construction briefs on January 21, 2021, and responsive claim

construction briefs on February 3, 2021. On February 25, 2021, I convened a claim construction hearing.[1]

On March 30, 2021, I granted a motion from GE seeking to terminate this investigation as to asserted claims 3, 7, 36, and 38 of the '985 patent and asserted claim 2 of the '705 patent. Order No. 20 (Mar. 30, 2021), *unreviewed*, Comm'n Notice (Apr. 15, 2021).

On April 26, 2021, I granted GE's motion for summary determination that it has satisfied the economic prong of the domestic industry requirement. Order No. 23 (Apr. 26, 2021). Specifically, I determined the economic prong of the domestic industry requirement has been satisfied under 19 U.S.C. §§ 1337(a)(3)(A) and (B) with respect to the '985 and '705 patents. *See* Order No. 23, at 5. The Commission did not review this determination, and it became final. Comm'n Notice (May 26, 2021).

On April 26, 2021, I granted a motion from GE seeking to terminate this investigation as to asserted claims 15, 16, and 21-24 of the '985 patent. Order No. 24 (Apr. 26, 2021), *unreviewed*, Comm'n Notice (May 17, 2021).

I held a prehearing conference on June 4, 2021, and convened the evidentiary hearing on June 7, 2021. The evidentiary hearing ended on June 11, 2021. *See* Tr. 1-1233.

On July 22, 2021, SGRE filed a motion seeking to reopen the evidentiary record to add four additional exhibits. Motion Docket No. 1218-029. GE filed a brief in opposition on August 2, 2021. I address the issues raised in the pending motion below in Section I.D.3.

[1] The transcript of the claim construction hearing is available as EDIS Doc. ID 735361 and is referred to in this initial determination as "CC Tr."

B. The Private Parties

1. Complainant GE

Complainant GE is a corporation that is organized and existing under the laws of the State of New York, with its principal place of business at 5 Necco Street, Boston, Massachusetts 02210. Am. Compl. ¶ 4.

2. Respondent SGRE

Respondent Siemens Gamesa Renewable Energy Inc. is a corporation organized under the laws of Delaware and has its principal place of business at 4400 Alafaya Trail Q2, Orlando, Florida 32826. SGRE's Response to the First Amended Complaint and Notice of Investigation ("SGRE Resp.") ¶ 10, EDIS Doc. ID 731147 (Jan. 19, 2021). Siemens Gamesa Renewable Energy, Inc. imports, sells, and services variable speed wind turbines, including the SWT-2.3 and SG 4.5 wind turbines and components thereof, including generators. *Id.*

Respondent Siemens Gamesa Renewable Energy A/S is a corporation organized under the laws of Denmark, having its headquarters and a principal place of business at Borupvej 16, 7330 Brande, Denmark. *Id.* ¶ 12. Siemens Gamesa Renewable Energy A/S develops and manufactures variable speed wind turbines, including SWT-2.3 wind turbines and certain components thereof, including generators. *Id.*

Respondent Gamesa Electric, S.A.U. is a corporation organized under the laws of Spain, having its headquarters and a principal place of business at Parque Tecnológico de Bizkaia, Building 206, 48170 Zamudio, BI, Spain. *Id.* ¶ 13. Gamesa Electric, S.A.U. develops and manufactures generators and other components of variable speed wind turbines, including generators and components for the SG 4.5 wind turbines. *Id.*

C. The Asserted Patents

GE asserts claims from two patents in this investigation: the '985 patent and the '705 patent (collectively, the "Asserted Patents").

1. U.S. Patent No. 6,921,985

The '985 patent, titled "Low Voltage Ride Through for Wind Turbine Generators," issued on July 26, 2005, and names Wilhelm Janssen, Henning Luetze, Andreas Buecker, Till Hoffmann, and Ralf Hagedorn as inventors. JX-0001 ("the '985 patent") at cover page. The '985 patent issued from application no. 10/350,452, filed on January 24, 2003, and expires on May 6, 2023. *Id.* The '985 patent is assigned to GE. *Id.*

GE presently asserts claims 1, 6, 12, 29, 30, 33, 34, 35, and 37 of the '985 patent against SGRE. *See* Notice of Investigation; Order No. 10; Order No. 20; Order No. 24; CIB at 18. To prove satisfaction of the technical prong of the domestic industry requirement, GE relies on claims 1, 6, 15, and 29 of the '985 patent. *See* Am. Compl. ¶ 65; CIB at 40-60. The claims at issue in this investigation read as follows:

> 1. A wind turbine generator comprising:
>
> a generator;
>
> a blade pitch control system to vary a pitch of one or more blades;
>
> a turbine controller coupled with the blade pitch control system;
>
> a first power source coupled with the turbine controller and with the blade pitch control system to provide power during a first mode of operation; and
>
> an uninterruptible power supply coupled to the turbine controller and with the blade pitch control system to provide power during a low voltage event in which the generator remains connected to a grid when the voltage at the output terminals of the generator is less than 50% of a rated voltage of the generator;

wherein in response to detection of a transition from the first mode of operation to a second mode of operation comprising the low voltage event the turbine controller causes the blade pitch control system to vary the pitch of the one or more blades in response to the transition.

6. A wind turbine generator comprising:

a generator;

a blade pitch control system to vary a pitch of one or more blades;

a turbine controller coupled with the blade pitch control system;

a first power source coupled with the turbine controller and with the blade pitch control system to provide power during a first mode of operation; and

an uninterruptible power supply coupled to the turbine controller and with the blade pitch control system to provide power during a low voltage event in which the generator remains connected to a grid and wherein a low voltage event comprises a voltage at the output terminals of the generator between 15% and 50% of a rated voltage of the generator;

wherein in response to detection of a transition from the first mode of operation to a second mode of operation comprising the low voltage event the turbine controller causes the blade pitch control system to vary the pitch of the one or more blades in response to the transition.

12. The wind turbine generator of claim 1 wherein the uninterruptible power supply comprises a battery power supply.

15. A wind turbine generator comprising:

a generator;

a power converter coupled with the generator, the power converter having an inverter coupled to receive power from the generator, a converter controller coupled with the inverter to monitor a current flow in the inverter wherein the converter controller is coupled to receive power from an uninterruptible power supply during a low voltage event, and a circuit coupled with the input of the inverter and with the converter controller to shunt current from the inverter and generator rotor in response to a control signal from the converter controller.

29. A method comprising:

providing power to wind turbine components using a generator of the wind turbine;

detecting a low voltage event;

receiving power from an uninterruptible power supply to a first subset of wind turbine components, wherein the first subset of wind turbine components comprises a blade pitch controller to selectively power the blade pitch controller to maintain a rotor speed below a predetermined overspeed limit during the low voltage event; and

disconnecting a second subset of wind turbine components from the generator during the low voltage event.

30. The method of claim 29 wherein the uninterruptible power supply comprises a battery power supply.

33. The method of claim 29 wherein a low voltage event comprises a voltage at the output terminals of the generator of less than 75% of a rated voltage of the generator.

34. The method of claim 33 wherein the low voltage event occurs for up to 3 seconds.

35. The method of claim 29 wherein a low voltage event comprises a voltage at the output terminals of the generator of less than 50% of a rated voltage of the generator.

37. The method of claim 29 wherein a low voltage event comprises a voltage at the output terminals of the generator between 15% and 50% of a rated voltage of the generator.

'985 patent at claims 1, 6, 12, 15, 29, 30, 33-35, and 37.

2. U.S. Patent No. 7,629,705

The '705 patent, titled "Method and Apparatus for Operating Electrical Machines," issued on December 8, 2009, and names Sidney A. Barker, Anthony Klodowski, John D'Atre, Einar Larsen, and Goran Drobnjak as inventors. JX-0002 ("the '705 patent") at cover page. The '705 patent issued from application no. 11/551,430, filed on October 20, 2006, and expires on December 6, 2027. *Id.* The '705 patent is assigned to GE. *Id.*

GE presently asserts claim 1 of the '705 patent against SGRE. *See* Notice of Investigation; Order No. 10; Order No. 20. To prove satisfaction of the technical prong of the domestic industry requirement, GE relies on claim 1 of the '705 patent. *See* Am. Compl. ¶ 65; CIB at 82-87. Claim 1 reads as follows:

> 1. A method for operating an electrical machine, said method comprising:
>
> > coupling the electrical machine to an electric power system such that the electric power system is configured to transmit at least one phase of electric power to the electrical machine; and
> >
> > configuring the electrical machine such that the electrical machine remains electrically connected to the electric power system during and subsequent to a voltage amplitude of the electric power system operating outside of a predetermined range for an undetermined period of time, said configuring the electrical machine comprising:
> >
> > > electrically coupling at least a portion of a control system to at least a portion of the electric power system;
> > >
> > > coupling the control system in electronic data communication with at least a portion of the electrical machine; and
> > >
> > > configuring the electrical machine and the control system such that the electrical machine remains electrically connected to the electric power system during and subsequent to the voltage amplitude of the electric power system decreasing below the predetermined range including approximately zero volts for the undetermined period of time, thereby facilitating zero voltage ride through (ZRVT).

'705 patent at claim 1.

D. The Accused Products

GE accuses of infringement two categories of wind turbines designed, manufactured, and imported by SGRE: (1) turbines having a full converter and (2) turbines having a doubly-fed induction generator ("DFIG") (collectively, the "Accused Products"). *See* CX-0607C; CIB at 6. The United States Harmonized Tariff Schedule number for the imported components of the

Accused Products are 8501.64.00, 8502.31.00, 8503.00.95, and 8504.40.95. *See* CX-0387.0002. GE and SGRE entered into a stipulation regarding the importation of the Accused Products or components thereof into the United States, and also entered into a stipulation that certain Accused Products are representative of the operation of other Accused Products. *See* CX-0387 (importation stipulation); CX-0388 (representative product stipulation). That stipulation divides the Accused Products into categories (a) through (d). Each of those categories is described in more detail below.

1. Accused Full-Converter Products

The full-converter products GE accuses of infringement in this investigation are the SWT 2.3-108, SWT 2.7-129, and SWT 2.9-129 wind turbine models with ABB power converters (collectively, the "Accused Full-Converter Products"). *See* CIB at 6; CX-0387.0002; JPX-0001C. The representative product stipulation identifies two categories of full-converter products: category (a) consists of those with software versions earlier than version PG_V30_VS_201202 and category (b) consists of those with software version PG_V30_VS_201202 or subsequent releases of that software. CX-0388.0001. This categorization of the Accused Full-Converter Products is only relevant to claim 29 of the '985 patent and the asserted claims that depend from claim 29. *See* CIB at 6 (citing Tr. at 59:4-9). Specifically, GE accuses the full-converter products in categories (a) and (b) of infringing claims 1, 6, and 12 of the '985 patent and claim 1 of the '705 patent. However, GE accuses only the full-converter products in category (a) of infringing claims 29, 30, 33-35, and 37 of the '985 patent. *Id.*

The record evidence shows that SGRE customers have commissioned Accused Full-Converter Products and operate them in the United States. *See, e.g.*, RX 0570C.0009 (Accused Full-Converter Product SWT 2.3-108 commissioned by Pattern Gulf Wind Holdings LLC);

RX-0631C.0035 (Accused Full-Converter Product SWT 2.9-129 commissioned by Nextera Energy Constructors, LLC, and Nextera Energy Resources LLC).

2. Accused DFIG Products

The DFIG products GE accuses of infringement in this investigation are the SG 5.0-145, SG 4.5-145, SG 3.465-132, SG 3.4-132, SG 2.625-114, SG 2.6-114, and SG 2.6-126 with Gamesa Electric SAU power converters, and the SG 2.1-114 with an Ingeteam converter (collectively, the "Accused DFIG Products"). *See* CIB at 6-7; CX-0387.0002; JPX-0001C; CX-0388.

The evidence shows that SGRE customers have commissioned Accused DFIG Products and operate them in the United States. *See, e.g.*, RX-0521C.0028 (Accused DFIG Product SG 5.0-145 commissioned by BMP Wind LLC); RX-0542C.0032 (Accused DFIG Product SG 5.0-145 commissioned by King Creek Wind Farm 2 LLC).The representative product stipulation identifies categories (c) and (d) as DFIG models with a Gamesa Electric SAU converter. Category (c) consists of those with software versions earlier than version FIP096_R.17_005 and category (d) consists of those with software version FIP096_R.17_005 or subsequent releases of that software. CX-0388.0001-.0002. This delineation of the Accused DFIG Products is relevant only to alleged infringement of claims 15, 16, and 21-24 of the '985 patent, claims that GE has dropped from this investigation and no longer asserts against SGRE. *See* CIB at 7; Order No. 24. GE accuses both categories (c) and (d) of infringing claims 1, 6, and 12 of the '985 patent and claim 1 of the '705 patent. CIB at 7. No argument was made at the evidentiary hearing that the infringement analysis of these claims differed for categories (c) and (d). *See id.*

For the SG 2.1-114 with an Ingeteam converter, the evidence demonstrates that it operates in the same manner as the DFIG models with Gamesa Electric converters for purposes of evaluating infringement of claims 1, 6, and 12 of the '985 patent and claim 1 of the '705 patent.

Jesus Arellano, head of engineering for the control section team for the onshore wind turbine department at SGRE, testified that the PLC—*i.e.*, the turbine controller—for the SG 2.1-114 is the same as the turbine controller for the DFIG products with Gamesa Electric SAU converters and that the pitching behavior during a voltage dip is therefore also the same. *See* JX-0158C.0006-.0007 (Arellano Depo. Tr.) at 19:17-20:6, 22:9-23:9; Tr. (Arellano) at 604:17-605:1. Mr. Arellano also testified that the SG 2.1-144 uses an uninterruptible power supply in a similar manner as the other DFIG products having Gamesa Electric SAU converters. JX-0158C.0009 (Arellano Depo. Tr.) at 33:12-15.

In addition, Andres Agudo, head of engineering for the converter team for the onshore wind turbine department at SGRE, testified that the SG 2.1-114—like the other accused DFIG models with a Gamesa Electric converter—includes the use of a converter and has a controller in electronic data communication with the generator to measure current output of the generator and rotor speed. JX-0159C.0013-.0014 (Agudo Depo. Tr.) at 49:17-51:12. Mr. Agudo also testified at the hearing that the SG 2.1-114 has the same ride-through specification as the DFIG models with a Gamesa Electric converter. Tr. (Agudo) at 593:15-594:3.

In view of the parties' representative product stipulation and the testimony provided by Messrs. Arellano and Agudo, all of the Accused DFIG Products will be treated identically for purposes of the infringement analysis set forth below.

3. Future Products

In addition to the Accused Full-Converter Products and Accused DFIG Products identified and discussed in the preceding two sections, GE identified the following SGRE products in its Amended Complaint (hereinafter "Future Products") and accused them of infringing the '985 and '705 patents:

- the 5.X series (including SG 5.8-155, SG 5.8-170)
- SG 6.0-154
- SG 7.0-154
- SG 8.0-167 DD
- SG 10.0-193 DD
- SWT 3.2-113
- SWT 3.4-108
- SWT 6.0-154
- SWT 7.0-154
- SWT DD-120
- SWT DD-130
- SWT DD-142

Am. Compl. ¶ 17. GE did not present evidence as to these Future Products at the hearing, either to compare them directly to the Asserted Patents to show infringement or to demonstrate that other Accused Products are representative of the structure and functionality of the Future Products.

With respect to these Future Products originally identified in GE's complaint but not raised at the hearing, SGRE argues: "Where, as here, a complainant seeks to have known accused products covered by an exclusion order but fails to present any evidence of infringement, a determination of non-infringement is warranted." RRB at 7. SGRE also takes the position that all Future Products should be excluded from any remedial order issued by the Commission in the event a violation of section 337 is found. RRB at 48.

GE argues that SGRE's "attempt to secure an advisory ruling" as to the noninfringement of the Future Products should be rejected. *See* CIB at 93. Specifically, GE argues that "the Commission does not have jurisdiction to adjudicate the infringement of non-imported products in a Section 337 investigation." *Id.* at 93-94 (citing *Certain Marine Sonar Imaging Devices*, Inv. No. 337-TA-921, Comm'n Op., 2016 WL 10987364, at *53 (U.S.I.T.C. Jan. 6, 2016) ("[T]he Commission notes that the record contains no evidence of importation as to Garmin's 2015 products, and as such the Commission has not adjudicated infringement as to those products." (internal citations omitted)).

After GE argued in its initial post-hearing brief that there was no evidence showing importation of the Future Products, SGRE moved to reopen the evidentiary record to receive four additional exhibits relating to the alleged importation of the Future Products. Motion Docket No. 1218-029 ("Mot."). In particular, SGRE seeks to admit the following exhibits, which are included as attachments to the pending motion:

- RX-0964 (Mot. Ex. A) is the declaration of Elizabeth Sneitzer, outside counsel for SGRE; the declaration purports to authenticate the three proposed exhibits listed below.
- RX-0965 (Mot. Ex. B) is Exhibit B to Respondents' Objections and Responses to Complainant's First Set of Interrogatories. SGRE claims this document identifies "SGRE's current and prospective 'offshore' wind turbine projects, which involve SGRE's 'direct drive' wind turbine designs and 'SICS' controller software." Mot. at 2-3.
- RX-0966C (Mot. Ex. C) is SGRE's executed Turbine Supply Agreement ("TSA") for the Coastal Virginia Offshore Windfarm. SGRE claims it was signed on July

30, 2018, and demonstrates the sale of two SWT-7.0-154 direct drive ("DD") wind turbines that were commissioned off the coast of Virginia in September 2020. Mot. at 3.

- RX-0967C (Mot. Ex. D) is SGRE's executed Turbine Supply Agreement ("TSA") for the North East Program Offshore Windfarms. SGRE claims this TSA was signed on October 12, 2020, and demonstrates the sale of 161 model SWT 11.0-200 direct drive wind turbines that are scheduled to be commissioned off the coast of Rhode Island in November 2024. Mot. at 3.

SGRE contends there is good cause to receive these four proffered exhibits into the record because "they are needed to allow the ALJ and Commission to evaluate the credibility of GE's arguments regarding the alleged 'Future Products,' the discovery SGRE provided concerning them, and whether the Commission has jurisdiction to adjudicate them."

GE opposes SGRE's motion to reopen the record, arguing that it "is an improper attempt to belatedly introduce evidence regarding a subset of these Future Products." Opp'n at 1. GE further argues:

> SGRE made arguments regarding these Future Products in its pre-hearing brief, yet chose not to introduce any evidence regarding them during the hearing. Moreover, the new exhibits that SGRE seeks to introduce fail in any event to establish importation or disclose the functionality of these products. Finally, admittance of these new exhibits without providing GE the opportunity to cross-examine knowledgeable SGRE witnesses would be prejudicial.

Id.

Having considered the arguments of the parties and reviewed the proposed exhibits, I have determined to deny SGRE's motion to reopen the record. Although the proposed exhibits apparently show that SGRE sold wind turbines for commissioning in Virginia and Rhode Island

in September 2020 and November 2024, respectively, these documents do not identify any components of these wind turbines as having been imported into the United States. The probative value of this evidence is therefore slight. In contrast, the prejudice that GE would experience if these exhibits were admitted into the record now is high. GE would be denied the opportunity to cross-examine knowledgeable witnesses as to their contents. Motion No. 1218-029 is denied.

As to whether I should determine if the Future Products infringe the '985 and '705 patents as part of this investigation, "[w]ithout some sort of affirmative showing of noninfringement by the respondent, a finding of noninfringement is not warranted under Commission precedent." *Certain RF Capable Integrated Circuits and Prods. Containing the Same*, Inv. No. 337-AT-982, Order No. 14, 2016 WL 4426486, at *6 (U.S.I.T.C. Aug. 4, 2016); *see also Certain UV Curable Coatings for Optical Fibers, Coated Optical Fibers, & Prod. Containing Same*, Inv. No. 337-TA-1031, Order No. 26, 2017 WL 3188642, at *2 (U.S.I.T.C. June 23, 2017) ("It is generally the complainant's prerogative to control which products it ultimately accuses of infringement. . . . If a respondent wishes for particular products to be adjudicated in the investigation, it may do so by putting forth an affirmative case for non-infringement."). Although GE's complaint alleged infringement as to all of SGRE's "current and legacy" variable speed wind turbines, after the investigation was instituted GE limited its definition of the Accused Products to the models identified by SGRE as having been imported for installation in the United States. RX-0939C.0003 (GE infringement contentions) (citing Ex. A to SGRE interrogatory responses). Neither party included an analysis of the Future Products in their infringement or non-infringement contentions, neither parties' experts opined on Future Products in their expert reports, and neither party addressed these Future Products at the evidentiary hearing. *See* CX-0476C.0135-.0205 (SGRE non-infringement contentions). Thus, to the extent SGRE wanted these Future Products

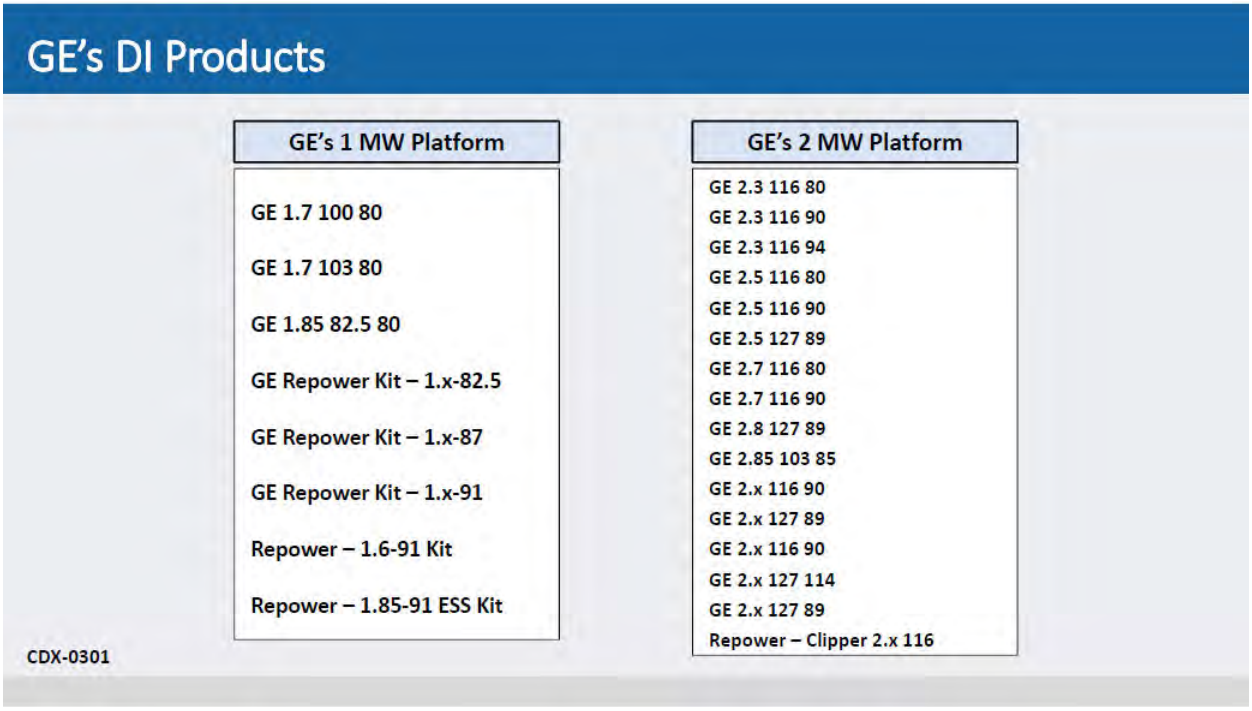
to be adjudicated in this investigation, it should have put forward an affirmative case of noninfringement. SGRE did not do so.

I therefore decline to adjudicate the alleged noninfringement of Future Products as part of this initial determination.

E. The Domestic Industry Products

GE relies on its 1 MW and 2 MW Platforms (collectively, the "Domestic Industry Products") to prove satisfaction of the domestic industry requirement. CIB at 8. The Domestic Industry Products include both newly installed wind turbines and repowered wind turbines. *Id.* A "repowered" turbine refers to an existing wind turbine retrofitted with new hardware. Tr. (Barton) at 72:14-19.

The demonstrative slide below lists the Domestic Industry Products. *See also* JPX-0002C (new unit and repower sales from Q3 2017 to Q2 2020); Tr. (Barton) at 71:21-73:13 (discussing the list of Domestic Industry Products on CDX-0301). The model name for each DI Product is derived from its rated wattage in megawatts, rotor diameter in meters, and (for new units) tower height in meters. Tr. (Barton) at 72:1-13.



CDX-0301.

II. JURISDICTION

A. Subject Matter Jurisdiction

Section 337 of the Tariff Act prohibits the importation, the sale for importation, or the sale after importation of articles that infringe a valid and enforceable patent if an industry exists in the United States relating to articles protected by the patent. 19 U.S.C. §§ 1337(a)(1)-(2). GE's Amended Complaint states a cause of action under section 337 by alleging that SGRE imports, sells for importation, and sells after importation certain variable speed wind turbine generators and components thereof that infringe the Asserted Patents. *See* Am. Compl. at 13-20. No party has contested the Commission's subject matter jurisdiction over this investigation. The Commission, therefore, has subject matter jurisdiction over this investigation.

B. Personal Jurisdiction

By filing a complaint and participating in this investigation, GE has consented to personal jurisdiction at the Commission. *See Certain Toner Cartridges, Components Thereof, and Systems Containing the Sam*e, Inv. No. 337-TA-1174, Initial Determination at 34-35 (July 23, 2020), *unreviewed*, Comm'n Notice (Sept. 8, 2020). SGRE has participated in this investigation by, among other things, responding to the complaint and notice of investigation and participating in discovery, thereby submitting itself to the personal jurisdiction of the Commission. I therefore find that the Commission has personal jurisdiction over all parties. *See, e.g., Certain Strontium-Rubidium Radioisotope Infusion Systems, and Components Thereof Including Generators*, Inv. No. 337-TA-1110, Initial Determination at 9 (Aug. 1, 2019), *not reviewed in pertinent part*, Comm'n Notice (Sept. 30, 2019).

C. *In Rem* Jurisdiction

As the parties have stipulated that the Accused Products have been imported into the United States, I find the Commission has *in rem* jurisdiction over the Accused Products in this investigation. CX-0387; JPX-0001C; *see Sealed Air Corp. v. Int'l Trade Comm'n*, 645 F.2d 976, 985-86 (C.C.P.A. 1981) (noting the Commission has jurisdiction over imported goods).

III. STANDING

SGRE does not dispute GE's ownership of the Asserted Patents. The record demonstrates that GE has standing in this investigation due to its ownership by assignment of the Asserted Patents. *See* JX-0003; JX-0004.

IV. IMPORTATION

To prove a violation of section 337 by any particular respondent, the complainant must show that the respondent engaged in "[t]he importation into the United States, the sale for

importation, or the sale within the United States after importation by the owner, importer, or consignee" of products accused of infringement. 19 U.S.C. §§ 1337(a)(1)(A)-(B). SGRE has stipulated that the Accused Products have been imported into the United States. CX-0387; JPX-0001C. I therefore find that the importation requirement of section 337 has been satisfied.

V. LEGAL PRINCIPLES

A. Claim Construction

"An infringement analysis entails two steps. The first step is determining the meaning and scope of the patent claims asserted to be infringed. The second step is comparing the properly construed claims to the device accused of infringing." *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 976 (Fed. Cir. 1995) (*en banc*) (internal citations omitted), *aff'd*, 517 U.S. 370 (1996). Claim construction resolves legal disputes between the parties regarding claim scope. *See Eon Corp. IP Holdings v. Silver Spring Networks*, 815 F.3d 1314, 1319 (Fed. Cir. 2016).

Evidence intrinsic to the application, prosecution, and issuance of a patent is the most significant source of the legally operative meaning of disputed claim language. *See Bell Atl. Network Servs., Inc. v. Covad Commc'ns Grp., Inc.*, 262 F.3d 1258, 1267 (Fed. Cir. 2001). The intrinsic evidence includes the claims themselves, the specification, and the prosecution history. *See Phillips v. AWH Corp*, 415 F.3d 1303, 1314 (Fed. Cir. 2005) (*en banc*); *see also Markman*, 52 F.3d at 979. As the Federal Circuit explained in *Phillips*, courts must analyze each of these components to determine the "ordinary and customary meaning of a claim term" as understood by a person of ordinary skill in the art at the time of the invention. 415 F.3d at 1313.

"It is a 'bedrock principle' of patent law that 'the claims of a patent define the invention to which the patentee is entitled the right to exclude.'" *Phillips*, 415 F.3d at 1312 (quoting *Innova/Pure Water, Inc. v. Safari Water Filtration Sys., Inc.*, 381 F.3d 1111, 1115 (Fed. Cir.

2004)). "[T]he claims themselves provide substantial guidance as to the meaning of particular claim terms." *Id.* at 1314; *see Interactive Gift Express, Inc. v. Compuserve Inc.*, 256 F.3d 1323, 1331 (Fed. Cir. 2001) ("In construing claims, the analytical focus must begin and remain centered on the language of the claims themselves, for it is that language that the patentee chose to use to 'particularly point[ ] out and distinctly claim[ ] the subject matter which the patentee regards as his invention."'). The context in which a term is used in an asserted claim can be "highly instructive." *Phillips*, 415 F.3d at 1314. Additionally, other claims in the same patent, asserted or unasserted, may also provide guidance as to the meaning of a claim term. *Id.*

The specification "is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term." *Id.* at 1315 (quoting *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996)). "[T]he specification may reveal a special definition given to a claim term by the patentee that differs from the meaning it would otherwise possess. In such cases, the inventor's lexicography governs." *Id.* at 1316. "In other cases, the specification may reveal an intentional disclaimer, or disavowal, of claim scope by the inventor." *Id.* As a general rule, however, the particular examples or embodiments discussed in the specification are not to be read into the claims as limitations. *Id.* at 1323. In the end, "[t]he construction that stays true to the claim language and most naturally aligns with the patent's description of the invention will be . . . the correct construction." *Id.* at 1316 (quoting *Renishaw PLC v. Marposs Societa' per Azioni*, 158 F.3d 1243, 1250 (Fed. Cir. 1998)).

When the intrinsic evidence does not establish the meaning of a claim, then extrinsic evidence (*i.e.*, all evidence external to the patent and the prosecution history, including dictionaries, inventor testimony, expert testimony, and learned treatises) may be considered. *Id.* at 1317. Extrinsic evidence is generally viewed as less reliable than the patent itself and its

prosecution history in determining how to define claim terms. *Id.* "The court may receive extrinsic evidence to educate itself about the invention and the relevant technology, but the court may not use extrinsic evidence to arrive at a claim construction that is clearly at odds with the construction mandated by the intrinsic evidence." *Elkay Mfg. Co. v. Ebco Mfg. Co.*, 192 F.3d 973, 977 (Fed. Cir. 1999).

B. Infringement

In a section 337 investigation, the complainant bears the burden of proving infringement of the asserted patent claims by a preponderance of the evidence. *See Spansion, Inc. v. Int'l Trade Comm'n*, 629 F.3d 1331, 1349 (Fed. Cir. 2010). This standard "requires proving that infringement was more likely than not to have occurred." *Warner-Lambert Co. v. Teva Pharm. USA, Inc*., 418 F.3d 1326, 1341 n.15 (Fed. Cir. 2005).

1. Direct Infringement

"[W]hoever without authority makes, uses, offers to sell, or sells any patented invention, within the United States or imports into the United States any patented invention during the term of the patent therefor, infringes the patent." 35 U.S.C. § 271(a). "Literal infringement requires the patentee to prove that the accused device contains each limitation of the asserted claim(s). If any claim limitation is absent, there is no literal infringement as a matter of law." *Bayer AG v. Elan Pharm. Research Corp*., 212 F.3d 1241, 1247 (Fed. Cir. 2000). For method claims, "infringement under § 271(a) occurs where all steps of a claimed method are performed by or attributable to a single entity." *Akamai Techs., Inc. v. Limelight Networks, Inc.*, 797 F.3d 1020, 1022 (Fed. Cir. 2015) (citing *BMC Res., Inc. v. Paymentech, L.P.*, 498 F.3d 1373, 1379-81 (Fed. Cir. 2007)). Literal infringement is a question of fact. *Finisar Corp. v. DirecTV Grp., Inc.*, 523 F.3d 1323, 1332 (Fed. Cir. 2008).

2. Induced Infringement

"[A] violation of Section 337 may arise from an act of induced infringement." *Suprema, Inc. v. Int'l Trade Comm'n*, 796 F.3d 1338, 1351 (Fed. Cir. 2015). Section 27l(b) of the Patent Act states: "Whoever actively induces infringement of a patent shall be liable as an infringer." 35 U.S.C. § 27l(b). "To prevail on a claim of induced infringement, in addition to inducement by the defendant, the patentee must also show that the asserted patent was directly infringed." *Epcon Gas Sys., Inc. v. Bauer Compressors, Inc.*, 279 F.3d 1022, 1033 (Fed. Cir. 2002). "Section 27l(b) covers active inducement of infringement, which typically includes acts that intentionally cause, urge, encourage, or aid another to directly infringe a patent." *Arris Group v. British Telecomms. PLC*, 639 F.3d 1368, 1379 n.13 (Fed. Cir. 2011). Liability for inducement requires proof that the party had "knowledge that the induced acts constitute patent infringement." *Global-Tech Appliances, Inc. v. SEB S.A.*, 563 U.S. 754, 766 (2011).

3. Contributory Infringement

A party is liable for contributory infringement if it "offers to sell or sells within the United States or imports into the United States . . . a material or apparatus for use in practicing a patented process, constituting a material part of the invention, knowing the same to be especially made or especially adapted for use in an infringement of such patent, and not a staple article or commodity of commerce suitable for substantial noninfringing use." 35 U.S.C. § 271(c). "[T]o prevail on contributory infringement in a Section 337 case, the complainant must show *inter alia*: (1) there is an act of direct infringement in violation of Section 337; (2) the accused device has no substantial non-infringing uses; and (3) the accused infringer imported, sold for importation, or sold after importation within the United States, the accused components that contributed to another's direct infringement." *Spansion*, 629 F.3d at 1353.

C. Validity

A patent is presumed valid. *See* 35 U.S.C. § 282; *Microsoft Corp. v. i4i Ltd. P'ship*, 131 S. Ct. 2238, 2242 (2011). A respondent who has raised patent invalidity as an affirmative defense has the burden of overcoming this presumption by clear and convincing evidence. *See Microsoft*, 131 S. Ct. at 2242. The patent validity questions in this investigation are governed by the Patent Act before it was amended by the America Invents Act ("AIA").

1. Anticipation

Under 35 U.S.C. § 102, a claim is anticipated, and therefore invalid, when "the four comers of a single, prior art document describe every element of the claimed invention, either expressly or inherently, such that a person of ordinary skill in the art could practice the invention without undue experimentation." *Advanced Display Sys., Inc. v. Kent State Univ.*, 212 F.3d 1272, 1282 (Fed. Cir. 2000). To be considered anticipatory, the prior art reference must be enabling and describe the applicant's claimed invention sufficiently to have placed it in possession of a person of ordinary skill in the field of the invention. *See Helifix Ltd. v. Blok-Lok, Ltd.*, 208 F.3d 1339, 1346 (Fed. Cir. 2000).

For a reference to constitute a "printed publication" under pre-AIA 35 U.S.C. § 102(a) or (b), it "must have been sufficiently accessible to the public interested in the art." *In re Cronyn*, 890 F.2d 1158, 1160 (Fed. Cir. 1989). Public accessibility may be based on a showing that the document was "disseminated or otherwise made available to the extent that persons interested and ordinarily skilled in the subject matter or art exercising reasonable diligence[ ] can locate it." *Kyocera Wireless Corp. v. Int'l Trade Comm'n*, 545 F.3d 1340, 1350 (Fed. Cir. 2008). Mere "conjecture that is not supported by the record" is not sufficient to show public accessibility. *Koninklijke Philips N.V. v. Zoll Med. Corp.*, 656 Fed. App'x. 504, 529 (Fed. Cir. 2016).

The on-sale bar under § 102(b) "applies when two conditions are satisfied before the critical date." *Pfaff v. Wells Elecs.*, 525 U.S. 55, 67 (1998). "[T]he product must be the subject of a commercial offer for sale" and "the invention must be ready for patenting." *Id*. Ready for patenting requires "proof of reduction to practice before the critical date" or "proof that prior to the critical date the inventor had prepared drawings or other descriptions of the invention that were sufficiently specific to enable a person skilled in the art to practice the invention." *Id*. at 67-68. "[W]hen development and verification are needed in order to prepare a patent application that complies with § 112, the invention is not yet ready for patenting." *Space Sys./Loral, Inc. v. Lockheed Martin Corp.*, 271 F.3d 1076, 1080 (Fed. Cir. 2001). Actual reduction to practice requires "(1) construct[ing] an embodiment or performed a process that met all the limitations and (2) determin[ing] that the invention would work for its intended purpose." *Barry v. Medtronic, Inc.*, 914 F.3d 1310, 1322 (Fed. Cir. 2019) (surgeries practicing claimed method did not constitute reduction to practice because inventor had not yet determined method worked for its intended purpose); *see also Polara Eng'g, Inc. v. Campbell Co.*, 894 F.3d 1339, 1349 (Fed. Cir. 2018) (tests in public spaces were not invalidating because such testing was required "at actual crosswalks of different sizes and configurations and where the prototype would experience different weather conditions to ensure that the invention would work for its intended purpose"); *Honeywell Int'l Inc. v. Universal Avionics Systems Corp.*, 488 F.3d 982 (Fed. Cir. 2007) (recognizing invention might not be ready for patenting until inventor ascertains how invention will function in practical circumstances).

In order for a public use to be invalidating under § 102(b), the purported use must have been: (1) "accessible to the public;" or (2) "commercially exploited." *Invitrogen Corp. v. Biocrest Mfg., L.P.*, 424 F.3d 1374, 1380 (Fed. Cir. 2005). Commercial exploitation requires more than

experimental use or a secret offer for sale. *Id.* To determine whether use of an invention was experimental, several factors may be considered, including the nature of the activity that occurred in public, public access to the use, and confidentiality obligations imposed on observers of the use. *Id*.

2. Obviousness

Under 35 U.S.C. § 103, a patent may be found invalid as obvious if "the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains." 35 U.S.C. § 103(a). Because obviousness is determined at the time of invention, rather than the date of litigation, "[t]he great challenge of the obviousness judgment is proceeding without any hint of hindsight." *Star Scientific, Inc. v. R.J. Reynolds Tobacco Co*., 655 F.3d 1364, 1375 (Fed. Cir. 2011).

When a patent is challenged as obvious, the critical inquiry in determining the differences between the claimed invention and the prior art is whether there is an apparent reason to combine the known elements in the fashion claimed by the patent at issue. *See KSR Int'l Co. v. Teleflex, Inc*., 550 U.S. 398, 417-18 (2007). Thus, when arguing obviousness based a combination of several prior art references, "the burden falls on the patent challenger to show by clear and convincing evidence that a person of ordinary skill in the art would have had reason to attempt to make the composition or device, or carry out the claimed process, and would have had a reasonable expectation of success in doing so." *PharmaStem Therapeutics, Inc. v. ViaCell, Inc.*, 491 F.3d 1342, 1360 (Fed. Cir. 2007) (citations omitted).

Obviousness is a determination of law based on underlying determinations of fact. *Star Scientific*, 655 F.3d at 1374. The factual determinations behind a finding of obviousness include:

(1) the scope and content of the prior art, (2) the level and content of the prior art, (3) the differences between the claimed invention and the prior art, and (4) secondary considerations of non-obviousness. *KSR*, 550 U.S. at 399 (citing *Graham v. John Deere Co.*, 383 U.S. 1, 17 (1966)). These factual determinations are referred to collectively as the "*Graham* factors." Secondary considerations of non-obviousness include commercial success, long felt but unresolved need, and the failure of others. *Id.* When present, secondary considerations "give light to the circumstances surrounding the origin of the subject matter sought to be patented," but they are not dispositive on the issue of obviousness. *Geo. M. Martin Co. v. Alliance Mach. Sys. Int'l*, 618 F.3d 1294, 1304-06 (Fed. Cir. 2010). For evidence of secondary considerations to be given substantial weight in the obviousness determination, its proponent must establish a nexus between the evidence and the merits of the claimed invention. *See W. Union Co. v. MoneyGram Payment Sys. Inc.*, 626 F.3d 1361, 1372-73 (Fed. Cir. 2010) (citing *In re GPAC Inc.*, 57 F.3d 1573, 1580 (Fed. Cir. 1995)).

3. Enablement

Section 112 of the Patent Act requires that a patent specification "enable any person skilled in the art to which it pertains . . . to make and use" the claimed invention. 35 U.S.C. § 112, ¶ 1 (pre-AIA). "Claims are not enabled when, at the effective filing date of the patent, one of ordinary skill in the art could not practice their full scope without undue experimentation." *Wyeth & Cordis Corp. v. Abbott Labs.*, 720 F.3d 1380, 1384 (Fed. Cir. 2013). The enablement requirement "prevents . . . overbroad claiming that might otherwise attempt to cover more than was actually invented." *MagSil Corp. v. Hitachi Glob. Storage Techs., Inc.*, 687 F.3d 1377, 1381 (Fed. Cir. 2012). "The scope of the claims must be less than or equal to the scope of the enablement to ensure that the public knowledge is enriched by the patent specification to a degree at least commensurate with the scope of the claims." *Sitrick v. Dreamworks, LLC*, 516 F.3d 993, 999 (Fed. Cir. 2008).

Enablement is a question of law based on underlying facts. *Wyeth & Cordis Corp.*, 720 F.3d at 1384. In analyzing whether the full scope of a claim is enabled, the Federal Circuit has considered the following factors: "(1) the quantity of experimentation necessary, (2) the amount of direction or guidance presented, (3) the presence or absence of working examples, (4) the nature of the invention, (5) the state of the prior art, (6) the relative skill of those in the art, (7) the predictability or unpredictability of the art, and (8) the breadth of the claims." *In re Wands*, 858 F.2d 731, 737 (Fed. Cir. 1988). However, the *Wands* factors "are illustrative, not mandatory." *Amgen, Inc. v. Chugai Pharm. Co., Ltd.*, 927 F.2d 1200, 1213 (Fed. Cir. 1991).

D. Domestic Industry

For a patent-based complaint, a violation of section 337 can be found "only if an industry in the United States, relating to the articles protected by the patent . . . concerned, exists or is in the process of being established." 19 U.S.C. § 1337(a)(2). The complainant bears the burden of establishing that the domestic industry requirement is satisfied. *John Mezzalingua Assocs., Inc. v. Int'l Trade Comm'n*, 660 F.3d 1322, 1331 (Fed. Cir. 2011). The domestic industry requirement of section 337 is often described as having an economic prong and a technical prong. *InterDigital Commc'ns, LLC v. Int'l Trade Comm'n*, 707 F.3d 1295, 1298 (Fed. Cir. 2013); *Certain Stringed Musical Instruments and Components Thereof*, Inv. No. 337-TA-586, Comm'n Op. at 12-14, USITC Pub. No. 4120 (Dec. 2009).

1. Economic Prong

Section 337(a)(3) sets forth the following economic criteria for determining the existence of a domestic industry in such investigations:

> (3) For purposes of paragraph (2), an industry in the United States shall be considered to exist if there is in the United States, with respect to the articles

> protected by the patent, copyright, trademark, mask work, or design concerned –
>
> (A) significant investment in plant and equipment;
>
> (B) significant employment of labor or capital; or
>
> (C) substantial investment in its exploitation, including engineering, research and development, or licensing.

19 U.S.C. § 1337(a)(3). Because the statutory criteria are listed in the disjunctive, satisfaction of any one of them will be sufficient to meet the economic prong of the domestic industry requirement. *See InterDigital Commc'ns*, 707 F.3d at 1303 n.4; *Certain Variable Speed Wind Turbines and Components Thereof*, Inv. No. 337-TA-376, Comm'n Op. at 15, USITC Pub. No. 3003 (Nov. 1996).

2. Technical Prong

The technical prong of the domestic industry requirement is satisfied when the complainant in a patent-based section 337 investigation establishes that it is practicing or exploiting the patents at issue. *See* 19 U.S.C. § 1337(a)(2) and (3); *Certain Microsphere Adhesives, Process for Making Same and Prods. Containing Same, Including Self-Stick Repositionable Notes*, Inv. No. 337-TA-366, Comm'n Op. at 8, USITC Pub. No. 2949 (Jan. 1996). "The test for satisfying the 'technical prong' of the industry requirement is essentially [the] same as that for infringement, *i.e.*, a comparison of domestic products to the asserted claims." *Alloc, Inc. v. Int'l Trade Comm'n*, 342 F.3d 1361, 1375 (Fed. Cir. 2003). To prevail, the patentee must establish by a preponderance of the evidence that the domestic product practices one or more valid claims of the patent. *See id.*; *Spansion*, 629 F.3d at 1349; *Certain Vision-Based Driver Assistance System Cameras and Components Thereof*, Inv. No. 337-TA-907, Comm'n Op. at 36, USITC Pub. No. 4866 (Feb. 2019). It is sufficient to show that the products practice any claim of that patent, not necessarily

an asserted claim of that patent. *See Certain Male Prophylactic Devices*, Inv. No. 337-TA-546, Comm'n Op. at 38, USITC Pub. No. 4005 (May 2008).

VI. THE '985 PATENT

A. Overview

According to the teachings of the '985 patent, disturbances that cause voltage fluctuations in the electrical grid are common. Prior art wind turbines disconnected from the grid and shut down during a low voltage event to prevent the blades from turning too fast—a condition known as overspeeding—and to protect sensitive electronic components. *See* '985 patent at 1:41-42, 2:45-48; *see also* Tr. (Brown) at 703:9-17. The '985 patent is directed to the improved design and operation of a wind turbine that allows it remain connected to the grid during certain low voltage events. This design is summarized in the Detailed Description:

> The techniques described herein allow a wind turbine generator to provide one or more of the following features: 1) to remain synchronized to the power grid during severe voltage fluctuations, 2) to maintain functioning of the blade pitch system in spite of lack of voltage at the generator terminals, 3) to protect the power converter and generator from high voltages and currents during the voltage fluctuation, and 4) to temporarily shut down non-vital subsystems that could be damaged by exposure to low voltages or could be tripped by either circuit breaker action or fuse operation.

'985 patent at 2:24-34.

The '985 patent was reexamined as part of an *inter partes* reexamination proceeding at the Patent Office. JX-0006 ("'985 reexam history"). With respect to the claims at issue in this investigation, a reexamination certificate issued on January 8, 2016, that (1) confirmed the patentability of claims 15, 29, and 30; (2) found claims 1, 6, 33, 35, and 37 patentable as amended;

and (3) found claims 12 and 34 patentable as dependent on an amended claim. '985 patent at 14-17.[2]

B. Level of Ordinary Skill in the Art

GE's experts Dr. Brown and Dr. Phinney both testified that a person of ordinary skill in the art at the time of the '985 patented invention would have a Bachelor of Science degree in electrical engineering or an equivalent degree program, with two or three years of experience in power electronics and/or electronic machines. Tr. (Brown) at 645:10-22; Tr. (Phinney) at 866:7-17; *see* RDX-0007.003. SGRE's expert Dr. Habetler agreed that this definition of a person of ordinary skill in the art is appropriate. Tr. (Habetler) at 1110:3-11; *see also* RIB at 12.

The testimony of Dr. Brown and Dr. Phinney as to the relevant level of skill is unrebutted. I therefore adopt their definition of a person of ordinary skill in the art at the time of the inventions disclosed in the '985 patent.

C. Claim Construction

The parties did not propose any terms from the '985 patent for construction during the claim construction phase of this investigation. SGRE subsequently raised non-infringement arguments as to the Accused Full-Converter Products that turn on the meaning of the phrase "voltage at the output terminals of the generator," which is found in claims 1 and 6 of the '985 patent. *See* RRB at 23-24.

The disputed term was added to the claims during the reexamination of the '985 patent. Claim 1 was amended to read: "an uninterruptible power supply coupled to the turbine controller and with the blade pitch control system to provide power during a low voltage event *in which the*

[2] The reexamination certificate for the '985 patent is in the record at JX-0001.00014–.00017 and will hereinafter be referred to as "'985 reexam certificate".

generator remains connected to a grid when the voltage at the output terminals of the generator is less than 50% of a rated voltage of the generator." '985 reexam certificate at 1:35-40 (emphasis original). Amended claim 6 includes the same limitation but covers a voltage "between 15 and 50%." '985 reexam certificate at 1:50-65.

When GE amended these claims, it provided a statement to the Patent Office that explicitly defined the voltage at the output terminals of the generator during the claimed "low voltage event" as being the grid voltage:

> Claims 1 and 6 have been amended to more particularly claim low voltage events consistent with their definition in the specification of the '985 patent and dependent claims, particularly claims 4 and 6. In particular, the claimed generator is required to remain connected to the grid during a low voltage event; and ***low voltage is defined as a voltage in which the grid voltage drops to less than 50%*** (amended claim 1), ***or to 15-50%*** (amended claim 6) ***of a rated voltage of the generator***. Support for the generator remaining connected to the grid during a low voltage event is found in at least Col. 1, lines 29-33; Col. 2, lines 39-42 and Col. 6, lines 24-29. . . .

See JX-0150.00015 (emphasis added).

At the evidentiary hearing, SGRE's expert Dr. Brown agreed that GE had defined what is meant by a low voltage event during the course of the reexamination history and that it would be appropriate to use that definition for purposes of this investigation:

> Q. Fair enough. And you agree that in the prosecution history, GE defined what it meant by low voltage event in each of claim 1 and 6, right?
>
> A. That is correct, yes.
>
> ***
>
> Q. And you agree that it would be appropriate to use the GE definition from the 580 reexamination history in evaluating the issue of infringement in this case, correct?
>
> A. I agree, yes.

Tr. (Brown) at 724:13-725:4.

Thus, the record demonstrates a person of skill in the art would have understood "the voltage at the output terminals of the generator" identified in claims 1 and 6 to mean the grid voltage. *See CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1366 (Fed. Cir. 2002) (a patentee may "clearly set forth a definition of [a] disputed claim term in either the specification or prosecution history"); *St. Clair Intellectual Prop. Consultants, Inc. v. Canon Inc.*, 412 F. App'x 270, 275-76 (Fed. Cir. 2011) ("Reexamination statements 'are relevant prosecution history when interpreting claims.'").

Moreover, GE's statements made during the reexamination are consistent with the teachings of the '985 specification, which confirm that the claimed low voltage event is one in which the grid voltage drops. *See* '985 patent at 1:58-67 ("Currently, wind turbine generators [*sic*] specifications can require connection and synchronization with the power grid down to levels of 70% of rated voltage. . . . However, more severe voltage fluctuations, for example, voltages at 15% of rated voltage cannot be accommodated using these techniques.").

Accordingly, for purposes of the '985 patent infringement analysis, "voltage at the output terminals of the generator" will be construed to mean the grid voltage.

D. Direct Infringement

GE asserts that the Accused Products satisfy each limitation of the '985 patent asserted claims, as follows:

- Accused DFIG Products – claims 1, 6 and 12
- Accused Full-Converter Products – claims 1, 6, 12, 29, 30, 33, 34, 35, and 37

CIB at 18.

1. Claims 1 and 6

Asserted claims 1 and 6 of the ’985 patent are nearly identical. The only difference between claim 1 and claim 6 is that the claimed “low voltage event” is “less than 50% of a rated voltage of the generator” in claim 1 and “between 15% and 50%” in claim 6. ’985 patent at claims 1 and 6. In its post-hearing briefs, GE assigns numbers to each limitation of claims 1 and 6 (*e.g.*, limitation [1.0] or limitation [6.3]). For reference, claims 1 and 6 are reproduced below with GE’s limitation labels:

[1.0] A wind turbine generator comprising:	[6.0] A wind turbine generator comprising:
[1.1] a generator;	[6.1] a generator;
[1.2] a blade pitch control system to vary a pitch of one or more blades;	[6.2] a blade pitch control system to vary a pitch of one or more blades;
[1.3] a turbine controller coupled with the blade pitch control system;	[6.3] a turbine controller coupled with the blade pitch control system;
[1.4] a first power source coupled with the turbine controller and with the blade pitch control system to provide power during a first mode of operation;	[6.4] a first power source coupled with the turbine controller and with the blade pitch control system to provide power during a first mode of operation;
[1.5] an uninterruptible power supply coupled to the turbine controller and with the blade pitch control system to provide power during a low voltage event in which the generator remains connected to a grid when the voltage at the output terminals of the generator is less than 50% of a rated voltage of the generator;	[6.5] an uninterruptible power supply coupled to the turbine controller and with the blade pitch control system to provide power during a low voltage event in which the generator remains connected to a grid and wherein a low voltage event comprises a voltage at the output terminals of the generator between 15% and 50% of a rated voltage of the generator;
[1.6] wherein in response to detection of a transition from the first mode of operation to a second mode of operation comprising the low voltage event the turbine controller causes the blade pitch control system to vary the pitch of the one or more blades in response to the transition.	[6.6] wherein in response to detection of a transition from the first mode of operation to a second mode of operation comprising the low voltage event the turbine controller causes the blade pitch control system to vary the pitch of the one or more blades in response to the transition.

CIB at 19.

Neither GE nor SGRE distinguishes between claims 1 and 6 for purposes of the infringement analysis. *See* CIB 19; Tr. (Brown) at 647:7-15, 727:5-12. My infringement analysis set forth below will also consider claims 1 and 6 of the '985 patent simultaneously.

a) Preamble [1.0]/[6.0] and limitations [1.1]-[1.3]/[6.1]-[6.3]: "A wind turbine generator comprising: a generator; a blade pitch control system to vary a pitch of one or more blades; a turbine controller coupled with the blade pitch control system;"

The evidence demonstrates that the Accused Products satisfy preamble [1.0]/[6.0] and limitations [1.1]-[1.3]/[6.1]-[6.3]: . The preamble and first limitation are satisfied because each of the Accused Products is a "wind turbine generator" that comprises a "generator." *See* Tr. (Brown) at 725:16-21; Tr. (Habetler) at 262:7-19, 283:7-17; JX-0124C.0026; JX-0127C.0005. The Accused Products also satisfy limitations [1.2]-[1.3]/[6.2]-[6.3] because each comprises "a blade pitch control system to vary a pitch of one or more blades" and a "turbine controller coupled with the blade pitch control system." *See* Tr. (Brown) at 725:16-21; Tr. (Habetler) at 262:20-263:22, 283:18-284:2; Tr. (Lund) at 576:17-24; JX-0124C.0013; JX-0117C.0018; Tr. (Arellano) at 605:20-25; JX-0121C.0005; JX-0123C.0008. SGRE does not dispute that the Accused Products satisfy preamble [1.0]/[6.0] and limitations [1.1]-[1.3]/[6.1]-[6.3]. *See* Tr. (Brown) at 725:16-21; RRB at 12-24.

b) Limitation [1.4]/[6.4]: "a first power source coupled with the turbine controller and with the blade pitch control system to provide power during a first mode of operation;"

GE argues that the Accused Products satisfy limitation [1.4]/[6.4], which requires "a first power source coupled with the turbine controller and with the blade pitch control system to provide

power during a first mode of operation." CIB at 20 (citing Tr. (Habetler) at 265:8-266:17, 285:11-287:11). GE identifies the combination of the power grid and the wind turbine generator as the claimed "first power source." *Id.* n.4 ("In the Accused Products the turbine and blade pitch controllers are connected to a bus that is coupled to both the generator and the grid and therefore receives power from both the generator and the grid (i.e., both are a 'first power source')." GE also identifies the generator's "normal operation" mode as the claimed "first mode of operation." *See id.*

The documentary evidence, reproduced below, demonstrates that the turbine controller (red) and the blade pitch control system (blue) are coupled to a bus that receives power from the grid and generator during normal operation. *See* Tr. (Habetler) at 265:8-266:9, 285:3-287:11; Tr. (Lund) at 577:4-16 (during normal operation the source of power is the grid); JX-0123C.0008 ("The wind turbine control runs in a PLC. The energy for this PLC is supplied by the grid. In case of a grid loss the PLC has an UPS that is used as a backup system.").[3]

[3] "PLC" stands for "programmable logic controller," which is a type of computer. Tr. (Habetler) 263:5-16. "UPS" stands for uninterruptible power supply. *See* Tr. (Holliday) 215:4-10.

CDX-008C (annotated excerpt from JX-0130C) (DFIG)

CDX-027C (annotated excerpt from JX-0133C.0026) (Full-Converter)

Variables in the software of the two accused product families also confirm this limitation is met. In the Accused DFIG Products, a variable called "CcuDipOn" is set when the grid voltage is below 85% of nominal voltage. *See* Tr. (Habetler) at 276:3-20; Tr. (Arellano) at 606:25-607:10, 626:9-20; Tr. (Brown) at 731:24-732:21. If the grid voltage is above 85%, then CcuDipOn is set to FALSE (0); if the grid voltage falls below 85%, then CcuDipOn is set to TRUE (1). *See* Tr. (Habetler) at 276:3-20; Tr. (Arellano) at 606:25-607:10, 626:9-20; Tr. (Brown) at 731:24-732:21. The claimed "first mode of operation" in the Accused DFIG Products occurs when CcuDipOn is FALSE. *See* Tr. (Habetler) at 276:3-20.

In the Accused Full-Converter Products, a variable called "FRT_detect" is set when the grid voltage is below 90% of nominal voltage. *See* Tr. (Habetler) at 292:6-18; Tr. (Lund) at

579:8-580:9; Tr. (Brown) at 730:5-22. If the grid voltage is above 90%, then FRT_detect is set to FALSE; if the grid voltage falls below 90%, then FRT_detect is set to TRUE. *See* Tr. (Habetler) at 292:6-18; Tr. (Lund) at 579:8-580:9; Tr. (Brown) at 730:5-22. The claimed first mode of operation occurs in the Accused Full-Converter Products when FRT_detect is FALSE. *See* Tr. (Habetler) at 292:6-18.

GE adduced evidence showing that, during the first mode of operation (*i.e.*, when CcuDipOn in the Accused DFIG Products is FALSE and FRT_detect in the Accused Full-Converter Products is FALSE), the turbine controller and the blade pitch control system receive power from the grid through the generator. *See* Tr. (Habetler) at 266:10-267:11, 287:2-11; Tr. (Lund) at 577:13-16 ("Q. Well, the source of power for those components comes from the grid and passes through the UPS, correct? A. Through -- during normal operation, that's correct."); Tr. (Brown) at 654:5-655:2 ("And so when you are above 70 percent of -- of supply voltage, you are going to not be using battery energy. You're going to be using grid energy."); Tr. (Brown) at 726:25-727:4 ("Q. And if the power is not coming from the batteries from the UPS, it's coming from the grid, correct? A. Yeah, it's coming from the generator grid connection in the DFIG designs, right, and then it's coming from, yeah, the grid in the Full-Converter designs."). Thus, the grid and generator are a first power source coupled with the turbine controller and with the blade pitch control system to provide power during a first mode of operation.

I therefore find that the Accused Products satisfy this claim limitation.

c) Limitation [1.5]/[6.5]: "an uninterruptible power supply . . . when the voltage at the output terminals of the generator is less than 50% of a rated voltage of the generator;" / "an uninterruptible power supply . . . and wherein a low voltage event comprises a voltage at the output terminals of the generator between 15% and 50% of a rated voltage of the generator;"

Limitation [1.5] requires "an uninterruptible power supply coupled to the turbine controller and with the blade pitch control system to provide power during a low voltage event in which the generator remains connected to a grid when the voltage at the output terminals of the generator is less than 50% of a rated voltage of the generator," and limitation [6.5] requires that the voltage is "between 15% and 50%." As discussed below, the GE adduced evidence to show that the Accused Products satisfy both limitation [1.5] and limitation [6.5].

The record evidence demonstrates that the Accused Products comprise an uninterruptible power supply ("UPS") coupled to the turbine controller and blade pitch control system. *See* Tr. (Habetler) at 270:3-22, 287:12-288:7; Tr. (Lund) at 576:25-577:23; Tr. (Brown) at 726:2-24. SGRE's expert Dr. Brown testified that the uninterruptible power supply's batteries provide power to the turbine controller and blade pitch control system when the grid voltage is less than 50% or between 15% and 50% (*i.e.*, during a low voltage event):

> Q. And in the accused wind turbines, the UPS provides power to the turbine controller and the blade pitch control system when the grid voltage is less than 50 percent, right?
>
> A. Yeah, it doesn't trigger at 50 percent, but at the 50 percent level, that is true.
>
> Q. And in the -- and in the accused wind turbines, the UPS provides power to the turbine controller and the blade pitch control system when the grid voltage is between 15 and 50 percent, right?
>
> A. Yes, same answer.
>
> Q. And the UPS behavior is the same for the accused Full-Converters and the DFIG design, right?

> A. That is correct, yes.
>
> Q. And if the power is not coming from the batteries in the UPS, it's coming from the grid, correct?
>
> A. Yeah, it's coming from the generator grid connection in the DFIG designs, right, and then it's coming, yeah, the grid in the Full-Converter designs.

Tr. (Brown) at 726:11-727:4; *see also* Tr. (Habetler) at 273:4-11; Tr. (Lund) at 577:20-578:6; JX-0158C.00009 (Arellano Depo. Tr.) at 30:11-31:21. SGRE does not dispute that the Accused Products have this functionality. *See* RRB at 12-24.

The evidence also shows that the Accused Products have a generator that remains connected when the grid voltage is less than 50% or between 15 and 50% of a rated voltage of the generator. Tr. (Habetler) at 274:6-24, 290:3-13; CX-0148C.0002 (ride-through specification for DFIGs); Tr. (Lund) at 573:14-574:6; Tr. (Brown) at 725:6-15. The ride-through specifications for the Accused Products (reproduced below) confirm this functionality, which SGRE does not dispute. *See* RRB at 12-24.

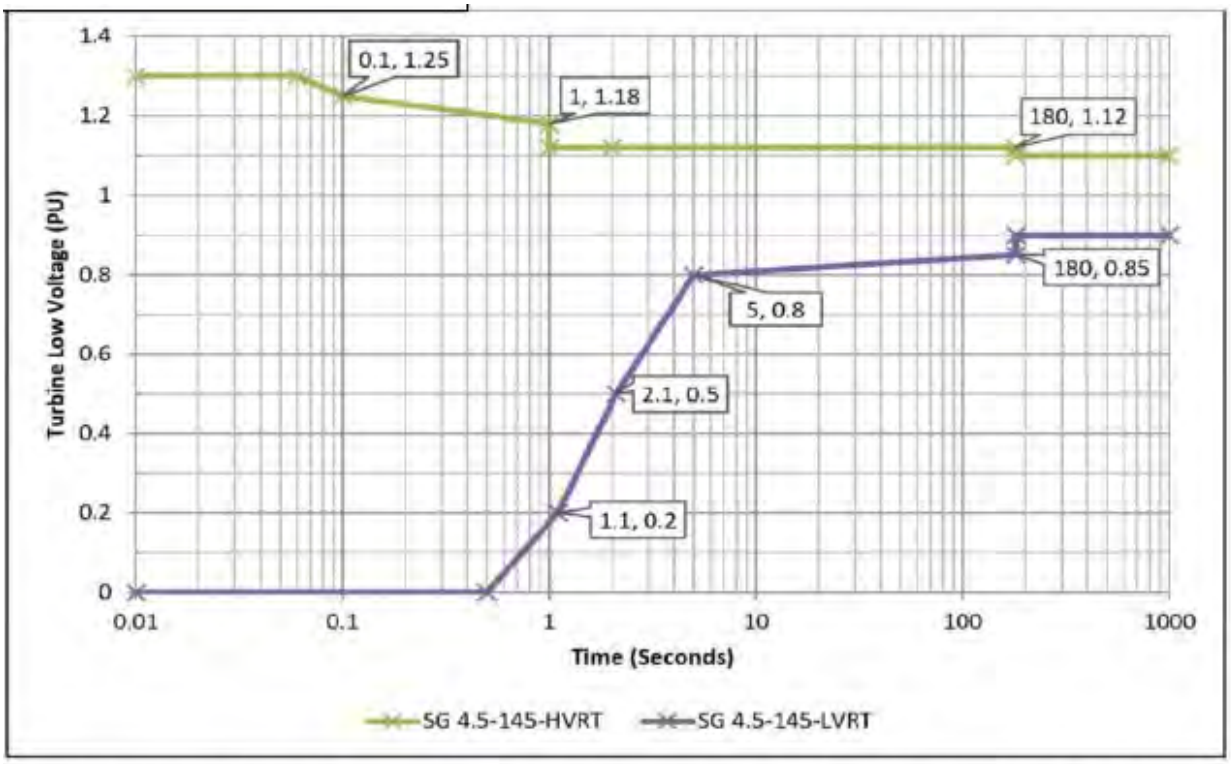


Figure 2: LVRT and HVRT characteristics of SG 4.5-145, 60 Hz wind turbines, at LV side of wind turbine transformer.

CX-0148C.0002 (DFIG)

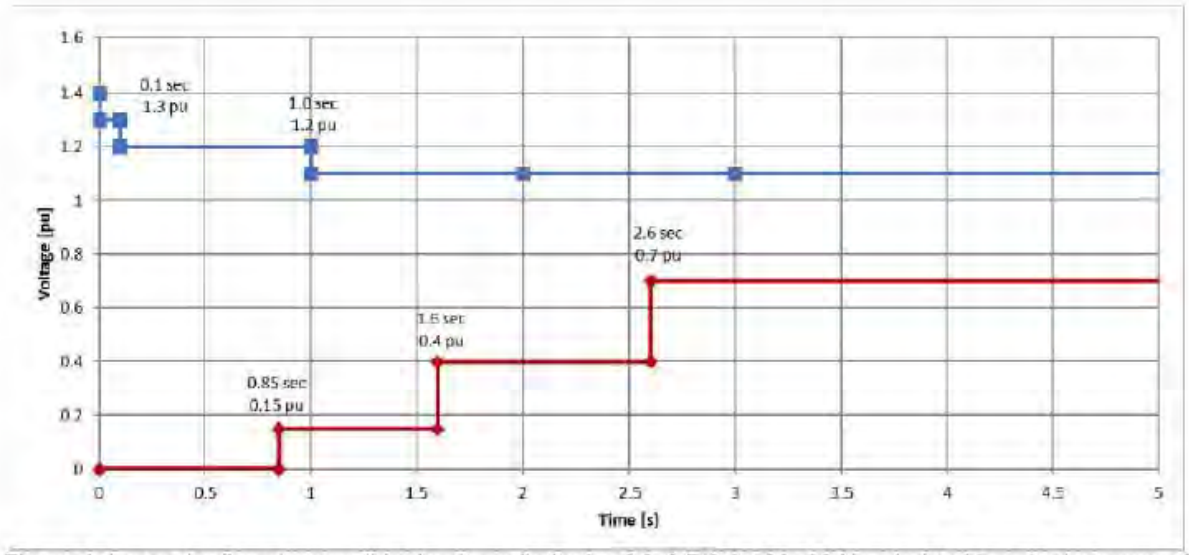


Figure 1: Lower (red) and upper (blue) voltage limits for SG-2.7/2.9-129, 60 Hz wind turbines in the range of 0-5 seconds. The nominal voltage is 690 V (i.e. 1 p.u.).

JX-0108C.0003 (Full-Converter)

SGRE does not contest that the Accused DFIG Products satisfy limitation [1.5] and limitation [6.5]. *See* RRB at 12-24.

For the Accused Full-Converter Products, SGRE argues that GE has not shown that the generator remains connected when the "voltage at the output terminals of the generator" is less than 50% (for claim 1) or between 15-50% (for claim 6) of nominal voltage. *See* RRB at 22-24. This argument is related to the claim construction issue discussed above in Section VI.C. As I have construed "voltage at the output terminals of the generator" to mean the grid voltage, the record evidence demonstrates that the Accused Full-Converter Products remain connected when the grid voltage at the point of connection is less than 50% or between 15-50%. *See* Tr. (Habetler) at 274:6-24, 290:3-13; CX-0148C.0002 (ride-through specification for DFIGs); Tr. (Lund) at 573:14-574:6; Tr. (Brown) at 725:6-15.

In view of the evidence adduced by GE and discussed above, I find that the Accused Products satisfy limitations [1.5] and [6.5].

d) Limitation [1.6]/[6.6]: "wherein in response to detection of a transition from the first mode of operation to a second mode of operation comprising the low voltage event the turbine controller causes the blade pitch control system to vary the pitch of the one or more blades in response to the transition"

The record evidence shows that the Accused Products meet limitation [1.6]/[6.6], which requires "detection of a transition from the first mode of operation to a second mode of operation comprising the low voltage event," and, in response to that transition, "the turbine controller causes the blade pitch control system to vary the pitch of the one or more blades." *See* Tr. (Habetler) at 275:6-280:24, 291:3-293:15. The first part of my analysis below addresses the requirement of detecting a transition between a first mode and a second mode, and the second part of my analysis addresses the requirement that the turbine controller causes the blade pitch control system to vary the pitch of the blades in response to the transition.

As explained above with respect to limitation [1.4]/[6.4], the Accused Products include a variable that determines whether the controller is operating in a first or a second mode of operation. In the Accused DFIG Products, "CcuDipOn" indicates when the grid voltage is below 85% of nominal voltage, and in the Accused Full-Converter Products, "FRT_detect" indicates when the grid voltage is below 90% of the nominal voltage. *See* Tr. (Habetler) at 276:3-20, 292:6-18; Tr. (Lund) at 578:19-580:9; Tr. (Arellano) at 606:25-607:10, 626:9-20; Tr. (Brown) at 730:5-22, 731:24-732:21. If the voltage is above 85% / 90%, then CcuDipOn / FRT_detect is set to FALSE; if the voltage is anywhere below 85% / 90%, then CcuDipOn / FRT_detect is set to TRUE. *See* Tr. (Habetler) at 276:3-20, 292:6-18; Tr. (Lund) at 578:19-580:9; Tr. (Arellano) at 606:25-607:10, 626:9-20; Tr. (Brown) at 730:5-22, 731:24-732:21. In the Accused DFIG and Full-Converter

Products, the second mode of operation is when CcuDipOn is TRUE and FRT_detect is TRUE, respectively. *See* Tr. (Habetler) at 274:25-276:20, 292:6-18.

SGRE does not dispute that the Accused Products operate as described above. *See* RRB at 12-24. SGRE instead argues that it does not infringe because the claimed "second mode of operation" must be limited to the low voltage event. *See id.* at 12-18. This non-infringement argument was articulated at the hearing by SGRE's expert Dr. Brown:

> Q. In your opinion, and the way you are interpreting claim 1, you're saying that the second mode of operation is limited to the low voltage event, correct?
>
> A. Yes. I am saying that the second mode of operation equals the low voltage mode, equals the low voltage event. Those three things are described as the same in GE's prosecution history statements is what I'm saying.
>
> Q. And you are doing the same thing in claim 6, you are again saying that in your view the second mode of operation is limited to the low voltage event, correct?
>
> A. I'm saying that it's the same.

Tr. (Brown) at 734:13-24.

SGRE's argument is contrary to the plain language of claims 1 and 6, in which the "second mode of operation comprises the low voltage event." '985 patent at claims 1 and 6. The term "comprises" means that the second mode of operation must include the low voltage event but is not limited to only the time of the low voltage event. *Cias, Inc. v. All. Gaming Corp.*, 504 F.3d 1356, 1360-61 (Fed. Cir. 2007) ("'comprising' . . . is inclusive or open-ended and does not exclude additional, unrecited elements or method steps"); *Vehicular Techs. Corp. v. Titan Wheel Int'l, Inc.*, 212 F.3d 1377, 1382-83 (Fed. Cir. 2000) ("The phrase 'consisting of' is a term of art in patent law signifying restriction and exclusion, while, in contrast, the term 'comprising' indicates an open-ended construction.").

SGRE argues that statements GE made to the Patent Office during reexamination of the '985 patent support its limited view of the second mode, but this argument is ultimately unavailing. *See* RRB at 14-15. During reexamination, GE amended claim 1 to add the "second mode of operation" limitation and submitted remarks equating this second mode of operation to the "low voltage event." The following excerpts from GE's December 28, 2011, Response to Office Action are instructive:

> In particular, the claimed generator is required to remain connected to the grid during a low voltage event; and low voltage is defined as a voltage in which the grid voltage drops to less than 50% (amended claim 1), or to 15-50% (amended claim 6) of a rated voltage of the generator.
>
> * * *
>
> Claims 1 and 6 have been further amended as recommend by the Examiner to require the transition from the first mode of operation be a transition to a low voltage mode.
>
> * * *
>
> The amended claim specifically requires that the pitch of the blades is controlled in response to detection of a transition from the first mode of operation to the only other mode required by claim 1, i.e., "the low voltage event."

RX-0644.0015, .0018; *see also* JX-0150.0015. Read in their entirety, GE's statements during reexamination are consistent with the interpretation of the term "comprising" discussed above—meaning that the claimed second mode of operation includes, but is not necessarily limited to, the low voltage event. GE's statements to the Patent Office do not demonstrate a "clear and unmistakable disavowal" of claim scope such that the claimed second mode of operation must consist ***solely*** of the low voltage event. *Cf. Contra Grober v. Mako Prods., Inc.*, 686 F.3d 1335, 1341 (Fed. Cir. 2012) ("When a patentee makes a 'clear and unmistakable disavowal of scope

during prosecution,' a claim's scope may be narrowed under the doctrine of prosecution disclaimer.").

I now turn to the claim requirement that the turbine controller causes the blade pitch control system to vary the pitch of the blades in response to the transition to the second mode of operation. As discussed above, the transition to the second mode of operation in the Accused Full-Converter Products occurs when the FRT_detect signal transitions from FALSE to TRUE. In response to receiving the FRT_detect signal, the turbine controller sends a [redacted] to the [redacted]. *See* Tr. (Habetler) at 291:17-293:15 (explaining that signal causes [redacted]); JX-0124C.0107 (block diagram illustrating [redacted]). The [redacted] is described in the turbine controller manual [redacted] JX-0125C.0406; *see also* Tr. (Lund) at 578:24-581:6; JX-0156C.00014, .00016 (Lund Depo. Tr.) at 52:20-53:9, 58:5-59:17; Tr. (Brown) at 730:23-731:23.

For the Accused DFIG Products, the transition to the second mode of operation occurs when the CcuDipOn (also called "dip bit") turns from FALSE to TRUE, as discussed above. This signal is sent from the converter controller to the turbine controller (referred to as the PLC). JX-0160C.00010 (Allen Depo. Tr.) at 34:20-35:7 (confirming that the CcuDipOn signal "is sent from the converter from the CCU to the PLC"). SGRE engineer Mr. Arellano testified that the CcuDipOn signal "affects mainly the pitch control." JX-0158C.00013-.00014 (Arellano Depo. Tr.) at 45:21-46:5; *see also* Tr. (Arellano) at 626:14-627:21. Mr. Arellano also testified regarding what happens to the Accused DFIG Products during a low voltage event that necessitates varying blade pitch:

> What happens in the low-voltage event is that we lost power suddenly. So that makes to accelerate the rotor and what we don't want is that, okay, as it is accelerating the rotor, the pitch system is going to move because of this difference between the set point and the measurement towards a safe position.
>
> But when we are going back, for example, when we recover from the event, the power is ramping up very sharply. So this is causing the generator speed to decrease acceleration and then to decrease the speed. And what we don't want is that the pitch system reacts so fast that it increases the torque so much at the same time that the power is recovering.

JX-0158C.00013 (Arellano Depo. Tr.) at 47:12-48:4. During a low voltage event, the blades are pitched away from the wind in order to reduce the rotor speed, and the blades are pitched back into the wind to increase the rotor speed after the low voltage event subsides. Pitching the blades back into the wind too quickly, however, could cause an undesired increase in rotor speed and torque in the shaft. *See* Tr. (Arellano) at 627:9-12, 628:2-7.

To address this problem, once the turbine controller receives the "CcuDipOn" signal of "1," it calculates and [redacted]" *See* JX-0120C.0010; Tr. (Brown) at 732:22-733:1; Tr. (Habetler) at 278:3-20. The dip bit causes the pitch to react more slowly during recovery from the low-voltage event than it otherwise would so that the controller does not overcompensate and increase the rotor speed too quickly. JX-0158C.00014 (Arellano Depo. Tr.) at 50:20-51:7; *see also* Tr. (Arellano) at 628:8-12 ("Q. So the dip bit, which is triggered when the grid voltage drops below 85 percent, will cause the pitch to react more slowly during recovery from the low voltage event than it otherwise would? A. Yes."). The dip control logic illustrated below confirms that [redacted] is in response to the detection of the CcuDipOn signal.

JX-0120C.0009 (annotated)

SGRE's requirements document for the SG 4.X confirms that the turbine controller in the Accused DFIG Products causes the blade pitch control system to vary the pitch of the one or more blades in response to the transition to a second mode of operation comprising the low voltage event. *See* Tr. (Habetler) at 280:3-24; CX-0136C.0060. The requirements document states that

CX-0136C.0060. Mr. Arellano testified that this description applies to all Accused DFIG Products. Tr. (Arellano) at 632:3-16.

In addition, SGRE's "Voltage dip simulations" document, which Mr. Arellano prepared on November 16, 2020, to help explain the operation of the Accused DFIG Products to counsel, shows that the Accused DFIG Products vary the pitch of the blades in response to the transition to a second mode of operation. *See* Tr. (Arellano) at 632:17-633:10; JX-0151C. Figure 3 from the simulation report is reproduced below, and it depicts a 1.28 second "Realistic dip voltage event" of more than 50%. *See* Tr. (Arellano) at 633:16-634:24.

JX-0151C.0003 (excerpt, annotated)

The red line shows the voltage dip and the blue line shows the "dip bit" (*i.e.*, CcuDipOn). *See* Tr. (Arellano) at 634:2-635:7. As shown in the graph, when the voltage drops to less than 50%, the dip bit transitions from FALSE (0) to TRUE (1). JX-0151C.0003 ("[redacted]"). This document also demonstrates that the pitch value is increased during the low voltage event. JX-0151C.0003 ("[redacted]").

For the reasons set forth above, I find that the Accused Full-Converter Products and Accused DFIG Products satisfy each limitation of claims 1 and 6 of the '985 patent and therefore infringe these claims.

2. Claim 12

Claim 12 depends from claim 1 and requires that the claimed "uninterruptible power supply comprises a battery power supply." The evidence shows that the uninterruptible power supply in the Accused Products comprises a battery power supply. *See* Tr. (Brown) at 726:8-10; Tr. (Habetler) at 282:3-10, 295:3-9; JX-0133C.0026. SGRE does not dispute that the Accused Products satisfy this limitation. *See* RRB at 12-24.

I therefore find that the Accused Products infringe claim 12 of the '985 patent.

3. Claim 29

GE accuses only the Accused Full-Converter Products of infringing claim 29 and its dependent claims. CIB at 6. In its post-hearing briefs, GE assigns a number to each step of claim 29. For reference, claim 29 is reproduced below with GE's labels:

> A method comprising:
>
> [29.1] providing power to wind turbine components using a generator of the wind turbine;
>
> [29.2] detecting a low voltage event;
>
> [29.3] receiving power from an uninterruptible power supply to a first subset of wind turbine components, wherein the first subset of wind turbine components comprises a blade pitch controller to selectively power the blade pitch controller to maintain a rotor speed below a predetermined overspeed limit during the low voltage event;
>
> [29.4] disconnecting a subset of wind turbine components from the generator during the low voltage event.

CIB at 37.

a) Step [29.1]: "providing power to wind turbine components using a generator of the wind turbine;"

The evidence shows that operators of the Accused Full-Converter Products perform step [29.1], which is "providing power to wind turbine components using a generator of the wind

turbine." GE's expert Dr. Habetler and SGRE's expert Dr. Phinney testified that the Accused Full-Converter Products include components, such as the blade pitch controller, gear oil pump, gear oil fan, and lubrication pump, that receive power from the generator during normal operation. Tr. (Habetler) at 295:14-296:2; Tr. (Phinney) at 1019:10-1020:11.

b) Steps [29.2]-[29.3]: "detecting a low voltage event; receiving power from an uninterruptible power supply to a first subset of wind turbine components, wherein the first subset of wind turbine components comprises a blade pitch controller to selectively power the blade pitch controller to maintain a rotor speed below a predetermined overspeed limit during the low voltage event"

As discussed above in Section VI.D.1.b) with respect to the FRT_detect signal, the evidence shows that operators of the Accused Full-Converter Products perform step [29.2] requiring "detecting a low voltage event." *See* Tr. (Habetler) at 296:3-6; Tr. (Lund) at 578:7-580:9; *see also* JX-0125C.0589, .0597-.0598 (turbine controller manual section describing "Grid Monitoring").

The evidence also shows that operators of the Accused Full-Converter Products perform step [29.3]. GE adduced evidence at the hearing demonstrating that the blade pitch controller selectively receives power from an uninterruptible power supply and maintains a rotor speed below a predetermined overspeed limit during a low voltage event. *See* Tr. (Habetler) at 296:7-297:5; CDX-038C (annotating JX-0133C.0026); Tr. (Lund) at 576:17-578:6, 581:3-9; JX-0117C.0031-.0032 (grid fault ride-through section describing how "the turbine rotor speed may rise and the pitch control must keep the generator speed in the allowed range ([redacted]). SGRE does not dispute that operators of the Accused Full-Converter Products perform this step.

c) Step [29.4]: "disconnecting a subset of wind turbine components from the generator during the low voltage event"

The record evidence shows that operators of the Accused Full-Converter Products perform step [29.4], which is "disconnecting a second subset of wind turbine components from the generator during the low voltage event." *See* Tr. (Habetler) at 297:12-298:11; Tr. (Lund) at 583:14-19. As explained above with respect to step [29.1], the gear oil pump, gear oil fan, and lubrication pump receive power from the generator during normal operation. At the hearing, SGRE's expert Dr. Phinney testified that these components are disconnected from the generator during a low voltage event:

> Q. Okay. So let's see where you do agree. You agree that during normal operation these loads receive their power from the grid or the generator, correct?
>
> A. Yeah, I think that's fair.
>
> Q. Okay. And if the generator is in production mode, the normal mode, then those loads are receiving power from the generator, right?
>
> A. You might say ultimately are receiving power from the generator, yes.
>
> ***
>
> Q. Right. Okay. And you agree that Mr. Lund, who was Siemens Gamesa's witness about the functionality of the [F]ull-[C]onverter products, he testified that during a low voltage event the gear oil pump, the gear oil fan, and the lubrication pump would be disconnected at those points, right?
>
> A. Yes, I think so.
>
> Q. Okay. When those components are disconnected at that point that you have on this slide, they can no longer receive power from the generator, correct?
>
> A. I think that's a fair statement. You know, if they were receiving power from the generator before and then those opened up, there wouldn't be a path for such power.

Tr. (Phinney) at 1020:3-1021:12; *see also* Tr. (Lund) at 583:14-19.

Above I determined that certain GE customers operate the Accused Full-Converter Products in the United States. *See* Section I.D.1. For the reasons set forth in this section, I find those operators of the Accused Full-Converter Products perform each step of claim 29 of the '985 patent and therefore infringe this claim.

4. Claims 30, 33, 34, 35, and 37

Asserted claims 30, 33, 34, 35, and 37 of the '985 patent depend from claim 29, discussed above. GE adduced evidence demonstrating that operators of the Accused Full-Converter Products perform the steps of claim 29 in the environment containing the additional limitations of these dependent claims.

The evidence shows that using the Accused Full-Converter Products practices claim 30, which requires that "the uninterruptible power supply comprises a battery power supply." *See* Tr. (Habetler) at 298:12-23; Tr. (Lund) at 577:17-23. SGRE does not dispute that operators of the Accused Full-Converter Products perform the method recited in claim 30. *See* RRB at 24-26.

As for the other asserted dependent claims, claim 33 requires performing "[t]he method of claim 29 wherein a low voltage event comprises a generator output voltage of less than 75% of a rated voltage for the generator"; claim 34 requires that "the low voltage event occurs for up to 3 seconds"; claim 35 requires that "a low voltage event comprises a generator output voltage of less than 50% of a rated voltage for the generator"; and claim 37 requires that "a low voltage event comprises a generator between 15% and 50% of a rated voltage for the generator." As shown by the grid performance specification reproduced below, the Accused Full-Converter Products meet these limitations:

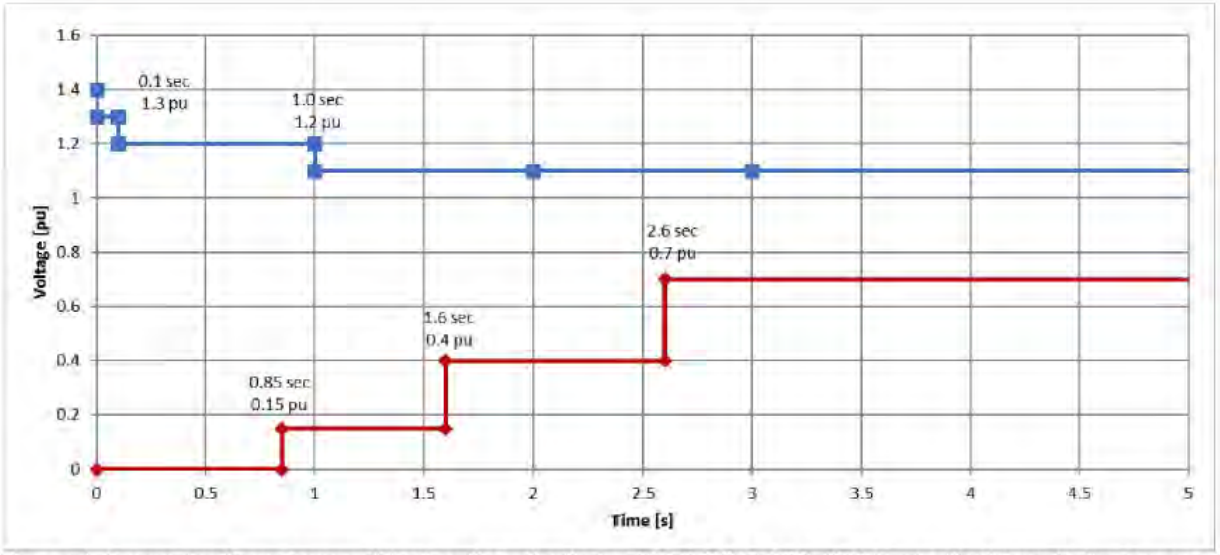


Figure 1: Lower (red) and upper (blue) voltage limits for SG-2.7/2.9-129, 60 Hz wind turbines in the range of 0-5 seconds. The nominal voltage is 690 V (i.e. 1 p.u.).

JX-0108C.0003; *see also* Tr. (Habetler) at 300:3-301:9. SGRE does not dispute that operating the Accused Full-Converter Products would satisfy these limitations. *See* RRB at 24-26.

Above I determined that certain GE customers operate the Accused Full-Converter Products in the United States. *See* Section I.D.1. For the reasons set forth in this section, I find that those operators infringe claims 30, 33, 34, 35, and 37 of the '985 patent when they operate the Accused Full-Converter Products.

E. Indirect Infringement

GE argues that "SGRE indirectly infringes the Asserted Patents by committing acts of induced and contributory infringement." CIB at 87-89. Specifically, GE alleges that "SGRE induces their customers to infringe by providing them with assembly manuals and field assistance to advise their customers on how to assemble and configure the Accused Products," and that "SGRE also contributes to infringement of the Asserted Patents by providing and/or selling significant components of the Accused Products that have no substantial noninfringing uses." *Id.* at 87. SGRE does not contest the evidence adduced by GE as to the actions of SGRE that support

a finding of indirect infringement, and SGRE did not address this issue in its post-hearing responsive brief. *See* Order No. 2 at Ground Rule 14.2 (finding waiver if an issue is not addressed in post-hearing briefing).

With respect to SGRE's knowledge of the Asserted Patents and the allegedly infringing acts of its customers, SGRE employee Paul Brogan testified that SGRE had knowledge of possible infringement of the Asserted Patents at least as early as 2018. *See* JX-0162C.00003-.00004 (Brogan Dep.) at 9:12-11:14. In addition, GE's filing of its complaint in this investigation provided SGRE with knowledge of the Asserted Patents as of July 31, 2020, the date the complaint was filed.

1. Induced Infringement

The evidence shows that SGRE induces its customers to infringe the Asserted Patents. Donald Marcucci, SGRE's Director of Project Acquisitions, testified that SGRE "is responsible for the transportation to the site" of the components used to construct the Accused Products after importation, and that customers are responsible for the actual construction, erection, configuration, testing and on-lining of the Accused Products. JX-0157C.00007-.00008 (Marcucci Dep.) at 24:20-26:13. SGRE also provides assistance to their customers "during the assembly and erection of the turbines" to aid the customers in constructing and configuring the Accused Products, including by providing assembly manuals and on-site experts to advise the customers. *Id*. at 27:14-22.

SGRE's turbine sale agreements also show that SGRE induces its customers to configure and operate the Accused Products in a manner that infringes the Asserted Patents. The turbine sale agreements instruct customers to achieve mechanical completion of the wind turbines that SGRE delivers prior to commissioning. *See* JX-0139C.0055 ("Purchaser is responsible to achieve

Mechanical Completion of a Unit prior to SGRE undertaking its Commissioning obligations."). "Mechanical Completion" includes erecting the tower and wind turbine generator, installing all materials and equipment necessary for the operation of the Accused Products, providing power to the Accused Products, and providing control connectivity for the Accused Products. JX-0139C.0017.

As discussed above in Section VI.D, operation of the Accused Products directly infringes the asserted claims of the '985 patent. Mr. Marcucci's testimony and SGRE's turbine sale agreements demonstrate that SGRE intentionally took actions that induced SGRE's customers to infringe the Asserted Patents, such as importing the component parts of the Accused Products into the United States, transporting the component parts to the customers' project sites, and providing assistance to the customers for the construction, erection, configuration, on-lining, and testing of the Accused Products. SGRE also induced infringement by providing assembly manuals to SGRE's customers and providing field technicians to advise customers in the construction and configuration of the Accused Products in an infringing manner. *See* Tr. (Habetler) at 350:15-351:1, 351:14-354:16. Given SGRE's knowledge of the Asserted Patents before this investigation, SGRE knew or should have known that encouraging their customers to assemble and configure the Accused Products in accordance with their assembly manuals, software, and parameters would infringe the Asserted Patents.

I therefore find that GE has shown that SGRE induces the infringement of claims 1, 6, 12, 29, 30, 33-35, and 37 of the '985 patent.

2. Contributory Infringement

GE contends that SGRE contributes to the infringement of the '985 patent by providing and selling the Accused Products and components thereof. CIB at 89. To prevail on contributory

infringement in a section 337 investigation, "the complainant must show *inter alia*: (1) there is an act of direct infringement in violation of Section 337; (2) the accused device has no substantial non-infringing uses; and (3) the accused infringer imported, sold for importation, or sold after importation within the United States, the accused components that contributed to another's direct infringement." *Spansion, Inc. v. Int'l Trade Comm'n*, 629 F.3d 1331, 1353 (Fed. Cir. 2010).

GE's contention is resolved by examining the second prong of the *Spansion* test: whether the record shows the SGRE turbines and components have "no substantial non-infringing uses." GE cites only two pieces of evidence to support its claim that the Accused Products have no non-infringing uses. First, GE cites four lines of testimony from Ashok Naik, SGRE's first-level technical support lead. CIB at 89 (citing JX-0164C.00009 (Naik Dep.) at 30:13-16). But that passage merely states that SGRE is the exclusive customer of a single piece of equipment called the Phoenix Contact turbine controller. The testimony says nothing about whether that equipment, or the other Accused Products and components, are capable of non-infringing uses. The second piece of evidence cited by GE is a passage of testimony from its own expert Dr. Habetler. CIB at 89 (citing Tr. (Habetler) at 355:6-25). In that passage, GE's counsel asked Dr. Habetler whether the Accused Products have substantial non-infringing uses and Dr. Habetler responded, "Yes. They certainly do." GE's counsel immediately asked the question again and the second time Dr. Habetler said, "No, none." This testimony was equivocal and conclusory, at best, and I do not credit it.

The record relied upon by GE fails to show that the Accused Products lack a substantial non-infringing use. Accordingly, GE has not shown that SGRE contributes to the infringement of claims 1, 6, 12, 29, 30, 33-35, and 37 of the '985 patent.

F. Technical Prong of the Domestic Industry Requirement

GE argues that all Domestic Industry Products practice claims 1, 6, 15, and 29 of the '985 patent. CIB at 40. Specifically, GE argues that all Domestic Industry Products practice claim 15 and that the Domestic Industry Products using GE's 30 newton meter pitch control system ("30 Nm PCS") practice claims 1, 6, and 29 (the "30 Nm Domestic Industry Products"). *Id.* The model numbers alleged to practice claim 15 are listed above in Section I.E (list of all Domestic Industry Products) and in demonstrative exhibit CDX-301, and the model numbers alleged to practice claims 1, 6, and 29 are listed in demonstrative exhibit CDX-302. *Id.*; *see* Tr. (Barton) at 71:21-74:14, 81:15-82:10.

1. Claims 1 and 6

As in the infringement analysis above, I will consider claims 1 and 6 of the '985 patent simultaneously for purposes of the technical prong analysis.

a) Preamble [1.0]/[6.0] and limitations [1.1]-[1.3]/[6.1]-[6.3]: "A wind turbine generator comprising: a generator; a blade pitch control system to vary a pitch of one or more blades; a turbine controller coupled with the blade pitch control system;"

The record evidence shows that the 30 Nm Domestic Industry Products practice preamble [1.0]/[6.0] and limitations [1.1]-[1.3]/[6.1]-[6.3]. The 30 Nm Domestic Industry Products comprise a doubly-fed induction generator and are thus "wind turbine generator[s]" that comprise "a generator." *See* Tr. (Habetler) at 301:17-25; CX-0093.0005; CX-0094.0004.

The 30 Nm Domestic Industry Products comprise "a blade pitch control system to vary a pitch of one or more blades." *See* Tr. (Habetler) at 302:14-20; CX-0089C.0009, .0011. Specifically, the 30 Nm Domestic Industry Products include GE's 30 Nm PCS, which is used to vary the pitch of the blades. *See* Tr. (Barton) at 75:6-76:7.

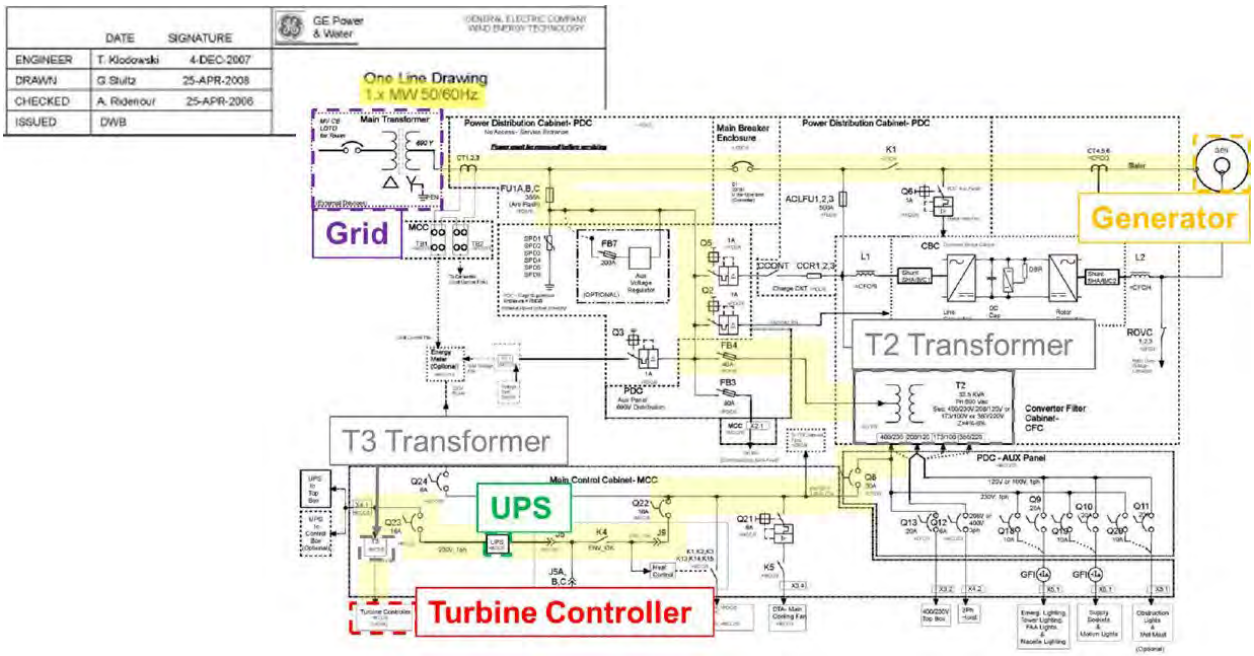
The 30 Nm Domestic Industry Products comprise "a turbine controller coupled with the blade pitch control system." *See* Tr. (Habetler) at 302:21-303:5; Tr. (Barton) at 76:8-25; JX-0046C.0016. The pitch control system will follow pitch angle commands received from the turbine controller. *See* Tr. (Barton) at 76:16-25, 83:14-84:2).

SGRE does not dispute the evidence discussed above for these claim elements. *See* RRB at 26-27. I therefore find that the 30 Nm Domestic Industry Products practice preamble [1.0]/[6.0] and limitations [1.1]-[1.3]/[6.1]-[6.3].

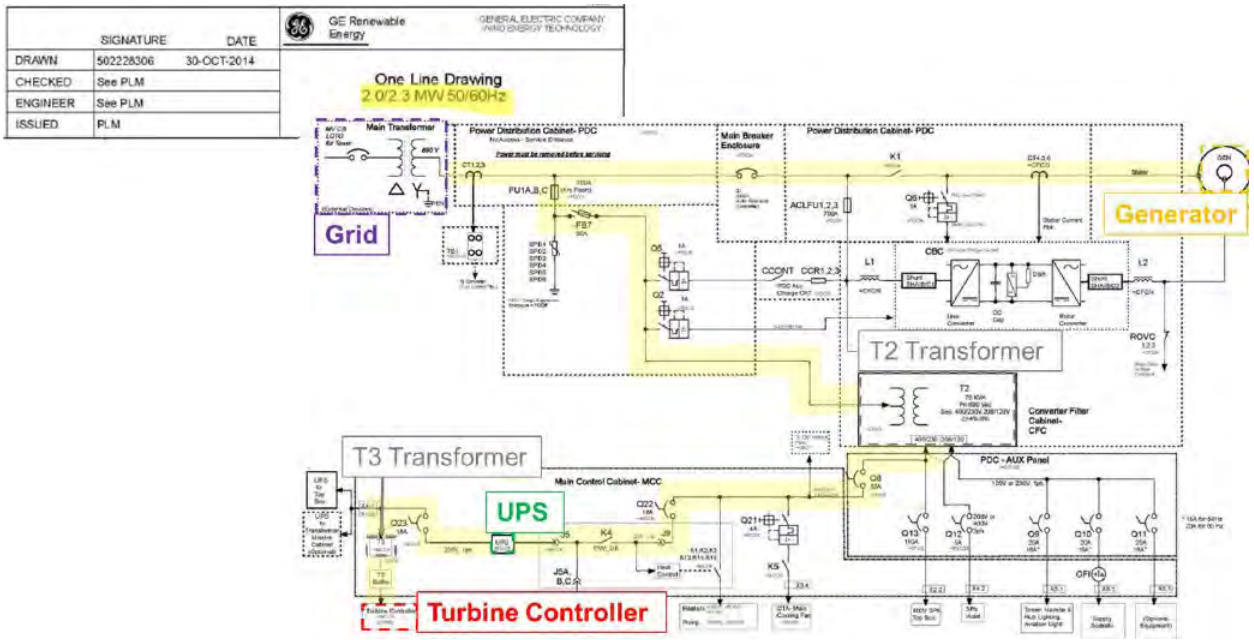
b) Limitation [1.4]/[6.4]: "a first power source coupled with the turbine controller and with the blade pitch control system to provide power during a first mode of operation;"

GE adduced evidence to show that the 30 Nm Domestic Industry Products comprise "a first power source coupled with the turbine controller and with the blade pitch control system to provide power during a first mode of operation." Tr. (Habetler) at 303:6-307:2. As in the infringement analysis of the Accused DFIG Products, the "first power source" limitation is satisfied by the combination of the power grid and the wind turbine generator and the "first mode of operation" is normal operation.

In the Domestic Industry Products, the grid and the DFIG generator—which together are the claimed first power source—are coupled with the turbine controller via a T2 transformer, an uninterruptible power supply, and a T3 transformer. *See* Tr. (Habetler) at 303:6-304:5; Tr. (Holliday) at 215:4-216:14, 217:10-16. This coupling is illustrated in the annotated figures below for the 1 MW and 2 MW Domestic Industry Products, respectively.

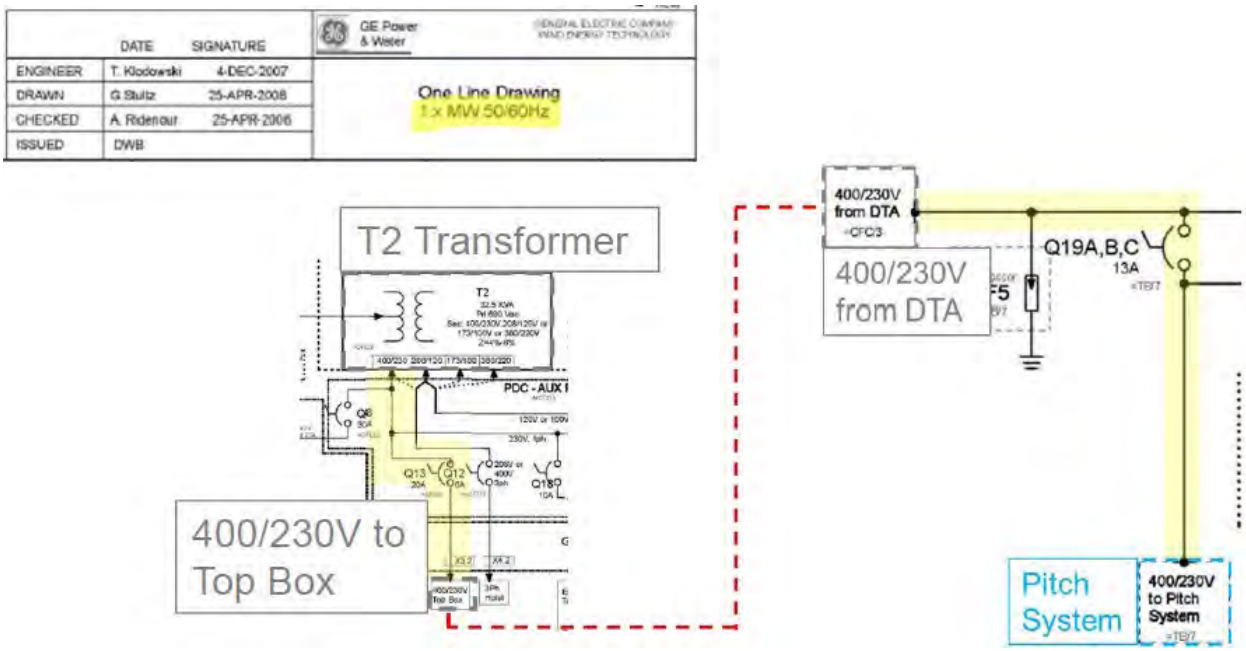


CDX-051 (excerpting and annotating JX-0045C.0001, .0003)



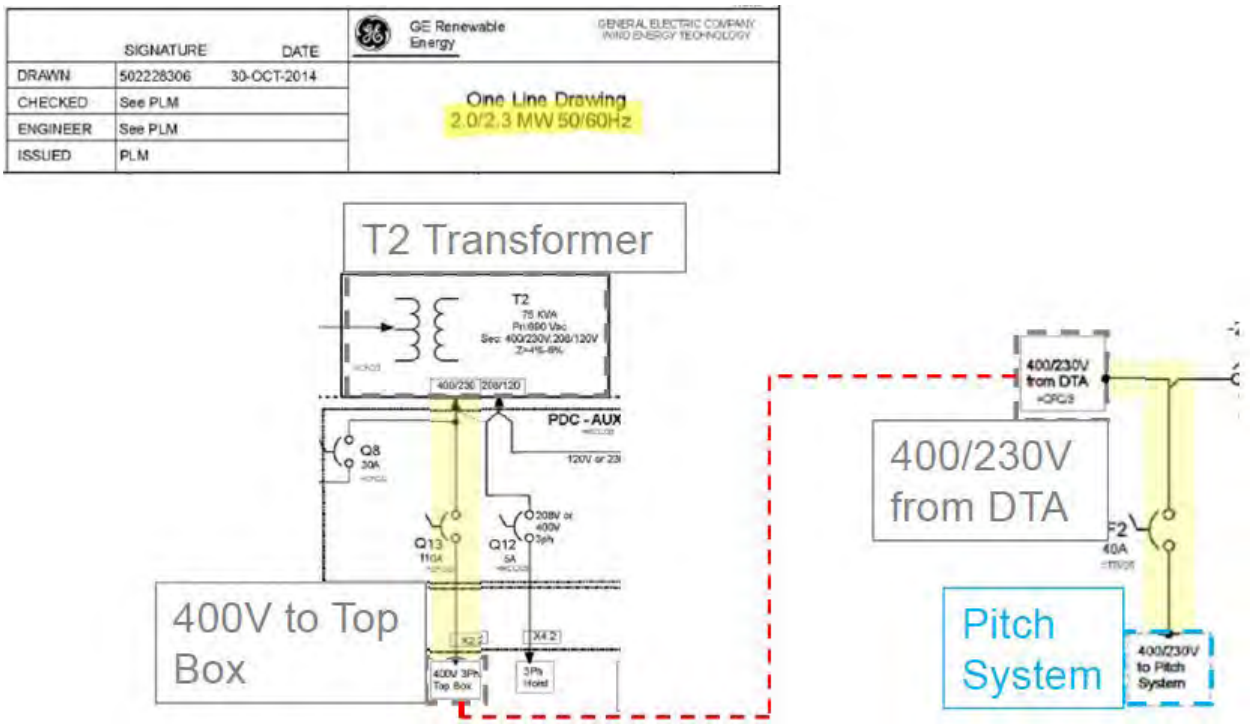
CDX-052 (excerpting and annotating JX- 0056C.0001, .0003)

The grid and generator are also coupled with the 30 Nm PCS via the same T2 transformer and the wind turbine's top box.[4] *See* Tr. (Habetler) at 304:6-305:2; Tr. (Barton) at 77:1-12. This coupling is illustrated in the annotated figures below for the 1 MW and 2 MW Domestic Industry Products, respectively.



CDX-053 (excerpting and annotating JX- 0045C.0001, .0003, .0005)

[4] The "Top Box" is a compartment within the wind turbine's nacelle; the Down Tower Assembly ("DTA") is a compartment within the wind turbine's tower beneath the nacelle. *See* JX-0045C; JX-0056C.



CDX-054 (excerpting and annotating JX- 0056C.0001, .0003, .0004)

GE's documentation describes [redacted] In the 30 Nm Domestic Industry Products, the wind turbine transitions from normal operation to LVRT Mode when grid voltage falls below a certain threshold. *See* Tr. (Barton) at 85:2-21; Tr. (Crankshaw) at 1042:6-1043:1. GE engineers Mr. Holliday and Mr. Barton testified that, during normal operation (*i.e.*, the claimed "first mode of operation"), the grid and generator (*i.e.*, the claimed "first power source") provide power to the turbine controller and the 30 Nm PCS in the Domestic Industry Products. *See* Tr. (Holliday) at 217:10-16; Tr. (Barton) at 77:1-12; *see also* JX-0046C.0043 ([redacted]

[5] "Mode 1" means the turbine controller is still sending pitch commands. *See* Tr. (Barton) at 83:14-85:10.

[redacted]);

JX-0043C.0009 [redacted]); *see also* Tr. (Habetler) at 306:3-21.

SGRE does not dispute the evidence discussed above for this claim limitation. *See* RRB at 26-27. I therefore find that the 30 Nm Domestic Industry Products practice this claim limitation.

c) Limitation [1.5]/[6.5]: "an uninterruptible power supply . . . when the voltage at the output terminals of the generator is less than 50% of a rated voltage of the generator;" / "an uninterruptible power supply . . . and wherein a low voltage event comprises a voltage at the output terminals of the generator between 15% and 50% of a rated voltage of the generator;"

GE adduced evidence demonstrating that the 30 Nm Domestic Industry Products comprise an uninterruptible power supply that provides power during a low voltage event, such as when the voltage at the output terminals of the generator is "less than 50% of a rated voltage of the generator" (for claim 1) or is "between 15% and 50% of a rated voltage of the generator" (for claim 6). *See* Tr. (Habetler) at 308:3-310:9.

The 30 Nm Domestic Industry Products are configured such that the generator remains connected to the grid when the voltage at the output terminals of the generator is less than 50% of a rated voltage of the generator (claim 1) and between 15% and 50% (claim 6). *See* Tr. (Habetler) at 309:17-21; *see also* Tr. (Barton) at 78:23-79:3. Grid operators specify how the Domestic Industry Products connected to the grid must respond to low voltage events. JX-0039C; JX-0077C. These specifications describe the voltage ranges and the amount of time that GE's 1 MW Platform and 2 MW Platform Domestic Industry Products can ride through. JX-0039C; JX-0077C; *see* Tr. (Holliday) at 221:25-223:5; JX-0039C.0006; JX-0077C.0006. GE confirms operation within these specifications through simulations, lab tests, and field tests. *See* Tr. (Holliday) at 223:6-224:25. GE also tests its low voltage ride through and zero voltage ride

through capabilities for voltage dips at both the low side and high side of the wind turbine's transformer. *Id*. The evidence shows that over 95% of GE's customers in the United States configure the Domestic Industry Products to perform ride through during grid faults down to zero voltage. *See* Tr. (Holliday) at 225:1-13.

The evidence shows that the 30 Nm Domestic Industry Products include multiple uninterruptible power supplies to provide power to the control systems during a low voltage event. Specifically, the 30 Nm Domestic Industry Products have an uninterruptible power supply in the down tower assembly coupled with the turbine controller and three battery boxes in the hub (the "hub uninterruptible power supply") to power the blade pitch control system. *See* Tr. (Holliday) at 215:4-216:15; Tr. (Barton) at 77:13-78:8; *see also* Tr. (Habetler) at 308:9-309:1. The down tower assembly uninterruptible power supply provides power to the turbine controller during a low voltage event in which the grid voltage is less than 50% or between 15% and 50%; this functionality is confirmed through lab testing. *See* Tr. (Holliday) at 217:17-218:16; JX-0045C.0003; JX-0056C.0003. The hub uninterruptible power supply is described in a GE technical document titled "30 Nm Pitch Control for ESS Wind Turbines System Guide" as providing power to the blade pitch control system during a low voltage event in which the grid voltage is less than 50% or between 15% and 50%. *See* Tr. (Barton) at 77:22-78:8; JX-0043C.0011, .0035, .0038.

SGRE does not dispute the evidence discussed above for this claim limitation. I therefore find that the 30 Nm Domestic Industry Products practice this claim limitation.

d) Limitation [1.6]/[6.6]: "wherein in response to detection of a transition from the first mode of operation to a second mode of operation comprising the low voltage event the turbine controller causes the blade pitch control system to vary the pitch of the one or more blades in response to the transition"

GE adduced evidence to show that the 30 Nm Domestic Industry Products are configured such that "in response to detection of a transition from the first mode of operation to a second mode of operation comprising the low voltage event the turbine controller causes the blade pitch control system to vary the pitch of the one or more blades in response to the transition." *See* Tr. (Habetler) at 311:3-312:22. As explained in more detail below, the 30 Nm Domestic Industry Products transition to "LVRT Mode" comprising the claimed low voltage event (*i.e.*, voltages less than 50% and between 15-50%), and the turbine controller causes the blade pitch control system to vary the pitch of the blades in response to the transition.

As discussed above in connection with limitation [1.4], GE's documentation describes "LVRT Mode" as an operational mode for speed control. The 30 Nm Domestic Industry Products transition from normal operation to LVRT Mode when the grid voltage falls below a certain threshold. *See* Tr. (Barton) at 85:2-21; Tr. (Crankshaw) at 1042:6-1043:1; JX-0047C.0067; JX-0048C.0127. The evidence shows that the 30 Nm Domestic Industry Products are in LVRT Mode when the grid voltage is less than 50% of nominal or between 15% and 50% of nominal. *See* Tr. (Barton) at 85:16-25; Tr. (Crankshaw) at 1042:20-1043:1. In response to the transition from the claimed first mode of operation (*i.e.*, normal operation) to the claimed second mode of operation (*i.e.*, LVRT Mode), the turbine controller in the 30 Nm Domestic Industry Products will change how the wind turbine controls rotor speed. JX-0047C.0067 (referencing "speed control"); JX-0048C.0127 (same). During normal operation, rotor speed is controlled through a combination of pitch commands to the blade pitch control system and torque commands to the power converter.

See Tr. (Barton) at 89:7-14. During LVRT Mode, rotor speed is controlled only by pitch because torque control is no longer possible. *Id.* Upon entering LVRT Mode, the 30 Nm Domestic Industry Products will pitch their blades to reduce the captured energy and prevent the rotor from overspeeding—turning too fast. *See* Tr. (Barton) at 86:23-87:8 ("[T]he blades will be moved in a way that we reduce the captured energy."); Tr. (Habetler) at 311:9-19, 320:20-321:3; JX-0047C.0066; JX-0048C.0126 ("'Speed control' in LVRT is driven by controlled pitching, Control Mode 1 pitch.").

SGRE contends that this claim limitation is not met because the 30 Nm Domestic Industry Products transition to LVRT Mode (the second mode of operation) at a grid voltage of 80%, which is above the 50% threshold recited in claims 1 and 6. *See* RRB at 26-27. SGRE's argument here is identical to its non-infringement argument with respect to limitations [1.6]/[6.6]. *See id.* at 12-18. As discussed in Section VI.D.1.d) above, SGRE's argument is unavailing because the claims require only that the "second mode of operation compris[e] the low voltage event," and do not require that the second mode of operation be limited to the low voltage event.

For the reasons set forth above, I find that the 30 Nm Domestic Industry Products practice each limitation of claims 1 and 6 of the '985 patent and that the technical prong of the domestic industry requirement is satisfied as to these claims.

2. Claim 15

GE argues that all Domestic Industry Products practice claim 15 of the '985 patent. CIB at 51. In its post-hearing briefs, GE assigns a number to each limitation of claim 15. For reference, claim 15 is reproduced below with GE's labels:

[15.0] A wind turbine generator comprising:

[15.1] a generator;

[15.2] a power converter coupled with the generator,

[15.3] the power converter having an inverter coupled to receive power from the generator,

[15.4] a converter controller coupled with the inverter to monitor a current flow in the inverter

[15.5] wherein the converter controller is coupled to receive power from an uninterruptible power supply during a low voltage event, and

[15.6] a circuit coupled with the input of the inverter and with the converter controller to shunt current from the inverter and generator rotor in response to a control signal from the converter controller.

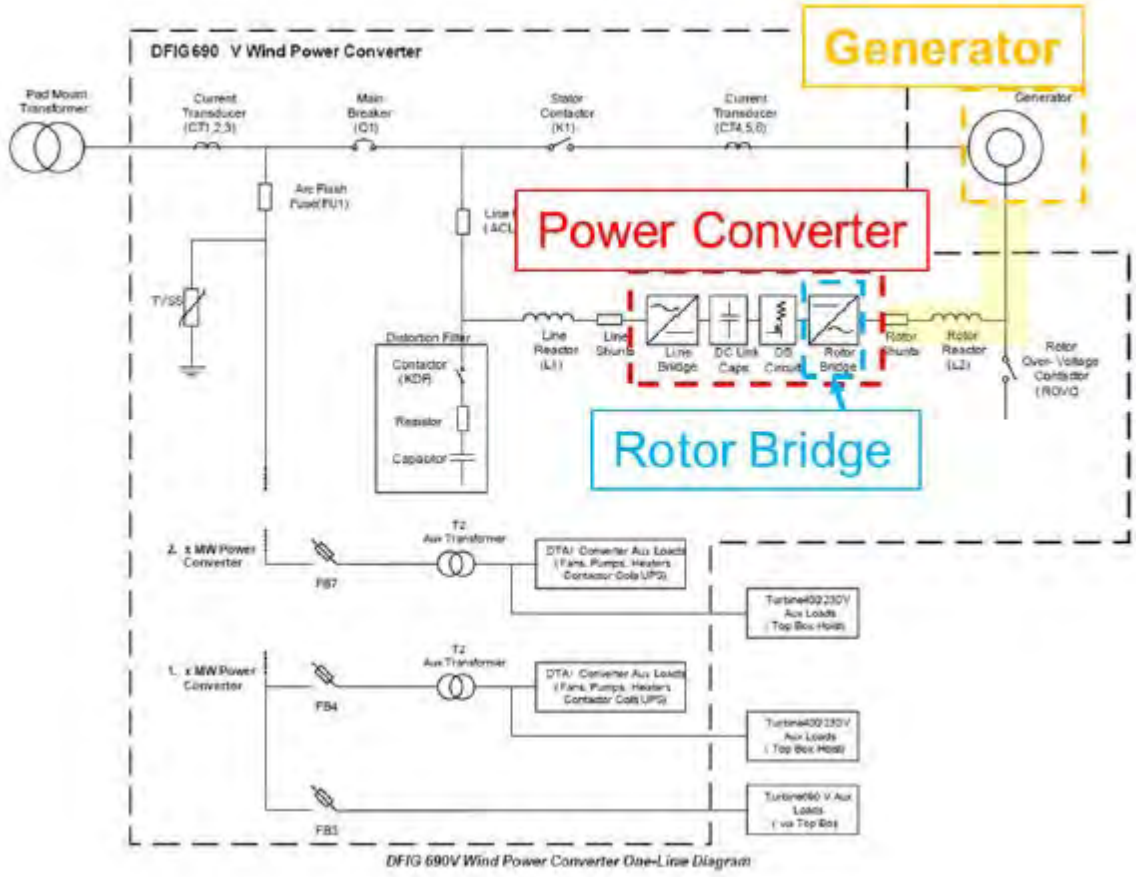
Id. at 51-52.

a) Preamble [15.0] and limitations [15.1]-[15.3]: "A wind turbine generator comprising: a generator; a power converter coupled with the generator, the power converter having an inverter coupled to receive power from the generator,"

The evidence shows that the Domestic Industry Products embody preamble [15.0] and limitations [15.1]-[15.3] . GE's expert Dr. Habetler testified that the Domestic Industry Products comprise doubly-fed induction generators; they are therefore "wind turbine generator[s]" that comprise "a generator." Tr. (Habetler) at 314:9-18; CX-0093.0005; CX-0094.0004.

The evidence shows that the Domestic Industry Products comprise "a power converter coupled with the generator." *See* Tr. (Habetler) at 314:19-25; Tr. (Holliday) at 208:15-211:3. The Domestic Industry Products also include a power converter that has "an inverter coupled to receive power from the generator." *See* Tr. (Habetler) at 314:19-315:17. The figure below, which annotates JX-0046C, illustrates the power converter coupled with the generator and the coupled

inverter (labeled "rotor bridge").[6] The rotor bridge receives power from the generator under certain circumstances. *See* Tr. (Habetler) at 314:19-315:17; Tr. (Holliday) at 209:18-21; JX-0046C.0019 ("For rotor mechanical speeds above synchronous speed (super-synchronous), rotor power is positive (+) and flows from the rotor, through the converters, and into the grid.").



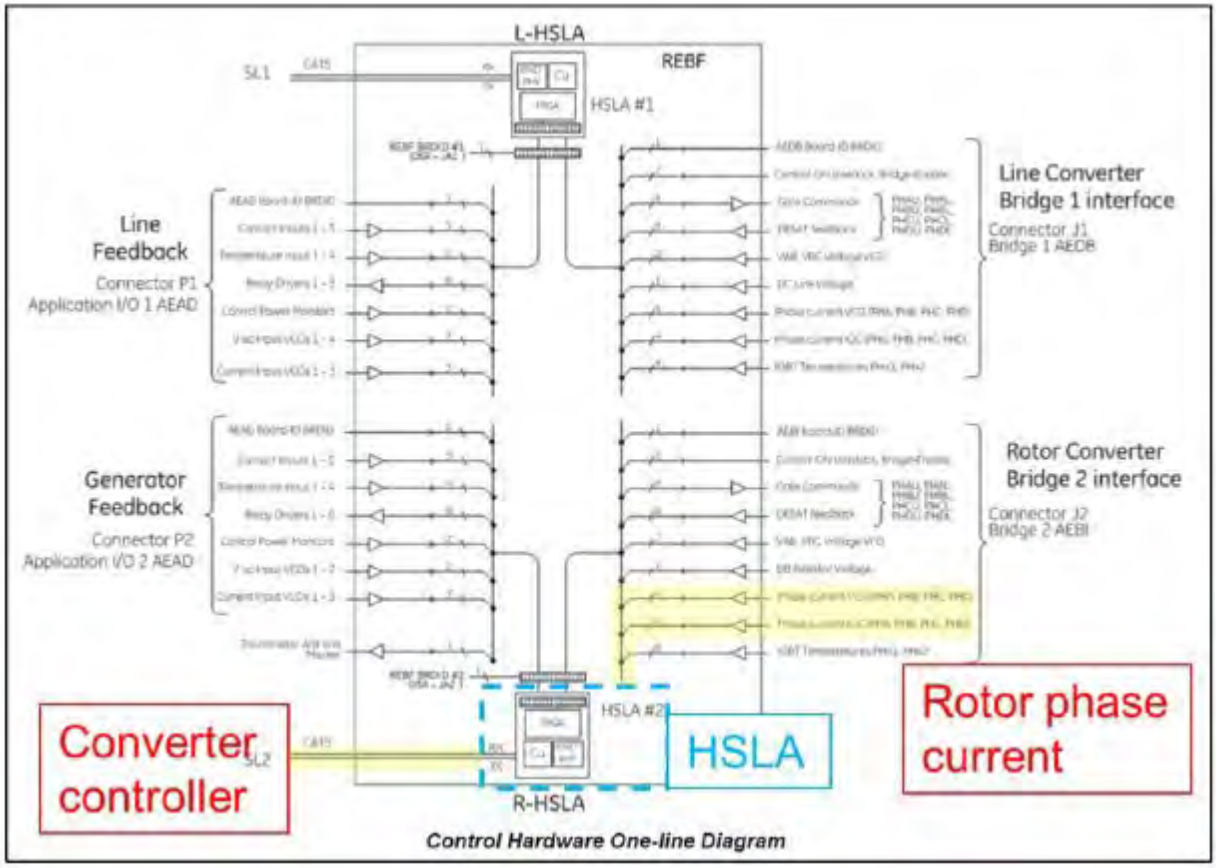
CDX-064 (annotating JX-0046C.0013)

[6] The "rotor bridge" is also referred to as a "rotor converter." *See* Tr. (Holliday) at 211:7-13; JX-0056C.0003 (including a label for "rotor converter" in upper-right quadrant).

SGRE does not dispute that the Domestic Industry Products embody these claim elements. *See* RRB at 27-29.

b) Limitation [15.4]: "a converter controller coupled with the inverter to monitor a current flow in the inverter"

The evidence shows that the Domestic Industry Products satisfy limitation [15.4], which requires "a converter controller coupled with the inverter to monitor a current flow in the inverter." Tr. (Habetler) at 315:18-316:11; Tr. (Holliday) at 211:4-212:6. The converter controller in the Domestic Industry Products is coupled with the rotor converter through a series of signal processing boards HSLA and AEBI. JX-0046C.0017. The converter controller in the Domestic Industry Products measures rotor phase current entering the rotor bridge (a current flow in the inverter) via a high-speed serial link ("HSLA") board. Tr. (Habetler) at 316:1-11; Tr. (Holliday) at 211:14-212.6. This signal path is shown in the figure below.



CDX-067 (annotating JX-0046C.0047)

Thus, the converter controller in the Domestic Industry Products measures the current flow (rotor phase current) in the inverter (rotor converter/rotor bridge) coming in from the generator rotor. SGRE does not dispute that the Domestic Industry Products practice this limitation. *See* RRB at 27-29.

c) Limitation [15.5]: "wherein the converter controller is coupled to receive power from an uninterruptible power supply during a low voltage event, and"

The evidence shows that, in the Domestic Industry Products, "the converter controller is coupled to receive power from an uninterruptible power supply during a low voltage event." Tr. (Habetler) at 316:12-25; Tr. (Holliday) at 215:4-217:16. Specifically, the down tower assembly