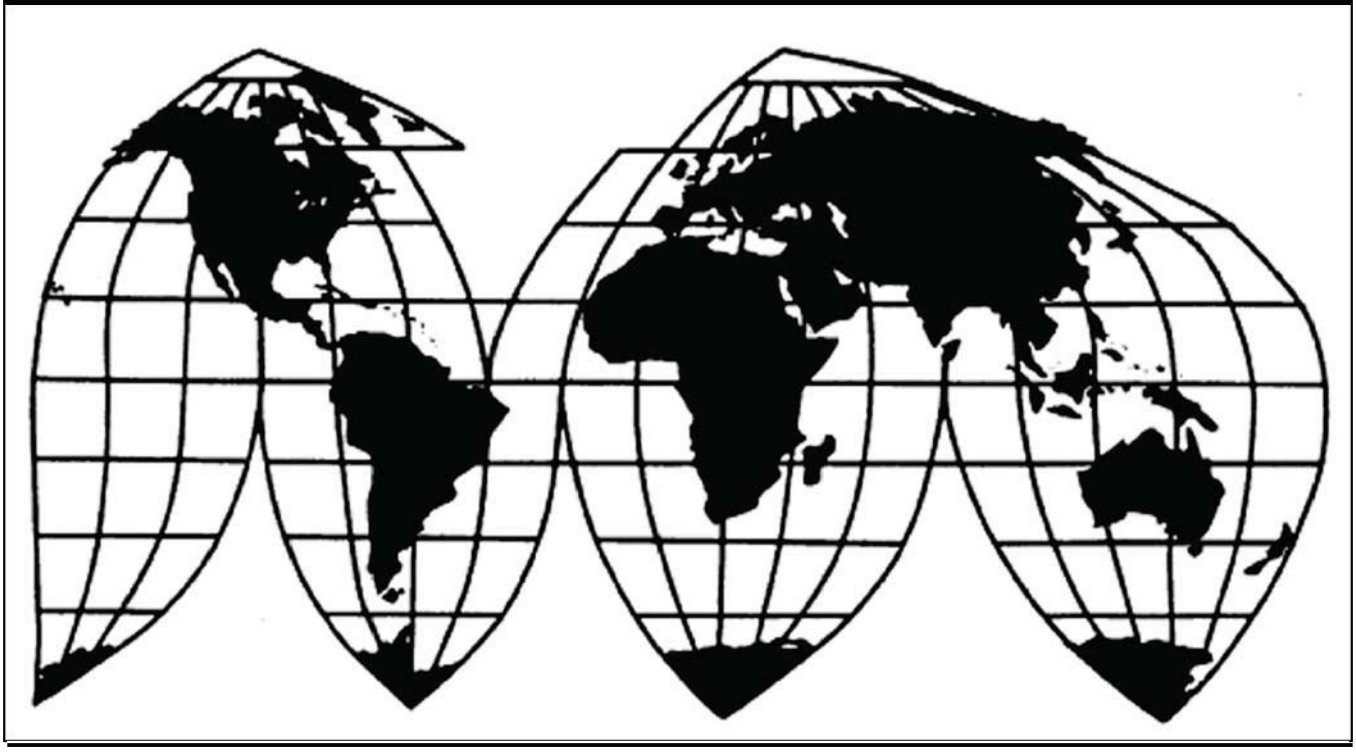
In the Matter of

Certain Variable Speed Wind Turbines and Components Thereof

Investigation No. 337-TA-641

Publication 4202 **December 2010**

U.S. International Trade Commission



Washington, DC 20436

U.S. International Trade Commission

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Daniel R. Pearson, Vice Chairman
Deanna Tanner Okun
Charlotte R. Lane
Irving A. Williamson
Dean A. Pinkert

Address all communications to
Secretary to the Commission
United States International Trade Commission
Washington, DC 20436

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UNITED STATES INTERNATIONAL TRADE COMMISSION
Washington, D.C. 20436

In the Matter of **CERTAIN VARIABLE SPEED WIND TURBINES AND COMPONENTS THEREOF**	**Investigation No. 337-TA-641**

TERMINATION OF INVESTIGATION WITH FINAL DETERMINATION OF NO VIOLATION

AGENCY: U.S. International Trade Commission.

ACTION: Notice.

SUMMARY: Notice is hereby given that the U.S. International Trade Commission has determined to terminate the investigation with a final determination of no violation in the above-captioned investigation under section 337 of the Tariff Act of 1930, as amended, 19 U.S.C. § 1337 ("section 337").

FOR FURTHER INFORMATION CONTACT: James A. Worth, Office of the General Counsel, U.S. International Trade Commission, 500 E Street, S.W., Washington, D.C. 20436, telephone (202) 205-3065. Copies of non-confidential documents filed in connection with this investigation are or will be available for inspection during official business hours (8:45 a.m. to 5:15 p.m.) in the Office of the Secretary, U.S. International Trade Commission, 500 E Street, S.W., Washington, D.C. 20436, telephone (202) 205-2000. General information concerning the Commission may also be obtained by accessing its Internet server (*http://www.usitc.gov*). The public record for this investigation may be viewed on the Commission's electronic docket (EDIS) at *http://edis.usitc.gov*. Hearing-impaired persons are advised that information on this matter can be obtained by contacting the Commission's TDD terminal on (202) 205-1810.

SUPPLEMENTARY INFORMATION: This investigation was instituted on March 31, 2008, based upon a complaint filed on behalf of General Electric Company of Fairfield, Connecticut ("GE") on February 7, 2008. 73 *Fed. Reg.* 16910. The complaint alleged violations of section 337 of the Tariff Act of 1930 (19 U.S.C. § 1337) in the importation into the United States, the sale for importation, and the sale within the United States after importation of certain variable speed wind turbines and components thereof that infringe claims 121-125 of U.S. Patent No. 5,083,039 ("the '039 patent") and claims 1-12, 15-18, and 21-28 of U.S. Patent No. 6,921,985 ("the '985 patent"). The complaint named as respondents Mitsubishi Heavy Industries, Ltd. of Tokyo, Japan ("MHI"); Mitsubishi Power Systems, Inc. of Lake Mary, Florida ("MPSA"); and Mitsubishi Heavy Industries America, Inc. of New York, New York ("MHIA"). On October 8, 2008, the Commission issued notice of its determination not to review an initial determination

("ID") (Order No. 10) granting GE's motion to amend its complaint and the notice of investigation to add claims 1-19 of U.S. Patent No. 7,321,221 ("the '221 patent") to this investigation.

On August 7, 2009, the ALJ issued a final ID finding a violation of section 337 in this investigation. The ALJ found that there was a violation in the sale for importation, importation, or sale after importation by respondents MHI and MPSA with respect to claim 121 of the '039 patent and claim 15 of the '985 patent. The ALJ found that there was no violation with respect to these claims by MHIA. The ALJ also found that there was no violation of section 337 by any party with respect to claims 5, 7, and 8 of the '221 patent.

On August 24, 2009, the Commission received petitions and/or contingent petitions for review from: (1) MHI, MPSA, and MHIA; (2) GE; and (3) the Commission investigative attorney. On September 1, 2009, each of the parties filed responses thereto.

On October 8, 2009, the Commission issued notice of its determination to review the final ID, except with respect to the issue of importation and the intent finding underlying the ALJ's inequitable conduct determination. 72 *Fed. Reg.* 52975 (Oct. 15, 2009). The Commission requested briefing on the issues on review, including certain specific questions, in addition to remedy, the public interest, and bonding.

On October 23, 2009, the Commission issued notice of its determination to extend the deadline for public submissions on remedy, the public interest, and bonding to November 2, 2009, and for all responses to all remedy, the public interest, and bonding submissions to November 9, 2009.

On October 22, 2009, Mitsubishi, GE, the IA, and Iberdrola filed submissions in response to the notice of review. On October 30, 2009, Turner Bros., LLC filed a submission on remedy. On November 2, 2009, Mitsubishi, GE, and the IA filed reply submissions on violation. On November 9, 2009, Mitsubishi, GE, the IA, and Iberdrola filed reply submissions on remedy.

Having reviewed the final ID, the submissions on review, and the record, the Commission has determined to terminate the investigation with a final determination of no violation. A Commission opinion will issue shortly.

This action is taken under the authority of section 337 of the Tariff Act of 1930, as amended (19 U.S.C. § 1337), and under sections 210.42-.51 of the Commission's Rules of Practice and Procedure (19 C.F.R. §§ 210.42-.51).

By order of the Commission.

Marilyn R. Abbott
Secretary to the Commission

Issued: January 8, 2010

CERTAIN VARIABLE SPEED WIND TURBINES AND COMPONENTS THEREOF **337-TA-641**

CERTIFICATE OF SERVICE

I, Marilyn R. Abbott, hereby certify that the attached **TERMINATION OF INVESTIGATION WITH FINAL DETERMINATION OF NO VIOLATION** has been served by hand upon the Commission Investigative Attorney Erin D. Joffre, Esq., and the following parties as indicated, on

January 8, 2010.

Marilyn R. Abbott

Marilyn R. Abbott, Secretary
U.S. International Trade Commission
500 E Street, SW
Washington, DC 20436

On Behalf of Complainant General Electric Company:

V. James Adduci, II, Esq.
ADDUCI, MASTRIANI & SCHAUMBERG LLP
1200 Seventeenth Street, NW – 5th Floor
Washington, DC 20036

( ) Via Hand Delivery
( ) Via Overnight Mail
(✓) Via First Class Mail
( ) Other: _____

On Behalf of Respondents Mitsubishi Heavy Industries, Ltd.; Mitsubishi Heavy Industries America, Inc.; and, Mitsubishi Power Systems America, Inc.:

Thomas W. Winland, Esq.
FINNEGAN HENDERSON FARABOW GARRETT & DUNNER, LLP
901 New York Avenue, NW
Washington, DC 20001

( ) Via Hand Delivery
( ) Via Overnight Mail
(✓) Via First Class Mail
( ) Other: _____

PUBLIC VERSION

UNITED STATES INTERNATIONAL TRADE COMMISSION
Washington, D.C.

In the Matter of **CERTAIN VARIABLE SPEED WIND TURBINES AND COMPONENTS THEREOF**	**Investigation No. 337-TA-641**

COMMISSION OPINION

I. INTRODUCTION

On August 7, 2009, the presiding administrative law judge ("ALJ") (Judge Charneski) issued a final initial determination ("final ID" or "ID") finding a violation of section 337 in the above-identified investigation. The ALJ found that there was a violation in the sale for importation, importation, or sale after importation by respondents Mitsubishi Heavy Industries, Ltd. ("MHI") and Mitsubishi Power Systems, Inc. ("MPSA") (collectively, "Mitsubishi")[1] with respect to claim 121 of U.S. Patent No. 5,083,039 ("the '039 patent") and claim 15 of U.S. Patent No. 6,921,985 ("the '985 patent"), but that there was no violation of section 337 by any party with respect to claims 5, 7, and 8 of U.S. Patent No. 7,321,221 ("the '221 patent"). Specifically, the ALJ found that (1) Mitsubishi infringed the asserted claims of the '039, '221, and '985

[1] The ID uses the collective term "Mitsubishi" to refer to MHI, MPSA, and Mitsubishi Heavy Industries America, Inc. ("MHIA"). In examining jurisdiction and importation, the ID concluded that MHIA has not been shown to have sold articles for importation, imported articles, or sold articles after importation. In this connection, the ALJ found that MHIA had not be found in violation. The Commission determined not to review the ALJ's finding with respect to importation. 72 *Fed. Reg.* 52975 (Oct. 15, 2009). This opinion thus uses the term Mitsubishi to refer to only MHI and MPSA.

patents, (2) the '039, '221, and '985 patents were not invalid by reason of anticipation, obviousness, enablement, or written description as alleged, and (3) GE satisfied the domestic industry requirement with respect to the '039 and '985 patents but not the '221 patent.

On October 8, 2009, the Commission issued notice of its determination to review the final ID, except with respect to the issue of importation and the ALJ's finding that GE lacked culpable intent in not naming Mr. Wilkins as an inventor of the '985 patent. This finding underlies the ALJ's determination of no inequitable conduct. 72 *Fed. Reg.* 52975 (Oct. 15, 2009). In its notice of review, the Commission requested briefing on the issues under review, focusing on (1) whether there would be infringement under the doctrine of equivalents if the Commission reversed the ALJ's claim construction and adopts the claim constructions proposed to the ALJ by the Commission investigative attorney ("IA") or Mitsubishi; (2) whether the Commission must reach the issue of inventorship in determining whether GE has standing to assert the '985 patent; and (3) whether claim 15 of the '985 patent requires that the device shunt current away from both the inverter and the generator, and whether the shunt circuit can be located within the inverter.

The imported products are electricity-generating windmills (also known as wind turbines) and the power circuits that allow them to operate safely and effectively on a power grid. The imported products are variable speed wind turbines which means that the blades of the windmill turn at whatever speed the wind is blowing. Variable speed wind turbines utilize specialized power components to allow them to adapt to modern power grids.

The three patents at issue each deal with separate problems encountered with attaching a variable speed wind turbine to a modern power grid. The '039 patent teaches a wind turbine

capable of converting the variable frequency current generated by a variable speed wind turbine into the fixed frequency current that a power grid requires. The '221 patent teaches a wind turbine that decouples the feed-in unit from the rotor windings when there is an electrical disturbance on the power grid and then recouples the system when the disturbance subsides. This disengagement protects the wind turbine from being damaged by electrical disturbances associated with power fluctuations. The '985 patent teaches a wind turbine with an uninterruptible power supply that can continue to supply power during a low voltage event on the power grid.

II. STANDARD FOR REVIEW

Under the Administrative Procedure Act, upon review of the initial determination of the ALJ, "the agency has all of the powers which it would have in making the initial decision except as it may limit the issues on notice or by rule." 5 U.S.C. § 557(b) (*quoted in Certain Acid-Washed Garments and Accessories*, Inv. No. 337-TA-324 (U.S.I.T.C. Aug. 6, 1992)); 19 C.F.R. § 210.45(c). In other words, once the Commission decides to review the decision of the ALJ, the Commission may conduct a review of the findings of fact and conclusions of law presented by the record under a *de novo* standard.

III. BACKGROUND

Procedural History

This investigation was instituted on March 31, 2008, 73 *Fed. Reg.* 16910, and on October 8, 2008, the Commission issued notice of its determination not to review an ID (Order No. 10) granting GE's motion to amend its complaint and the notice of investigation to add claims 1-19 of the '221 patent to this investigation. 73 *Fed. Reg.* 61441 (Oct. 16, 2008). On April 21, 2009,

the Commission issued notice of its determination not to review an ID (Order No. 30) granting GE's amended motion for summary determination that it had satisfied the economic prong of the domestic industry requirement with respect to all three asserted patents.

The evidentiary hearing in this investigation commenced on May 11, 2009. At the hearing, GE narrowed the asserted claims to claim 121 of the '039 patent; claims 5, 7, and 8 of the '221 patent; and claim 15 of the '985 patent. *See* Tr. 155.

On August 7, 2009, the ALJ issued a final ID finding a violation of section 337 in this investigation. The ALJ found that there was a violation in the sale for importation, importation, or sale after importation by respondents MHI and MPSA with respect to claim 121 of the '039 patent and claim 15 of the '985 patent. The ALJ found that there was no violation with respect to these claims by MHIA. The ALJ also found that there was no violation of section 337 by any party with respect to claims 5, 7, and 8 of the '221 patent.

On August 24, 2009, the parties filed three petitions and/or contingent petitions for review: (1) MHI, MPSA, and MHIA; (2) GE; and (3) the Commission investigative attorney. On September 1, 2009, each of the parties filed responses thereto.

On October 8, 2009, the Commission issued notice of its determination to review the final ID, except with respect to the issue of importation and the intent finding underlying the ALJ's inequitable conduct determination. 72 *Fed. Reg.* 52975 (Oct. 15, 2009). The Commission requested briefing on the issues on review, including certain specific questions, in addition to remedy, the public interest, and bonding.

On October 22, 2009, Mitsubishi, GE, the IA, and Iberdrola filed submissions in response to the notice of review. On October 30, 2009, Turner Bros., LLC filed a submission on remedy.

On November 2, 2009, Mitsubishi, GE, and the IA filed reply submissions on violation. On November 9, 2009, Mitsubishi, GE, the IA, and Iberdrola filed reply submissions on remedy.

IV. APPLICABLE LAW

A. Infringement

Determining infringement is a two-step process which consists of determining the scope of the asserted claim (claim construction) and then comparing the accused product or process to the claim as construed.

1. Claim Construction

Claim terms are interpreted as they would be understood by a person of ordinary skill in the art in the context of the intrinsic evidence, consisting of the claims, the specification, and the prosecution history, if in evidence, and relevant extrinsic evidence of the meaning of the claim to a person of ordinary skill in the art. *See, e.g., Phillips v. AWH Corp.*, 415 F.3d 1303, 1316-17 (*en banc*) (citations omitted).

2. Literal Infringement

An accused device literally infringes a patent claim if it contains every limitation recited in the claim. *See, e.g., Litton Sys., Inc. v. Honeywell, Inc.*, 140 F.3d 1449, 1454 (Fed. Cir. 1998).

3. Doctrine of Equivalents

Even where an accused process does not literally infringe an asserted patent claim, it may nevertheless infringe under the doctrine of equivalents. The Federal Circuit has articulated two tests for determining infringement under the doctrine of equivalents:

> This court applies two articulations of the test for equivalence. *See Warner-Jenkinson*, 520 U.S. at 40, 117 S.Ct. 1040 (explaining that different phrasings of the test for equivalence may be "more suitable to different cases,

> depending on their particular facts"). Under the insubstantial differences test, "[a]n element in the accused device is equivalent to a claim limitation if the only differences between the two are insubstantial." *Honeywell Int'l Inc. v. Hamilton Sundstrand Corp.*, 370 F.3d 1131, 1139 (Fed.Cir.2004). Alternatively, under the function-way-result test, an element in the accused device is equivalent to a claim limitation if it "performs substantially the same function in substantially the same way to obtain substantially the same result." *Schoell v. Regal Marine Indus., Inc.*, 247 F.3d 1202, 1209-10 (Fed.Cir.2001).

Voda v. Cordis Corp., 536 F.3d 1311, 1326-27 (Fed. Cir. 2008). Under either articulation, equivalence must be determined for each claim limitation. *See id.*

B. Domestic Industry

The domestic industry requirement of section 337 is set out at section 337(a)(2) and (a)(3). Section 337(a)(2) provides:

> (2) Subparagraphs (B), (C), (D), and (E) of paragraph (1) [concerning violations of section 337] apply only if an industry in the United States, with respect to the articles protected by the patent, copyright, trademark, mask work, or design concerned, exists or is in the process of being established.

Section 337(a)(3) provides:

> (3) [A]n industry in the United States shall be considered to exist if there is in the United States, with respect to articles protected by the patent . . . 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.

The Commission has divided the domestic industry requirement into an economic prong (which requires certain activities) and a technical prong (which requires that these activities relate to the intellectual property being protected), such that an industry must exist or be in the process of

being established. Section 337(a)(2), (a)(3); *see, e.g., Certain Variable Speed Wind Turbines and Components Thereof*, Inv. No. 337-TA-376 (*"Wind Turbines I"*), USITC Pub. 3003 (Nov. 1996), Comm'n Op. at 14-17. Under the definitions of section 337(a), an industry exists if there is "significant investment in plant and equipment," "significant employment of labor or capital," or "substantial investment in [the patent's] exploitation, including engineering, research and development, or licensing." Section 337(a)(3)(A),(B),(C).

With respect to section 337(a)(3)(A) and (B), the technical prong is met by investments in plant or equipment and employment in labor or capital that are actually related to "articles protected by" the intellectual property right which forms the basis of the complaint. Section 337(a)(3); *see Wind Turbines I* at 14-17. With respect to section 337(a)(3)(C), the technical prong is met if the activities of engineering, research and development, and licensing are actually related to the asserted intellectual property right.

C. Validity

1. Anticipation

A patent is invalid as anticipated if a single prior art reference contains all of the limitations of the asserted claim. 35 U.S.C. § 102; *Verve, LLC v. Crane Cams, Inc.*, 311 F.3d 1116, 1120 (Fed. Cir. 2002).

2. Obviousness

A patent may be found invalid as obvious.[2] The Supreme Court explained that one

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[2] The Patent Statute provides that an invention may be obvious as follows:

> A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the

ascertains whether an invention would have been obvious to a person of ordinary skill in the art by examining the scope and content of the prior art, differences between the prior art and the claims at issue, and the level of ordinary skill in the pertinent art, keeping in mind such secondary considerations as commercial success, long felt but unsolved needs, and failure of others. *Graham v. John Deere*, 383 U.S. 1, 17 (1966). A *prima facie* case of obviousness may be shown where all of the claimed elements occur in the prior art, and there is a showing that it would have been "obvious" to combine them. Prior to *KSR Int'l Co. v. Teleflex, Inc.*, 550 U.S. 398 (2007) ("*KSR*"), the Federal Circuit required a teaching, suggestion, or motivation to combine the elements found in the prior art. Under the Supreme Court's teaching in *KSR*, a teaching, suggestion, or motivation to combine elements need not come from a prior art reference. *KSR*, 127 S. Ct. at 1741 (2007).

3. Enablement

To satisfy the enablement requirement of 35 U.S.C. § 112, the specification must teach those of ordinary skill in the art how to practice the claimed invention without undue experimentation. *See, e.g., In re Vaeck*, 947 F.2d 488, 495 (Fed. Cir. 1991). In the words of the statute, "the patent must contain a description sufficient to enable one skilled in the art to make and use the full scope of the claimed invention." 35 U.S.C. § 112. A patent is invalid if it does

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> 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. Patentability shall not be negatived by the manner in which the invention was made.

35 U.S.C. § 103(a).

not enable the claimed invention.

4. Written Description

The written description requirement of 35 U.S.C. § 112 is satisfied if the patent disclosure conveys with reasonable clarity to those skilled in the art that the inventor was in possession of the claimed invention at the time of filing of the application which gave rise to the issued patent. *Purdue Pharma L.P. v. Faulding Inc.*, 230 F.3d 1320, 1323 (Fed. Cir. 2000).

D. Inequitable Conduct

Inequitable conduct that renders a patent unenforceable exists if an applicant withholds material information from the PTO with an intent to deceive. *Norian Corp. v. Stryker Corp.*, 363 F.3d 1321, 1330-31 (Fed. Cir. 2004).

E. Inventorship

The Federal Circuit has explained that an invention may be the product of a joint effort:

> ...People may be joint inventors even though they do not physically work on the invention together or at the same time, and even though each does not make the same type or amount of contribution. 35 U.S.C. § 116. The statute does not set forth the minimum quality or quantity of contribution required for joint inventorship.
>
> Conception is the touchstone of inventorship, the completion of the mental part of invention. *Sewall v. Walters*, 21 F.3d 411, 415, 30 USPQ2d 1356, 1359 (Fed.Cir.1994). It is "the formation in the mind of the inventor, of a definite and permanent idea of the complete and operative invention, as it is hereafter to be applied in practice." *Hybritech Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 1376, 231 USPQ 81, 87 (Fed.Cir.1986) (citation omitted). Conception is complete only when the idea is so clearly defined in the inventor's mind that only ordinary skill would be necessary to reduce the invention to practice, without extensive research or experimentation. *Sewall*, 21 F.3d at 415, 30 USPQ2d at 1359; *see also Coleman v. Dines*, 754 F.2d 353, 359, 224 USPQ 857, 862 (Fed.Cir.1985) (conception must include every feature of claimed invention). Because it is a mental act, courts require corroborating evidence of a contemporaneous disclosure that would enable one skilled in the art to make the invention. *Coleman v. Dines*, 754 F.2d at 359, 224 USPQ at 862.

Burroughs Wellcome Co. v. Barr Labs., Inc., 40 F.3d 1223, 1227-28 (Fed. Cir. 1994).

VI. DISCUSSION

A. The '039 Patent

1. Squirrel Cage Generators and DFIG Generators

As discussed *infra*, the '039 patent teaches, *inter alia*, an "inverter for supplying output electricity." Much of the discussion therefore focuses on the inverters and converters which convert direct current (DC) into alternating current (AC) and vice versa.

There are two types of variable speed wind turbines: squirrel cage generators and DFIG generators (doubly fed induction generators). The accused Mitsubishi turbines are DFIG turbines rather than squirrel cage generators. The GE turbines, proferred to satisfy the domestic industry requirement, are also DFIG turbines. It is undisputed that the '039 patent covers squirrel cage generators, and many of the disputes over claim construction, and hence infringement and domestic industry, are really disputes about whether the claimed invention of the '039 patent also covers DFIG generators. The '039 patent teaches a power factor controller **54**, inverter controllers **50** and **52**, and associated inverters which supply output electricity to the grid. '039 patent, col. 5, lines 43-46, Figures 1-2. GE has proferred the rotor-side (generator-side) converter of the DFIG wind turbines to meet the "inverter for supplying output electricity" limitation. GE Post-Hearing Brief at 64, 70.

2. Claim Construction

Claim 121 of the '039 patent is directed to a wind turbine that converts variable frequency electricity into fixed frequency electricity using a power converter, an inverter, and an inverter controller means (disputed terms are in italics):

121. A variable speed wind turbine comprising:

a turbine rotor including at least one blade mounted to a rotatable shaft;
a multiphase induction generator having a rotor coupled to the turbine shaft for rotation therewith;
a power converter for converting variable frequency electricity generated by the generator into fixed frequency electricity, the power converter including an *inverter for supplying output electricity*, wherein the inverter has active switches; and
inverter controller means coupled to the inverter and responsive to a power factor control signal for controlling the active switches to supply electricity at a desired angle between voltage and current.

a. "inverter controller means"

The ALJ held that the phrase "inverter controller means" was not a "means plus function" claim term and construed it to be simply "an inverter controller, *i.e.,* a piece of equipment that may be implemented in the form of a digital processor." ID at 43. The Commission determined to review.

The use of the word "means" in a claim creates a presumption that the claim is a "means-plus-function"claim under 35 U.S.C. § 112 ¶6, and this presumption must be overcome by a showing that the language within the claim itself provides sufficient structure to perform the claimed function. *Kemco Sales, Inc. v. Control Papers Co., Inc.*, 208 F.3d 1352, 1361 (Fed. Cir. 2000); *Sage Prods., Inc. v. Devon Indus., Inc.*, 126 F.3d 1420, 1427-28 (Fed. Cir. 1997). If the claim itself does not provide the structure that performs the claimed function, then the claim is understood to refer to the specification which must provide the structure required to perform the function. See 35 U.S.C. § 112 ¶ 6. This is because a patentee cannot claim every structure that performs a recited function. *See Holland Furniture v. Perkins Glue Co.*, 277 U.S. 245 (1928).

The function of the claimed inverter controller means is being "responsive to a power

factor control signal" and "controlling the active switches to supply electricity at a desired angle between voltage and current." The ID reasoned that the structure was present in the claims because a person of ordinary skill in the art would understand the meaning of "inverter controller." The ID relies on the testimony of Dr. Kirtley who states that a person of ordinary skill in the art could program a computer to perform the function of an inverter controller. ID at 42 (citing 483-484; 659-61). Dr. Kirtley states that: "One of skill in the art in 1991 would have recognized an inverter controller - - as a thing, a piece of equipment that was fairly well known. I mean, it was known how to make one....You would buy the basic components. And of course they always require some glue logic and some programming." Tr. at 483:23-484:8. However, Dr. Kirtley does not explain how a person of ordinary skill in the art would program the computer to perform the required function other than to state that the required function is known from the claim language:

> Q: What kind of information would you need to provide to an inverter controller to make it work in a variable speed wind turbine?
> A: You have to tell it what to do.
> Q: And does claim 121 tell the person of ordinary skill what you want the inverter controller to do?
> A: Yes. It says control the active switches. And you can read the rest. What it does is it says, look, you need to tell this thing to inject current, AC current into the system at a defined angle between voltage and current. This thing says a desired angle between voltage and current.
> Q: And does - - would a person of ordinary skill understand what the inverter controller needed to be responsive to?
> A: This claim language says it has to be responsive to a power factor control system that establishes that angle. It also pretty clearly has to be responsive to the voltage on the system so that it can inject current at the right angle.
> Q: Is there anything - - still focusing on this inverter controller term, is there anything in the written description or the figures that supports your view that inverter controller was known as a specific structure.
> A: Well, yes, there are a number of places in the patent, in the figures and in the written description where the controller is mentioned and its function is described.

Tr. 484:22-486:1.

While claim 121 identifies the function to be programmed, we find that this testimony does not establish that a person of ordinary skill in the art would know how to program the computer to achieve this function, other than by looking at the rest of the patent, including the figures and the written description. Indeed, the specification goes into minute detail on the calculations the inverter controller means uses to achieve the desired functions. We find that claim 121 does not provide sufficient structure to perform the claimed function and thus that the claim falls under 35 U.S.C. § 112 ¶6.

We next consider the relevant structure. In this connection, the ID referred to inverter control unit **88**. ID at 42 (citing '039 patent, col. 16, lines 48-55). We find that power factor controller **54** is also a part of the inverter control unit **88**, and conclude that these components together are the structure which performs the claimed function. The power factor controller **54** receives a power factor input signal, and in one of its operational modes, the power factor controller **54** generates a power factor angle phi, which it transmits to the inverter control unit **88**. The inverter control unit **88** then drives the inverter. '039 patent, col. 5, lines 43-46; col. 18 lines 44-58; Figs. 2 and 13; Tr. 670:23-677:4, 714:11-717:8 (Kirtley); Tr. 1139:3-1144:9 (Habetler); 658:1-659:7 (Kirtley); Tr. 1141:12-1144:9 (Habetler)). The identified structure of the inverter controller means is used only to control the "grid-side" or "line-side" inverter. *See* '039 patent, col. 3, lines 17-27.

b. "inverter for supplying output electricity"

The claim requires an "inverter for supplying output electricity" at "a desired angle

between voltage and current." The ALJ construed the phrase "inverter for supplying output electricity" consistent with its ordinary meaning such that the only limitations on the inverter are: (1) that it must supply output electricity, and (2) that it must have active switches. ID at 38. The ALJ held that there is no limitation in the claim or the specification that requires the inverter to be located on the grid or line side of the generator (as opposed to the generator side). ID at 38. The Commission determined to review.

We find that the term "output" in the claim phrase "inverter for supplying output electricity" indicates that the claim phrase refers to an inverter on the grid (line) side from which the electricity for the grid (*i.e.*, "output" electricity) emerges. *See Innova/Pure Water, Inc. v. Safari Water Filtration Systems, Inc.*, 381 F.3d 1111, 1119 (Fed. Cir. 2004) ("Furthermore, we observe that Safari's interpretation largely reads the term "operatively" out of the phrase 'operatively connected.' While not an absolute rule, all claim terms are presumed to have meaning in a claim."). This reading is confirmed by the statement in the Summary of the Invention in the '039 specification that "[t]he present invention further includes an apparatus and method for controlling the active switches at the grid side inverter to supply output electricity at a desired angle between voltage and current." '039 patent, col. 3, lines 17-27. We therefore determine that "an inverter for supplying output electricity" means a device located on the grid side of the circuit that converts DC to AC.

3. Literal Infringement

The ALJ found that the accused products ("the Mitsubishi Wind Turbine" or "MWT") literally meet each limitation of claim 121 of the '039 patent. ID at 43-46.

a. "inverter controller means"

The ALJ found that in the MWT, [[

]] ID at 45

(citing Tr. 495-499). The ALJ acknowledged that according to the claim language, the inverter controller must be "responsive to a power factor control signal for controlling the active switches to supply electricity at a desired angle between voltage and current." ID at 46.[3] However, the ALJ rejected Mitsubishi's argument that [[

]] ID at 46. The ALJ reasoned that "infringement in a situation like this does not turn on a particular use of the apparatus (or, for that matter, whether the apparatus is actually put into operation)." *Id.* (citing *Hewlett-Packard Co., v. Bausch & Lomb, Inc.*, 909 F.2d 1464, 1468 (Fed. Cir. 1990) ("apparatus claims cover what a device *is*, not what a device *does*."')). The ALJ thus found that the MWT practices this claim limitation literally. ID at 46. The Commission determined to review.

We find that the accused Mitsubishi CCU does not perform the recited function because it is not responsive to a power factor control signal but rather [[

]] *See* CX-575C at MHI0515877. The input of the accused CCU

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[3] By way of background, in describing GE's power control technology, an expert explains that "The power factor control will proportionately change the reactive power as the real power goes up. So, for example, if you get a - - if the wind velocity increases, you'll make more power and push it through the transmission line. And the voltage will change unless you do something with the reactive power. So first order, a power factor control will change the reactive power proportionately to the real power so that the power factor angle stays constant. And that's a good thing to do in terms of maintaining better control of voltage." One subsidiary issue is the manner in which the device of claim 121 and the accused products control the angle between voltage and current.

has been [[ ]] which is not a power factor control signal within the meaning of the patent. Because the inverter controller means is the central aspect of the invention of the '039 patent, the fact that the accused device does not perform one of the stated functions is particularly noteworthy. Moreover, the Mitsubishi CCU does not operate using a structure that is the same as, or equivalent to, the power factor controller **54** and inverter control unit **88**. Thus even though the Mitsubishi CCU coordinates real power and reactive power, it does so in a different manner using a different structure, and is not responsive to a power factor control signal. *E.g., Multiform Desiccants, Inc. v. Medzam, Ltd.*, 133 F.3d 1473, 1479 (Fed. Cir. 1998) ("However, claims written in the means-for form of § 112 ¶ 6 do not, by virtue of this form, acquire a scope as to the function beyond that which is supported in the specification, or as to the structure beyond equivalents of that shown in the specification."). Thus, the Mitsubishi product does not satisfy the claimed requirement, and does not infringe claim 121 of the '039 patent.

b. "inverter for supplying output electricity"

The ALJ declined to limit the construction of "inverter for supplying output electricity" to inverters located on the grid (line) side and thus directly connected to the grid. See ID at 37-38. The ALJ noted that under the construction proposed by Mitsubishi and the IA, the accused products would not infringe claim 121 because the path of output electricity from a DFIG differs from that of the squirrel cage generator to which Mitsubishi and the IA would limit claim 121. ID at 45. However, the ALJ found that in the accused MWT, the rotor-side inverter has active switches (called "IGBTs," which stand for insulated gate bipolar transistors) that meet the "inverter for supplying output electricity" limitation of claim 121. ID at 45 (citing Tr. 477-481

(Kirtley)). The ALJ observed that the rotor-side inverter supplies reactive power to the DFIG rotor so that the generator outputs electricity at the desired angle between voltage and current and the flow of reactive current from the rotor-side inverter to the rotor is reactive power that is supplied to the grid. ID at 45 (citing Tr. 474-476, 479, 711-712, 821-822). In this connection, the ALJ found that the MWT practices this claim limitation literally. ID at 45. The Commission determined to review.

For the reasons outlined *supra*, the Commission construes "inverter for supplying output electricity" as a device that converts DC to AC located on the power grid (line) side of the circuit in order to give meaning to the term "output." The rotor-side inverter of a DFIG is not directly connected to the grid. Tr. 468:14-16. The DFIG turbines have three modes of operation, subsynchronous, synchronous, and supersynchronous, but in none of these modes does the rotor-side inverter supply AC to the grid. Tr. 468:14-16, 23-24; 472-475; 1136-37.

The inverter is part of the overall functioning of the wind turbine, but to say that the overall functioning of the wind turbine is "for supplying output electricity" would not give meaning to the claim term. *See Innova/Pure Water, Inc.*, 381 F.3d at 1119. GE argues that the Mitsubishi Wind Turbines literally satisfy this limitation because the rotor side inverter supplies power to the grid in a certain mode. GE Submission at 15 (citing Tr. 472:4-473:5; 470:9-471:3 (Kirtley); ID at 45). However, Mitsubishi points to testimony that this reactive power "sloshes back and forth" but on balance does not result in the net supply of electricity. Mitsubishi Submission at 18 (citing Tr. 240:5-13 (Lyons); Tr. 473:20-474:18 (Kirtley)). This reactive power does not therefore result in the supply of output electricity because there is no net power delivery

to the grid. Tr. 240:5-13 (Lyons); *see also* Tr. 473:20-474:18 (Kirtley)).[4]

Because the inverter in the accused products is not on the power grid (line) side and does not supply output AC to the grid, the accused product does not literally infringe the claim term "inverter for supplying output electricity."

4. Infringement Under the Doctrine of Equivalents

The ALJ did not conduct an analysis of whether the Mitsubishi Wind Turbines infringe the '039 patent under the doctrine of equivalents because he found that they infringe literally. ID at 46. There were no petitions for review, but the Commission determined to review the issue because it determined to review claim construction, and requested briefing on whether there would be infringement under the doctrine of equivalents under either Mitsubishi's or the IA's claim construction.

a. "inverter controller means"

GE argues that the converter control unit (CCU) of the Mitsubishi Wind Turbine is equivalent to the claimed "inverter controller means" because [[

]] GE Submission at 20 (citing ID at 45; Tr. 495:7-499:17 (Kirtley); CX-177C at MHI0668211-12); 22 (citing Tr. 522:1-9; 719:18-25; 638:13-19; 493:11-494:9 (Kirtley)). GE acknowledges that the [[

[4] GE has identified its rotor-side converter as the component which satisfies the "inverter for supplying output electricity" limitation. GE Post-Hearing Brief at 70.

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Mitsubishi responds that "means plus function" claims are limited to structure disclosed in the specification and its equivalents, *Atmel Corp. v. Information Storage Devices, Inc.*, 198 F.3d 1374, 1381 (Fed. Cir. 1999), and that analysis for equivalents collapses into the analysis for literal infringement under 35 U.S.C. § 112 ¶ 6. *Frank's Casing, Crew & Rental Tools, Inc. v. Weatherford Int'l, Inc.*, 389 F.3d 1370, 1379 (Fed. Cir. 2004). Mitsubishi argues that, in any case, the changes required to the patent's inverter control means in Mitsubishi's Wind Turbine would amount to creating "a completely different structure." Mitsubishi Submission at 16 (citing Habetler Tr. at 1145:19-1147:12). Mitsubishi explains that the CCU in the Mitsubishi DFIG Wind Turbine controls the active switches of the rotor-side converter and does not perform the claimed function of controlling the active switches of an inverter for supplying output energy. Mitsubishi Reply Submission at 12. Mitsubishi also contends that [[

]] Mitsubishi Reply Submission at 13-14 (citing Tr. 502:8-506:24 (Kirtley)). The IA agrees with Mitsubishi. IA Submission at 8 (citing Tr. 680:13-681:20; 682:8-698:12); 3-4 (citing Tr. 1154:4-1158:19; RX-537 at INGT0000371).

We find that the function/way/result test for equivalency is not here met because the Mitsubishi CCU operates in a different way [[

]] *See* CX-575C at MHI0515877. We also credit the testimony that the changes required to convert the Mitsubishi CCU into the patented inverter controller means would result

in a completely different structure. Habetler Tr. at 11:45:19-1147:12. GE has also failed to provide particularized proof on an element-by-element basis. *Malta v. Schulmerich Carillons, Inc.*, 952 F.2d 1320, 1327 n.5 (Fed. Cir. 1991); *Nestier Corp. v. Menasha Corp.-Lewisystems Div.*, 739 F.2d 1576, 1579-80 (1984); *Pennwalt Corp. v. Durand-Wayland, Inc.*, 833 F.2d 931, 934 (Fed.Cir.1987) (*en banc*), *overruled in part on other grounds by, Cardinal Chem. Co. v. Morton Int'l,* 508 U.S. 83, 113 S.Ct. 1967, 124 L.Ed.2d 1 (1993). Because the Mitsubishi CCU is not equivalent to the claimed "inverter controller means" limitation, we determine that the Mitsubishi Wind Turbines do not infringe the asserted claim of the '039 patent under the doctrine of equivalents.

b. "inverter for supplying output electricity"

GE argues that the rotor-side inverter of the Mitsubishi Wind Turbine is equivalent to the claimed inverter because a person of ordinary skill in the art would understand that the power factor control would need to take place in the rotor-side converter in the DFIG type of generator (as opposed to the grid side). GE Submission at 16.

Mitsubishi argues that the "inverter for supplying output electricity" limitation is not met because the Mitsubishi DFIG system functions in a different way, only converting some of the electricity to DC, and because the rotor-side converter in a DFIG system is not at a fixed frequency of 60 Hz and is not at a desired angle between voltage and current. Mitsubishi Submission at 18-19. Mitsubishi explains that although its rotor-side converter can provide reactive power, it is not output electricity because "actually power that sloshes back and forth simultaneously, [results in] no net power delivery." Mitsubishi Reply Submission at 18 (quoting Tr. 240:5-13 (Lyons); also citing Tr. 473:20-474:18 (Kirtley)). Mitsubishi asserts that its rotor-

side converter does not output AC electricity at a desired angle between voltage and current because (1) most of the power output goes directly from the stator to the grid and does not pass through the converter and (2) the angle between the voltage and current that leave the rotor-side converter varies with the rotor speed. *Id.* at 19-20 (citing Tr. 464:14-464:14-465:9; 700:5-701:17, 702:1-19 (Kirtley); 1116:24-1117:10; 1129:21-1131:17, 1195:13-1196:11(Habetler)).

The IA asserts that the Mitsubishi Wind Turbine rotor-side converter is not an inverter, but rather a rectifier. IA Reply Submission at 3 (citing IA Post-Hearing Br. at 20-23).

Equivalence is analyzed on an element by element basis, rather than deciding whether one machine as a whole is equivalent to another. *Warner-Jenkinson Co. v. Hilton Davis Chem. Co.*, 520 U.S. 17, 29 (1997). We agree with Mitsubishi that the rotor side inverter is not equivalent to the grid side inverter because the rotor side inverter does not supply output AC electricity even though it supplies reactive power. Tr. 240:5-13 (Lyons); Tr. 473:20-474:18 (Kirtley); 1129:21-1131:17 (Habetler). We also agree that the Mitsubishi rotor side inverter is not equivalent because it supplies power at an angle that varies. Tr. 464:14-465:9; 700:5-701:17, 702:1-19 (Kirtley); 1116:24-1119:18; 1195:13-1196:11(Habetler). We find these distinctions to be substantial. We also find that GE has failed to provide the particularized evidence required to establish infringement under the doctrine of equivalents. Because the Mitsubishi CCU is not equivalent to the claimed "inverter for supplying output electricity," we determine that the Mitsubishi Wind Turbines do not infringe the asserted claim of the '039 patent under the doctrine of equivalents.

Because the accused Mitsubishi Wind Turbines do not satisfy limitations of claim 121 as discussed above, the Commission does not take a position on the "power converter" limitation.

See Beloit v. Valmet Oy, 742 F.2d 1421 (Fed. Cir. 1984).

5. Domestic Industry

The ALJ rejected the proposed claim constructions of Mitsubishi and the IA. ID at 48. The ALJ found that the GE Turbine, like the MWT, is not based on a squirrel-cage generator but rather contains a DFIG (*i.e.,* a doubly-fed induction generator). ID at 48 (citing Tr. at 1166-1167 (Habetler); 339 (Holley)). The ALJ found that GE satisfied the technical prong of the domestic industry requirement for the '039 patent under his claim construction of claim 121 which covered DFIGs. The Commission determined to review.

Both the Mitsubishi products and the GE products are DFIG generators as opposed to squirrel cage generators. It is undisputed that there is no difference between the GE products and Mitsubishi products for the purposes of analyzing whether the products are covered by the '039 patent. We determine that GE has not satisfied the technical prong of the domestic industry requirement for the '039 patent for the same reasons that we determine that Mitsubishi does not literally infringe claim 121. Specifically, the GE Wind Turbines do not possess "an inverter controller means" or "inverter for supplying output electricity at a desired angle between real power and reactive power."

6. Enablement and Written Description

The ALJ found that the asserted claim of the '039 patent was adequately enabled and described in the specification. ID at 50-53. The Commission determined to review. Because we agree with the IA and Mitsubishi that the ID erred in declining to construe "inverter controller means" as a means-plus-function term in accordance with 35 U.S.C. § 112 ¶ 6, it is also our view that the ALJ analyzed enablement and written description under an incorrect claim construction.

Once "inverter controller means" is understood as a "means-plus-function" claim, then it is construed as possessing the corresponding structure of the specification, *i.e.*, Figures 2 and 13, and equivalents thereof. In this connection, the specification does adequately describe the claimed "inverter controller means." We therefore determine to affirm the ID's conclusion as to written description under the revised claim construction. We take no position as to enablement because the parties have not focused their arguments on the extent to which the patent document teaches a person of ordinary skill how to practice the invention. *See Beloit v. Valmet Oy*, 742 F.2d 1421 (Fed. Cir. 1984).

7. Obviousness

The parties stipulated that there were four prior art references relevant to smoothing out the current in wind turbines, *i.e.*, Arsudis, Warneke, Mohan, and Ooi. *See* Joint Submission and Stipulation Regarding Prior Art ("Prior Art Stips."), ¶ 1 (May 7, 2009). Mitsubishi argued before the ALJ that the asserted claim of the '039 invention was obvious in light of Arsudis alone or in combination with Warneke, Mohan, and Ooi. The ALJ held that the asserted claim of the '039 patent was not invalid for obviousness. The Commission determined to review this issue as part of its review of the '039 patent issues.

Mitsubishi does contest the nonobviousness of claim 121 under its proposed claim construction. The IA did not petition for review of the ALJ's finding of nonobviousness. We do not take issue with the ALJ's analysis that none of the prior art references suggest output of electricity at a desired power factor angle in response to a power factor control signal, or how to achieve this. ID at 59-61.

B. The '221 Patent

The ALJ found that Mitsubishi literally infringed the asserted claims of the '221 patent and that the asserted claims of the '221 patent were not invalid by reason of obviousness. The ALJ, however, found no violation of section 337 with respect to the '221 patent because he found that GE did not prove that it satisfies the domestic industry requirement with respect to the '221 patent. Specifically, the ALJ held that GE had failed to satisfy one of three claim limitations that he examined.

1. Claim Construction

The '221 patent teaches a wind turbine that disconnects the feed-in unit from the rotor windings when there is an electrical disturbance on the power grid in order to protect the turbine's electrical components, and then restores the connection when the disturbance ends. Claims 5, 7, and 8 remain in this investigation. Independent claim 5 recites (disputed term in italics):

> 5. A wind turbine, comprising: a rotor with at least one rotor blade, the rotor being rotatably arranged with regard to a substantially horizontal rotor axis; an induction generator whose rotor windings are coupled to the rotor and whose stator coils can be coupled to a voltage grid; a feed-in unit for feeding currents into the rotor windings; a control unit for controlling the frequency of the fed-in currents depending on the rotor rotation frequency, and an emergency unit which can be operated to *electrically decouple the feed-in unit from the rotor windings in case of variations of the grid voltage amplitude*, wherein the emergency unit comprises a release arrangement for *releasing the rotor current feed-in after decoupling, when the currents generated in the rotor windings by variation of the grid voltage amplitude triggering the decoupling are declined to a predetermined value.*

The ALJ found that the only dispute among the parties over the construction of the asserted claims covered the final, "emergency unit" element, specifically the limitation that requires decoupling the rotor when the variation in the grid voltage amplitude rises, and then

"releasing," *i.e.*, re-engaging, the rotor current feed-in after currents in the rotor-windings fall to a pre-determined value. ID at 63-64.

"predetermined value"

The ALJ construed "predetermined value" in the phrase "the emergency unit comprises a release arrangement for releasing the rotor current feed-in after decoupling, when the currents generated in the rotor windings by variation of the grid voltage amplitude triggering the decoupling are declined to a predetermined value" as not dependent solely on the value of current, holding that "[a] time constant, in the form of a specific time range, may be considered when determining that predetermined value." ID at 70. The Commission determined to review.

The ALJ explained that the predetermined value is a value at which the release referred to in the claim will not jeopardize the electrical components of the turbine. ID at 69. The ALJ noted the statement in the specification that "[b]asically, resuming the feeding of rotor current can be accomplished under consideration of a predetermined time constant." ID at 69-70 (citing '221 patent, col. 3, lines 4-6).

We agree with the IA that the ALJ erred in his construction of "a predetermined value" in light of the plain language of the claim, the specification, and expert testimony. The IA points out that the plain language of the claim makes the required release contingent on a drop in current to a predetermined value. The ALJ notes that the release occurs "when" the current drops to a predetermined value and reasons that waiting a predetermined amount of time may reach the same result of releasing "when" the current reaches a predetermined value. GE contends that it would be a mistake to require direct measurement of current, and points to the Federal Circuit decision in *Linear Tech. Corp. v. ITC*, in which the Court held that the limitation at issue in that

case, "monitoring the current to the load," could be satisfied by indirect measurement. GE Submission at 65 (discussing 566 F.3d 1049, 1059 (Fed. Cir. 2009)).

We find that the claim language "a predetermined value," according to its ordinary meaning and read in context of the entire claim and specification, is a value of current, and thus that the claim requires the wind turbine to measure current or an adequate proxy for current to determine whether the current has declined to a level previously decided upon. As explained below, the statement in the specification relied on by the ALJ must be read in context.

2. Literal Infringement

The ALJ found that the accused products ("the Mitsubishi Wind Turbine" or "MWT") literally met each limitation of the asserted claims of the '221 patent. ID at 72 (discussing claim 5); ID at 74 (discussing claims 7 and 8 which depend on claim 5).

"a predetermined value"

The ALJ construed the "predetermined value" limitation of "emergency unit" to not require direct monitoring of current. The ALJ found that in the MWT, after decoupling has occurred, the rotor current feed-in is later released when the currents generated in the rotor windings are declined to a predetermined value and that the crowbar[5] in the MWT uses [[

[5] The crowbar is a part of a turbine which may perform the function of decoupling the feed-in unit when there are voltage fluctuations on the power grid. The IA states that the Mitsubishi Wind Turbines do not release the "rotor current feed-in" when the rotor currents are declined to a predetermined level. IA Petition at 32. The IA explains that it is undisputed that, [[

]] IA Petition at 32 (citing Tr. 1450:13-20 (Toliyat); Tr. 978:8-11 (Collins)).

]] ID at 72 (citing Tr. 905 (Collins). The ALJ found that the MWT met the limitations of "emergency unit" as he had construed it. ID at 72. The Commission determined to review.

GE argues that the ALJ correctly found that the 225 ms time period used by Mitsubishi Wind Turbines acts as a proxy for determining when rotor currents have declined to a safe level. GE Submission at 67 (citing ID at 72; Tr. 878-885; 905, 909-12 (Collins); CX-262C at 7)).

The ALJ had relied on the teaching in the specification that there are two modes of protecting the circuitry: (1) waiting a predetermined amount of time before re-engaging the rotor or (2) waiting for the current to drop to a predetermined value. ID at 72 (relying, *inter alia*, on '221 patent, col. 3, lines 4-6). The ALJ noted the statement in the specification that "[b]asically, resuming the feeding of rotor current can be accomplished under consideration of a predetermined time constant." ID at 69-70 (citing '221 patent, col. 3, lines 4-6). The immediately following sentence in the specification presents the latter current-drop mode as an improvement on the former amount-of-time mode: *"In view of an increase in plant safety, it has been shown particularly expedient that when the rotor current is sensed* as a two or three-phase signal or the rectified current is sensed as a single-phase signal *and the current that was sensed drops to a predetermined value*, the feeding of the rotor current is resumed." *Ibid.*, lines 6-11 (emphasis added). Indeed, the IA states that [[

]] This is borne out by the expert testimony. Tr. 1453:10-19 (Toliyat); Tr. 978:12-22 (Collins). It is our view that [[ ]] cannot serve as an adequate proxy for current because the relationship between the two cannot be guaranteed. We determine to reverse the

ALJ's finding of literal infringement of the asserted claims of the '221 patent, including claims 7 and 8 which depend on claim 5.

3. Infringement Under the Doctrine of Equivalents

The ALJ found that the Mitsubishi Wind Turbines infringe the asserted claims of the '221 patent, as construed in the ID, under the doctrine of equivalents. ID at 73. The Commission determined to review.

"a predetermined value"

As discussed, the claim calls for release of rotor current feed-in when the current drops to a predetermined value. We agree with the IA that there is no evidence that [[ ]] achieves this in the sense that it coincides with a decline to a predetermined value of current. Indeed, the evidence is to the contrary. Tr. 1453:10-19 (Toliyat); Tr. 978:12-22 (Collins). Nor has GE established particularized proof of equivalence. *See, e.g., Malta v. Schulmerich Carillons, Inc.*, 952 F.2d 1320, 1327 n.5 (Fed. Cir. 1991); *Nestier Corp. v. Menasha Corp.-Lewisystems Div.*, 739 F.2d 1576, 1579-80 (1984); *Pennwalt Corp. v. Durand-Wayland, Inc.*, 833 F.2d 931, 934 (Fed.Cir.1987) (*en banc*), *overruled in part on other grounds by, Cardinal Chem. Co. v. Morton Int'l,* 508 U.S. 83, 113 S.Ct. 1967, 124 L.Ed.2d 1 (1993). We therefore determine that Mitsubishi does not infringe the asserted claims of the '221 patent under the doctrine of equivalents.[6] Because the accused Mitsubishi Wind Turbines do not satisfy the

[6] We do not agree with Mitsubishi that GE is estopped from asserting infringement under the doctrine of equivalents because of an argument-based prosecution history estoppel. Mitsubishi Submission at 30-31. Mitsubishi has not established that GE distinguished the Rebsdorf reference based on the indirect measurement of current. *See* Complainant General Electric Company's Motion to Amend Amended Complaint and Notice of Investigation (July 31, 2008), App. G, Amendment and Response to Final Office Action at 13 (June 7, 2007).

"predetermined value" limitation, we take no position on whether the accused Mitsubishi Wind Turbines satisfy the "grid voltage amplitude limitation." *See Beloit v. Valmet Oy*, 742 F.2d 1421 (Fed. Cir. 1984).

4. Domestic Industry

The ALJ examined whether GE's wind turbines met four limitations of claim 5 of the '221 patent in order to determine whether the turbines were made in accordance with the '221 patent claims.

"predetermined value": The releasing limitation

The ALJ found that the GE Turbines do not satisfy the releasing limitation of claim 5 either literally or through the doctrine of equivalents. ID at 78-86.[7] The ID stated that GE admits that its turbine does not monitor currents generated in the rotor windings to determine when release of rotor current feed-in should occur. ID at 78. The ALJ found that GE Turbines monitor DC bus voltage value rather than current. ID at 78-79 (citing Tr. at 346-347 (Holley)). In this connection, the ALJ found that GE Turbines do not satisfy the releasing limitation literally or under the doctrine of equivalents. ID at 83-84 (citing Tr. at 347-356). The ALJ reasoned that in order to prove that the DC bus values could satisfy the limitation [by serving as a proxy for current], GE would have to explain exactly what the DC bus voltage value is that results in crowbar deactivation, and how release in response to that DC bus voltage works. *See* ID at 84.

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[7] As a threshold matter, the ALJ rejected Mitsubishi's argument that the patentee had disavowed any equivalents in the prosecution history. ID at 79-82. The ALJ found that no disavowal was made during prosecution of the '221 patent that is relevant to the specific arguments that GE makes in this investigation concerning the "release arrangement" in its own turbines or whether they practice claim 5 under the doctrine of equivalents. ID at 80-81 (citing RX-10 at MHI4019510-11).

The ID found that "such an explanation appears nowhere in the above-quoted testimony, or in GE's brief." ID at 84.

GE submits that the ALJ failed to recognize that [[

]] GE Petition at 17-18; GE Reply Submission at 31-32. In this connection, GE argues that the GE turbines satisfy the function-way-result test for equivalents. *Id.*

Mitsubishi argues that the GE Wind Turbine does not release as soon as current drops below 1300 amps. Mitsubishi Submission at 34 (citing Tr. 1477:20-1478:18; CX-199C)). Mitsubishi points to expert testimony that there is no one-to-one correlation between DC bus voltage, relied on by the GE Wind Turbine, and current. GE Reply Submission at 58-59 (citing Tr. 1034:21-25 (Collins)).

The IA agrees with Mitsubishi. IA Submission at 18; IA Reply Submission at 13.

We find that GE has not proven that it satisfies the "releasing term," either literally or under the doctrine of equivalents, and that there is no indication that the ALJ overlooked any evidence in this regard. The ALJ credited the testimony that GE Turbines [[

]] ID at 82-86; Tr. 1469:4-12; 1473:23-1478:18 (Toliyat); Tr. 1032:21-25; 1033:17-23 (Collins)). Testimony also established that [[

]] Tr. at 994:17-995:4; 1034:12-25; 1094:21-24;

[8] [[

]] CX-286C.

1033:17-1034:25 (Collins) [[

]] Therefore, the GE Turbine release is based on DC link voltage rather than current, and GE has not established that DC link voltage is a sufficient proxy for current.

Accordingly, because GE does not practice the "predetermined value" limitation which appears in all claims of the '221 patent, GE has not satisfied the domestic industry requirement as to the '221 patent. We therefore affirm the ALJ's finding of no violation of section 337 with respect to the '221 patent.[9]

C. The '985 Patent

The '985 patent teaches a wind turbine with an uninterruptible power supply that can continue to supply power during a low voltage event on the grid. The continued operation is known as "low voltage ride through."

The ALJ held that the asserted claim 15 of the '985 patent was literally infringed by Mitsubishi's Wind Turbines, that GE satisfied the domestic industry requirement with respect to the '985 patent, that the asserted claim of the '985 patent was not invalid by reason of obviousness or failure to satisfy the best mode requirement, and that the '985 patent was not unenforceable by reason of inequitable conduct. As part of his determination on inequitable conduct, the ALJ held that Thomas Wilkins was an inventor of claim 15 of the '985 patent, that the patentee had failed to name Thomas Wilkins as an inventor, and that this failure to name

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[9] Because there is no violation of section 337 with respect to the '221 patent, we do not take a position on whether GE has satisfied the domestic industry requirement with respect to other limitations of claim 5, *i.e.*, "variation of grid voltage amplitude" and "to electrically decouple the feed-in unit from the rotor windings." *See Beloit v. Valmet Oy*, 742 F.2d 1421 (Fed. Cir. 1984).

Thomas Wilkins as an inventor was material, but that there was no inequitable conduct because Mitsubishi had not shown by clear and convincing evidence that the patentee possessed culpable intent in failing to name him. The Commission determined not to review the ALJ's finding that the patentee did not possess deceptive intent in leaving Wilkins' name off the final patent application, but the Commission determined to review the other issues, including whether Wilkins should properly have been named as an inventor, and if so, what would be the effect of failing to name Wilkins.

1. Standing

The ID concluded that GE had failed to include a proper inventor and that this was material, but that there was no proof of culpable intent and therefore there was not sufficient proof of inequitable conduct. ALJ Order No. 32, which denied a motion for summary determination of no inequitable conduct, deemed the following facts to be established:

1. The '985 patent issued on July 26, 2005 upon Application No. 10/350,452 ("the '452 application").
2. Thomas Wilkins was listed as one of six inventors when the '452 application was filed.[10]
3. GE admits that its counsel removed Thomas Wilkins from the '452 application subsequent to its filing.
4. Thomas Wilkins is not listed as an inventor on the '985 patent.

Order No. 32 at 11. The ALJ states that the above facts were not in dispute at the time that Order No. 32 issued, and they remain uncontested. ID at 115. Indeed, the evidence adduced at the hearing served only to confirm them. *Id.*

As part of his inequitable conduct determination, the ALJ held that the identity of the

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[10] *See* Complaint, Ex. D at GE001610.

inventors is material to the prosecution of a patent. ID at 115-16 (citing *Board of Educ. v. American Bioscience, Inc.*, 333 F.3d 1330, 1344 (Fed. Cir. 2003) (footnote omitted)). The ALJ further found that Mitsubishi had shown by clear and convincing evidence that Wilkins is an inventor of the subject matter of claim 15 of the '985 patent, and thus the absence of Wilkins' name as an inventor on the final patent application is material for the purposes of determining inequitable conduct. ID at 116. The ALJ found that Wilkins conceived of an uninterruptible power supply to meet low voltage ride through requirements and invented a capacitor for this purpose. ID at 116-119 (citing, *inter alia*, Tr. at 2211-24). The Commission determined not to review the ALJ's finding that GE lacked deceptive intent in leaving Wilkins off the final patent application, and therefore the Commission has in effect determined that there is no inequitable conduct. Nevertheless, the ALJ's finding that Wilkins was a proper inventor of claim 15 of the '985 patent (which the ALJ reached as part of the materiality prong of his inequitable conduct determinations) remains an issue.

Mitsubishi argues that the ALJ is correct that GE failed to name Wilkins as an inventor, and that as a result GE lacked standing to assert the '985 patent in this investigation. Mitsubishi submits that the testimony of Mr. Lutze, the technical head of an engineering group in Germany who worked closely with Mr. Wilkins, the testimony of Mr. Fogarty, the GE employee who drafted the invention disclosure letter that underlies the '985 patent, and Mr. Wilkins' work during and after the Lake Benton II project[11] are sufficient to corroborate his inventorship.

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[11] The Lake Benton II project was an engineering project in which the Enron Wind companies (*i.e.*, Enron Wind Systems, Inc., its subsidiaries, partners, and successors) were developing their wind turbine technology, specifically its uninterruptible power supply technology, in May 2000. *See* RX-354C; ID at 112, 116; Complaint, App. D. The turbine project

Mitsubishi Reply Submission at 71-73, including n.53 (citing JX-10, 46:4-8, 46:12-48:4, 48:19-49:3, 51:2-12; Tr. 2007:21-24; 2012:3-25 (Fogarty). Mitsubishi argues that GE has the burden to establish standing and that GE's claims related to the '985 patent must be dismissed because GE cannot establish sole ownership. *Id.* at 39 (citing *Bd. of Trustees of Leland Stanford Jr. Univ. v. Roche Molecular Sys.*, -- F.3d -- , 2009 WL 3110809, at *13 (Fed. Cir. Sept. 30, 2009)).

GE argues that Wilkins is not an inventor and merely briefed the team on the prior art. GE Submission at 98-101. GE argues that even if the ALJ's inventorship determination stands, GE nonetheless has standing to assert the '985 patent because it had legal title at the time of filing of the complaint. *Id.* at 79-80 (citing 35 U.S.C. § 152; 37 C.F.R. §§ 3.73(a), 3.91(a); *Arachnid, Inc. v. Merit Indus., Inc.*, 939 F.2d 1574, 1578-79 (Fed. Cir. 1991)). GE argues that (1) the Commission unlike a district court cannot correct inventorship under 35 U.S.C. § 256; (2) inventorship and ownership of patent rights are related but different; and (3) GE had sole ownership of rights to the '985 patent at the time of filing the complaint. *Id.* at 80-87. GE asserts that the Federal Circuit has instructed district courts to allow patentees to correct inventorship or to invalidate patents for lack of proper inventorship, and GE states that this would be impossible if courts had to dismiss for lack of standing. GE Submission at 85 (discussing *Pannu v. Iolab Corp.*, 155 F.3d 1344, 1350-51 (Fed. Cir. 1998)). GE further argues that it was Mitsubishi's burden to prove that Wilkins lacked an obligation to assign his invention rights to his employer, and that while there was no actual written obligation produced before the ALJ, GE could have proferred testimony that others believed Wilkins had a duty to assign any

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was later acquired by GE. *See id.*

ownership interests. *Id.* at 91-94.

The IA points out that even though the plaintiff facially had legal title at the beginning of the *Ethicon* suit, the Federal Circuit affirmed the dismissal for lack of standing for failure to name an inventor. IA Reply Submission at 16 (citing *Ethicon, Inc. v. U.S. Surgical Corp.*, 135 F.3d 1456, 1458 (Fed. Cir. 1998)). The IA also argues that even where the court does not change the ownership of the patent, it may still dismiss for lack of standing for failure to name an inventor. *Id.* at 16-17 (citing *Roche*, 2009 WL 330809 at *4)).

Analysis

Mitsubishi argues that GE lacks standing to assert the '985 patent because it did not name Wilkins as an inventor. The controlling rule pursuant to 19 C.F.R. § 210.12(a)(iii)(7) ("For every intellectual property based complaint..., include a showing that at least one complainant is the owner or exclusive licensee of the subject intellectual property....") and the caselaw is that a party may file a complaint in a patent-based case only if it has joined all owners as plaintiffs. *See Ethicon, Inc. v. U.S. Surgical Corp.*, 135 F.3d 1456, 1458 (Fed. Cir. 1998) ("One more settled principle governs this case, however. An action for infringement must join as plaintiffs all co-owners."); *see also* CHISUM ON PATENTS § 21.03[2][f].

GE is named on the face of the patent as the assignee and therefore possesses legal title as an owner. *Arachnid, Inc. v. Merit Indus., Inc.*, 939 F.2d 1574, 1578 n.2 (Fed. Cir. 1991) ("The entity to whom the grant of the patent is made by the PTO [or that entity's successor in title] holds the 'legal title' to the patents.") (citing G. Curtis, A TREATISE ON THE LAW OF PATENTS § 168 (4th ed. 1873)). The issue before us, however, is whether Wilkins is also properly characterized as an owner. If so, and only if so, GE lacks standing to assert the '985 patent.

The Commission finds that Wilkins is an unnamed inventor of claim 15 of the '985 patent,[12] that GE has not provided any showing to the effect that Wilkins had an obligation to assign the patent to GE, and that GE has not joined Wilkins as a party to this investigation. Nevertheless, it is undisputed that Wilkins is not named on the face of the patent, and we find that Wilkins therefore lacks such legal title as to make him an owner of the '985 patent. As an inventor, Wilkins does have an equitable interest that can be perfected to legal title upon application to the USPTO, or through correction by a district court under 35 U.S.C. § 256. The Commission, however, lacks the authority to correct inventorship under Section 256 or any other statutory provision, and the Commission's authority in this regard must be conferred by statute. Moreover, Mitsubishi cannot properly assert an equitable interest on behalf of Wilkins. *See Dorr-Oliver v. United States*, 432 F.2d 447, 451 (Ct. Cl. 1970); *Mercantile National Bank of Chicago v. Howmet Corp.*, 524 F.2d 1031, 1034 (7th Cir. 1975); *Bd. of Trustees of Leland Stanford Jr. Univ. v. Roche Molecular Sys.*, 583 F.3d 832, 848 (Fed. Cir. 2009).

Mitsubishi and the IA have relied upon two cases, *Ethicon, Inc. v. U.S. Surgical Corp.*, 135 F.3d 1456, 1458 (Fed. Cir. 1998), and *Roche Molecular Sys.*, 583 F.3d at 841-42, 848-49 (Fed. Cir. 2009), in support of their argument that GE lacks standing. *Ethicon* is distinguishable because the court corrected inventorship pursuant to Section 256 prior to dismissing the complaint for failure to properly join all owners. *Ethicon*, 135 F.3d at 1459-60. Similarly, in

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[12] The ALJ's finding that GE failed to name Wilkins as an inventor is corroborated by the Lake Benton II report and by Lutze and Fogarty regarding contributions during and after Lake Benton II in conceiving of the claimed uninterruptible power supply. JX-10 at 218-220; RX-354C at GEWT00163510; Tr. 2007:21-24; 2012:3-25 (Fogarty); Tr. 2206-07, 2226-35 (Wilkins).

Roche, Stanford had failed to join an inventor named on the face of the patent – who was therefore an owner – and could not prove that Stanford had received an assignment from that person. *Roche*, 583 F.3d at 841-42, 848-49.

We therefore find that GE possesses standing to assert the '985 patent, and we proceed to analyze the issues related to that patent.[13]

2. Domestic Industry

a. Claim Construction

The '985 patent teaches a wind turbine with an uninterruptible power supply that can continue to supply power during a low voltage event on the grid. The continued operation is known as "low voltage ride through." Claim 15 recites (disputed terms in italics):

> 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.

The ALJ construed "uninterruptible power supply" as not limited to a power storage

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[13] As to Mitsubishi's defense that claim 15 of the '985 patent is invalid by reason of 35 U.S.C. § 102(f), we agree with the IA that the Commission may not invalidate a patent claim *sua sponte, i.e.*, where invalidity has not been asserted by the respondent as a defense to infringement of a properly asserted claim. *See generally, Lannom Mfg. Co. v. United States Int'l Trade Comm'n*, 799 F.2d 1572, (Fed.Cir.1986). We have considered requesting further briefing from the parties as to whether the defense of 35 U.S.C. § 102(f) was sufficiently pleaded and maintained as a defense. Because we have determined that GE lacks a domestic industry in the '985 patent, however, we will not delay completion of the investigation in order to take further briefing on that issue. *See Beloit Corp. v. Valmet Oy*, 742 F.2d 1421, 1423 (Fed. Cir. 1984) (Commission may decide not to take a position on an issue where it finds another issue to be dispositive with respect to a finding that there is no violation).

system. ID at 97. The ALJ held that the term "shunt current from the inverter and generator rotor" cannot require a crowbar (or other shunting circuit) between the rotor and the rotor-side converter. ID at 98-99.

"shunt current from the inverter and generator rotor"

The ALJ held that the limitation "shunt current from the inverter and generator rotor" cannot require a crowbar (or other shunting circuit) between the rotor and the rotor-side converter. ID at 98-99. The ALJ notes that claim 15 expressly provides for "a circuit coupled with the input of the inverter and with the converter controller," and also that the circuit is "to shunt current from the inverter and generator rotor." ID at 98. In this connection, the ALJ concluded that as far as the location of the circuit is concerned, it must be coupled with the input of the inverter and the converter controller. *Id.* The ALJ also concluded that current must be shunted "from the inverter and generator rotor." *Id.* The ALJ held that "shunt current from the inverter and generator rotor" is not limited to the example in the specification which utilizes a crowbar (or other shunting circuit) between the rotor and the rotor-side converter. ID at 99 (discussing '985 patent, col. 4, lines 44-58). The Commission determined to review.

Mitsubishi argues that the circuit cannot be located within an inverter itself. Mitsubishi Petition at 58. Mitsubishi provides the example that a circuit within the inverter that allows harmful currents coming from the rotor to enter the inverter would fail to meet what the ID found as [[

]] *Id.* at 58-59 (discussing ID at 103-04.) Mitsubishi responds to GE's argument, based on *Linear Tech. Corp. v. Int'l Trade Comm'n*, 566 F.3d at 1055, that a component of a device can satisfy multiple claim limitations.

Mitsubishi argues that *Linear* is inapposite because the specification in that case "expressly disclose[d]" that two limitations could "share common components," *Linear Tech*, 566 F.3d at 1055. *Id.* at 59-60.

GE argues that the ALJ properly rejected respondents' argument that claim 15 requires a specific location for the shunt. GE Response at 71. GE states that the ALJ noted that [[

]] *Id.* at 72-73 (discussing ID 103-104; '985 patent, col. 4, lines 14-18). GE further argues that respondents' proposed construction of the "shunting" limitation ignores the common-sense understanding of the preferred embodiment by requiring the inverter to remain on during the operation of the crowbar. *Id.* at 73-74 (citing Tr. at 602:4-603:4 (Kirtley); 1605:7-1606:2 (Toliyat)).

GE argues that Mitsubishi's claim construction improperly imports two limitations into the claim: (1) that current must be prevented from reaching the inverter, not just shunted and (2) that the claimed inverter can only be the rotor-side inverter. GE Reply Submission at 25.

The IA argues that the "inverter" can only correspond to the rotor-side converter and the shunt circuit cannot be located inside the inverter. IA Submission at 21-22 (citing Tr. 561:24-562:12; 755:23-757:25; 759:3-760:16 (Kirtley); Tr. 1332:21-1334:17; 1349:2-22; 1831:12-16; 1832:11-1833:1 (Toliyat); '985 patent, col. 4, lines 50-58, Figure 4; col. 5, lines 9-11).

The express terms of the claims require shunting "from" the inverter. The shunt circuit cannot be within the inverter and still shunt current "from" the inverter. We therefore determine to construe the term "shunt current from the inverter and generator rotor" to mean that the shunt

circuit is not located within the inverter.

b. Practice of Claim 15 Literally or Under the Doctrine of Equivalents

The ALJ concluded that although the parties have disputed whether the rotor-side or grid-side inverter, or both, should be protected, both are protected in the GE Turbine. ID at 107 (citing Tr. 622-623 (Kirtley); Tr. 1618 (Toliyat); Tr. 938-939 (Collins)). In this connection, the ALJ found that the GE Turbine literally practices claim 15 of the '985 patent. *Id.* The ALJ further found that the GE Turbines practice this limitation of claim 15 under the doctrine of equivalents inasmuch as the GE Turbine does not differ substantially from the express limitations of the claim. ID at 107. The Commission determined to review.

GE argues that the claimed inverter of the '985 patent can be either a rotor-side inverter or a grid-side inverter, based on the literal meaning of "inverter," and because there are two inverters shown in Figure 2 of the '985 patent. GE Submission at 26.

Mitsubishi argues that the grid-side converter cannot literally satisfy the inverter requirement because the specification of the '985 patent describes the rotor-side converter as being coupled with the generator, not the grid-side inverter. Mitsubishi Reply Submission at 26-27 (citing col. 4, lines 50-52). Mitsubishi submits that the switches in GE's rotor-side converter act in a substantially different way than the circuit recited in claim 15 because in GE's device, converter switches remain exposed to rotor currents even when the shunt is active. Mitsubishi Submission at 28 (citing Tr. 765:6-20; 774:9-16 (Kirtley); 1429:6-21, 1640:4-15; 1641:14-18; 1642:15-22; 1429:6-21 (Toliyat)). Mitsubishi disagrees with GE's argument that the switches inside its rotor-side converter can count as both part of the inverter and as the shunt circuit. Mitsubishi Reply Submission at 24. Mitsubishi explains that in *Dolly*, the Federal Circuit

approved of combining two unrelated claim elements for purposes of equivalency, but stated that a "court cannot convert a multi-limitation claim to one of [fewer] limitations to support a finding of equivalency." *Id.* at 23-24 (citing *Dolly, Inc. v. Spalding & Evenflo Cos.*, 16 F.3d 396, 399-400 (Fed. Cir. 1994)).

Mitsubishi further argues that GE failed to present particularized testimony and linking arguments for each element to support a finding of infringement under the doctrine of equivalents. Mitsubishi Submission at 10 (citing, *inter alia*, *Tex. Instruments Inc. v. Cypress Semiconductor Corp.*, 90 F.3d 1558, 1566-67 (Fed. Cir. 1996); *Malta v. Schulmerich Carillons, Inc.*, 952 F.2d 1320, 1327 n.5 (Fed. Cir. 1991)). Mitsubishi points out that GE relies on cross-examination of Mitsubishi's expert witness to prove equivalence rather than proferring its own expert witness. *Id.* at 21. Mitsubishi asserts that the Federal Circuit has expressed skepticism regarding a patentee's attempt to build an equivalence case solely on cross-examination of a defendant's witness. *Id.* (citing *Lear Siegler, Inc. v. Sealy Mattress Co.*873 F.2d at 1426-27).[14]

The IA argues that the GE 1.5MW Wind Turbine does not satisfy the shunt limitation because it utilizes the very structure that is supposed to be avoided to handle the excess current by allowing it to flow through the components of the wind turbine. IA Submission at 13 (Tr. at 1396:3-15; 1428:9-1429:21; 1635:1-3 (Toliyat)).

Analysis

Claim 15 calls for a shunt circuit that shunts current from the inverter. GE's shunt circuit

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[14] Mitsubishi also argues that GE has waived assertion of infringement under the doctrine of equivalents. Mitsubishi Reply Submission at 28-29. We disagree. *See* GE Pre-Hearing Br. At 124; GE Post-Hearing Br. at 33.

does not shunt current from the inverter because it is within the inverter. Thus GE does not literally satisfy the requirement of shunting current away from the inverter.

GE relies on the cross-examination of Mitsubishi's expert Dr. Toliyat, Tr. at 1397:10-18, and on a snippet of testimony from its own expert, Dr. Kirtley, Tr. at 618:7-17, for the proposition that the accused component satisfies the function/way/result test for equivalence. We find this evidence to lack the particularized proof on a limitation-by-limitation basis required by *Malta v. Schulmerich Carillons, Inc.*, 952 F.2d 1320, 1327 n.5 (Fed. Cir. 1991); *Nestier Corp. v. Menasha Corp.-Lewisystems Div.*, 739 F.2d 1576, 1579-80 (1984); *Pennwalt Corp. v. Durand-Wayland, Inc.*, 833 F.2d 931, 934 (Fed.Cir.1987) (*en banc*), *overruled in part on other grounds by, Cardinal Chem. Co. v. Morton Int'l,* 508 U.S. 83, 113 S.Ct. 1967, 124 L.Ed.2d 1 (1993).

GE has not demonstrated that its product achieves the function of shunting current away from the inverter. *See, e.g., Dolly, Inc. v. Spalding & Evenflo Cos.*, 16 F.3d 396, 400 (Fed. Cir. 1994) ("A stable rigid frame assembled from the seat and back panels is not the equivalent of a separate stable rigid frame which the claim language specifically limits to structures exclusive of seat and back panels."). Moreover, although there is testimony that the switches inside the GE inverter short the circuit, this is a different way of shorting the circuit, and there is no testimony that the difference is insubstantial. The purpose of the shunt is to protect the inverter from high currents. The record shows that the very switches and components that the '985 patent seeks to protect are being subjected to high current in the GE turbines. Tr. 1428:4-1429:21 [[

]] *see also* Tr. 1398:8-11; 1399:7-13; (Toliyat)); IA Submission at 14. The Commission therefore determines that GE does not practice the '985 patent and does not satisfy the domestic industry requirement with respect thereto.

Thus, the Commission finds that there is no violation of section 337 with respect to the '985 patent, and takes no position on other disputed issues raised with respect to the '985 patent. *See Beloit v. Valmet Oy*, 742 F.2d 1421 (Fed. Cir. 1984).

VII. CONCLUSION

In our view, there is no infringement of the '039 and '221 patents, and GE failed to establish the existence of a domestic industry with respect to the '985 patent. For the foregoing reasons, we determine to reverse the ALJ's finding of violation of section 337 with respect to the asserted claims of the '039 and '985 patents and affirm the ALJ's finding of no violation with respect to the asserted claims of the '221 patent.

By order of the Commission.

Marilyn R. Abbott
Secretary to the Commission

Issued: MAR 0 2 2010

CERTAIN VARIABLE SPEED WIND TURBINES AND COMPONENTS THEREOF **337-TA-641**

CERTIFICATE OF SERVICE

I, Marilyn R. Abbott, hereby certify that the attached **COMMISSION OPINION** has been served by hand upon the Commission Investigative Attorney Erin D. Joffre, Esq., and the following parties as indicated, on MAR 0 2 2010.

Marilyn R. Abbott, Secretary
U.S. International Trade Commission
500 E Street, SW
Washington, DC 20436

On Behalf of Complainant General Electric Company:

V. James Adduci, II, Esq.
ADDUCI, MASTRIANI & SCHAUMBERG LLP
1200 Seventeenth Street, NW – 5th Floor
Washington, DC 20036

( ) Via Hand Delivery
(✓) Via Overnight Mail
( ) Via First Class Mail
( ) Other: _____

On Behalf of Respondents Mitsubishi Heavy Industries, Ltd.; Mitsubishi Heavy Industries America, Inc.; and, Mitsubishi Power Systems America, Inc.:

Thomas W. Winland, Esq.
FINNEGAN HENDERSON FARABOW GARRETT & DUNNER, LLP
901 New York Avenue, NW
Washington, DC 20001

( ) Via Hand Delivery
(✓) Via Overnight Mail
( ) Via First Class Mail
( ) Other: _____

PUBLIC:

Heather Hall
LEXIS-NEXIS
9443 Springboro Pike
Dayton, OH 45342

( ) Via Hand Delivery
(✓) Via Overnight Mail
( ) Via First Class Mail
( ) Other: _____

Kenneth Clair
THOMAS WEST
1100 Thirteenth Street NW –Suite 200
Washington, DC 20005

( ) Via Hand Delivery
(✓) Via Overnight Mail
( ) Via First Class Mail
( ) Other: _____

PUBLIC VERSION

UNITED STATES INTERNATIONAL TRADE COMMISSION
Washington, D.C.

In the Matter of **CERTAIN VARIABLE SPEED WIND TURBINES AND COMPONENTS THEREOF**	**Inv. No. 337-TA-641**

INITIAL DETERMINATION
Administrative Law Judge Carl C. Charneski

Pursuant to the notice of investigation, 73 Fed. Reg. 16910 (2008), this is the Initial Determination in the matter of *Certain Variable Speed Wind Turbines and Components Thereof*, United States International Trade Commission Investigation No. 337-TA-641. *See* 19 C.F.R. § 210.42(a).

It is held that a violation of section 337 of the Tariff Act of 1930, as amended, 19 U.S.C. § 1337, has occurred in the importation into the United States, the sale for importation, or the sale within the United States after importation of certain variable speed wind turbines or components thereof by reason of infringement of one or more of claim 121 of United States Patent No. 5,083,039 and claim 15 of United States Patent No. 6,921,985. It is further held that a violation of section 337 has not occurred by reason of infringement of claims 5, 7, and 8 of United States Patent No. 7,321,221.

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The following abbreviations may be used in this Initial Determination:

ALJ - Administrative Law Judge

ALJX - Administrative Law Judge Exhibit

CDX - Complainant's Demonstrative Exhibit

CPX - Complainant's Physical Exhibit

CX - Complainant's Exhibit

Dep. - Deposition

EDIS - Electronic Document Imaging System

FF - Finding(s) of Fact

JPX - Joint Physical Exhibit

JX - Joint Exhibit

PCL - Proposed Conclusion of Law (CPCL, RPCL or SPCL)

PFF - Proposed FF (CPFF, RPFF or SPFF)

PRF - Proposed Reply or Rebuttal Finding (CPRF, RPRF or SPRF)

RDX - Respondents' Demonstrative Exhibit

RPX - Respondents' Physical Exhibit

RX - Respondents' Exhibit

SX - Commission Investigative Staff Exhibit

Tr. - Transcript.

I. Background

A. Institution and Procedural History of This Investigation

By publication of a notice in the *Federal Register* on March 31, 2008, this investigation was instituted pursuant to subsection (b) of section 337 of the Tariff Act of 1930, as amended, 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 variable speed wind turbines and components thereof that infringe one or more of claims 104 and 121-125 of U.S. Patent No. 5,083,039 and claims 1-12, 15-18, and 21-28 of U.S. Patent No. 6,921,985, and whether an industry in the United States exists as required by subsection (a)(2) of section 337.

73 Fed. Reg. 16910 (2008).

The notice of investigation named as the complainant General Electric Company ("GE") of Fairfield, Connecticut. *Id.* The following companies were named as the respondents: Mitsubishi Heavy Industries, Ltd. ("MHI") of Tokyo, Japan; Mitsubishi Heavy Industries America, Inc. ("MHIA") of New York, New York; and Mitsubishi Power Systems, Inc. ("MPSA") of Lake Mary, Florida (collectively, "Mitsubishi" or "Mitsubishi respondents"). *Id.* The Commission Investigative Staff ("Staff") of the Commission's Office of Unfair Import Investigations is also a party in this investigation. *Id.*

Order No. 10 is an unreviewed initial determination granting GE's motion to amend its complaint and the notice of investigation to add claims 1-19 of United States Patent No. 7,321,221 to this investigation. *See* Notice of Commission Decision Not to Review an Initial Determination Granting Complainant's Motion to Amend the Complaint and Notice of

Investigation and Extending the Target Date (Oct. 8, 2009).

Order No. 30 is an unreviewed initial determination granting GE's amended motion for summary determination on the economic prong of the domestic industry requirement with respect to all three asserted patents. *See* Notice of Commission Decision Not to Review an Initial Determination Granting GE's Amended Motion for Summary Determination That the Economic Prong of the Domestic Industry Requirement Has Been Satisfied (Apr. 21, 2009).[1]

The evidentiary hearing in this investigation commenced on May 11, 2009. At the commencement of the hearing, it was established that GE had narrowed the number of asserted claims to claim 121 of U.S. Patent No. 5,083,039 ("the '039 patent"); claims 5, 7, and 8 of U.S. Patent No. 7,321,221 ("the '221 patent"); and claim 15 of U.S. Patent No. 6,921,985 ("the '985 patent"). *See* Tr. 155.

The parties have filed post-hearing briefs, reply briefs, and proposed findings. The issues are ripe for determination.

B. The Patents and Products at Issue

1. Technological Background

All three asserted patents involve wind turbines used to generate electricity. Electricity is

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[1] The notice of investigation (73 Fed. Reg. 16910 (2008)) provides that a determination must be made as to whether an industry in the United States exists, as required by 19 U.S.C. § 1337(a)(2). The domestic industry requirement consists of both an economic prong (*i.e.*, there must be an industry in the United States) and a technical prong (*i.e.*, that industry must relate to articles protected by the intellectual property at issue). *See Certain Ammonium Octamolybdate Isomers,* Inv. No. 337-TA-477, Comm'n Op. at 55, USITC Pub. 3668 (Jan. 2004). The complainant bears the burden of proving the existence of a domestic industry. *Certain Methods of Making Carbonated Candy Products,* Inv. No. 337-TA-292, Comm'n Op. at 34-35, USITC Pub. 2390 (June 1991). In any investigation, the domestic industry requirement must be satisfied as to each asserted patent. *See* 19 U.S.C. § 1337(a)(2).

supplied to utilities from many sources, including power plants that use fossil fuel, nuclear fuel, or water to turn generators, as well as wind turbines (sometimes called windmills). Wind turbines are often located on wind farms and they use the wind to turn their generators. Electrical energy produced by all of these sources is transmitted along power lines that are part of a system called a grid. Collins (Tutorial) Tr. 10, 36-37.

Electricity is transmitted at a certain voltage. Voltage is the potential difference between two points. Voltage has been described, by way of analogy, to the pressure that is placed on water a in garden hose; when one squeezes the trigger on the nozzle at the end of a hose, water flows out of the nozzle when the water pressure at the nozzle is less than the water pressure in the hose. Collins (Tutorial) Tr. 11-12.

The voltage of electrical energy arriving from the source is usually stepped up for transmission along the grid. Later, at substations along the grid, the voltage is stepped down to a level that is safe for distribution to, and use by, loads which consume power (including homes, factories and office buildings). Collins (Tutorial) Tr. 10-12; Toliyat (Tutorial) Tr. 81.

Electricity is transmitted on the grid in the form of alternating current, or "AC," which means that the voltage and the flow of current alternate with time. The voltage, or current, is sometimes said to flow back and forth, *i.e.,* to push and pull. By contrast, the current used within battery-powered devices is direct current, or "DC." DC flows in one direction. Collins (Tutorial) Tr. 14-15. Current, which is represented by the letter "I," is measured in amperes, often referred to as "amps." Collins (Tutorial) Tr. 12-13. "Resistance" is opposition to the flow of an electrical charge. Collins (Tutorial) Tr. 13.

In the United States, electricity is supplied at a rate of 60 cycles (*i.e.,* changes in voltage)

per second. Thus, electricity is said to be supplied at 60 hertz. The cycles, or oscillations of voltage and current, may be represented in the form of waves, specifically, mathematical sine, or sinusoidal, waves that flow up and down in an alternating pattern. Collins (Tutorial) Tr. 15-20; Habetler (Tutorial) Tr. 77.

If voltage pushes and electrical current flows at the same time (*i.e.,* as voltage increases so does current), all of the power flowing in the electrical power system is said to be "real power" (denoted by the letter "P"). This real power can be put to useful work by a consumer, and may be measured in terms of watts.[2]

However, the timing (or phases) of the voltage and the current can differ.[3] The difference in phases is expressed in terms of a "power factor angle." Thus, at a phase angle of 90 degrees, there is such a delay between the voltage and the current that one does not have any "real power," but only "reactive power" (denoted by the letter "Q"). In that situation, power is not available for useful work, and cannot be measured in watts. Instead, the power is measured in "VARs" (which stands for "volt ampere reactive"). Reactive power has some uses (*e.g.,* it can be used in certain situations to increase voltage), and is sometimes supplied to the grid. It is often the case that a shift at less than a 90 degree angle is present in an electrical system, such that both real and

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[2] The output of the wind turbines at issue in this investigation are measured in megawatts (MW). *See* Habetler (Tutorial) Tr. 63-64; Joint Submission and Stipulations, ¶¶ 4, 5, 7, 8, 10, 11 and 12 (May 7, 2009) ("Stips.").

[3] If the voltage decreases, but the current does not decrease until later, the current is called a "lagging current." The current is said to lag the voltage in phase. However, if the current is ahead of the voltage, there is a "leading current." Collins (Tutorial) Tr. 26-27.

reactive power are present at the same time.[4] Collins (Tutorial) Tr. 20-29, 32-33, 39-40.

Due to the fact that AC voltage oscillates, power systems typically do not supply power as single-phase, which could be represented as a single sine wave. Rather, in order to supply constant power, power systems usually combine three sources of voltage (or pumps) so that at any given time, the voltages are at different stages of oscillation (which may be represented by three evenly offset sine waves). Such a system is said to be a three-phase system and the delay in oscillations that appears when comparing one wave to another is called a phase shift. Collins (Tutorial) Tr. 18-20; Toliyat (Tutorial) Tr. 87-88.

Despite the fact that the loads drawing on the grid do not remain constant, the electricity supply on the grid is managed to provide steady, constant power. Collins (Tutorial) Tr. 34-35, 40; Habetler (Tutorial) Tr. 85-87. Indeed, most generators that provide power for the grid (such as coal-burning or nuclear power plants) are able to provide a consistent output to the grid because the amount of fuel used to produce electricity can be regulated. However, one cannot regulate the wind. Thus one cannot control when wind turbines or wind farms will supply power, and when they will not. The variability of output from wind turbines, however, has not presented a major problem for grid stability because wind energy has supplied only a small amount of power in comparison to the amount of power derived from conventional sources. Yet, as the use of wind turbines increases, so do the challenges presented by connecting wind turbines to the grid. Collins (Tutorial) Tr. 11-12, 36-40.

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[4] Sometimes, instead of referring to the phase angle, one may refer to a power factor in which 1 represents 100 percent real power; 0 represents no power available for useful work (equivalent to a 90 degree angle); and .5 indicates that 50 percent of the power being transmitted is available for useful work. Collins (Tutorial) Tr. 29-32.

In addition, there is also a question of the frequency (or hertz) of the electric output from the wind turbine when there is insufficient wind to generate electricity. This is because, in basic terms, electricity is generated by rotating a magnet through coils of wire, with the rotation speed of the magnet determining the hertz of the generator output. In conventional power systems, a so-called "synchronous" generator is used, which converts mechanical energy into electrical energy. A synchronous generator can be operated only at the speed required for a 60 hertz output.

Modern wind turbines, however, are not so limited. They are called "variable speed wind turbines" because, unlike a synchronous generator, they generate electricity as the blades turn at various speeds, depending upon the amount of wind that is available.[5] Variable speed wind turbines use a type of induction generator that is sometimes called an "asynchronous" generator. In an asynchronous generator, the rotation speed of the magnet determines the frequency of the output and it varies with wind speed. Collins (Tutorial) Tr. 38-40, 58.

Thus, if one were using a generator whose output would differ in hertz depending on the rotation of the wind turbine blades, then use of a "power converter" would be required to ensure that any power generated by the wind turbines is supplied to the grid at 60 hertz.[6] Power

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[5] The older, fixed-speed wind turbines could only operate at a single speed (with about a 1 to 2 percent variation), and in that way they provided power at the desired frequency, *e.g,* 60 hertz. They were prone, among other things, to mechanical stress in the gearbox and other components due to wind gusts. Collins (Tutorial) Tr. 40.

[6] The configuration of such a generator is sometimes called a "squirrel cage" because, in a manner reminiscent of a squirrel cage (or spinning wheel), there is a fairly direct, mechanical correlation (through a gearbox) between the wind turbine blades and the spinning (*i.e.,* the rotating) part of the generator. Further, with a squirrel cage generator, there is no power connection to the generator's rotor, only to the stationary part of the generator. All of the power,

(continued...)

converters may include capacitors,[7] diodes,[8] switches and other components and circuitry. They may be located in the body of the wind turbine (such as in the tower base), or they may be external to the turbine.[9]

A common design uses a power converter as an intermediary between a wind turbine and the power grid. Such a power converter typically converts the wind turbine output from AC to DC current, then (with the assistance of a capacitor) smooths the DC current out to the constant frequency required by the grid, and finally (through a component called an "inverter") coverts the output back to AC as required by the grid. Collins (Tutorial) Tr. 38-44, 50.

Another way to address the frequency problem caused by the variable speed of a modern turbine is to use a generator that adjusts its own internal magnetic field so as to influence the output at the "stator" (*i.e.,* at the stationary part of the rotor system). With such a generator, the output of the stator is synchronized with the frequency of the grid. Thus, the stator output can be connected directly to the grid. This type of generator is called a "doubly-fed induction generator" or "DFIG." Collins (Tutorial) Tr. 44-45; Habetler Tr. 68.

A DFIG takes some energy from the grid, which goes through a power converter, and

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[6](...continued)
therefore, must flow through the power converter to reach the grid. Thus, the converter is called a "fully rated" converter because it handles all of the current from the generator. *See* Habetler (Tutorial) Tr. 67.

[7] A capacitor can store energy in an electric field. Toliyat (Tutorial) Tr. 94.

[8] A diode is a unidirectional switch, *i.e.,* it lets current flow in only one direction. Toliyat (Tutorial) Tr. 92-93.

[9] The power converters may actually consist of two converters, *i.e.,* a generator (or rotor) side converter and a grid side converter. *See* Collins (Tutorial) Tr. 44, 47-51; Habetler (Tutorial) Tr. 69-70, 72-73.

then connects to the generator's rotor in order to create a magnetic field.[10] The rotation of the rotor (which is driven by wind turbine blades connected through a gearbox covered by the "nacelle") combines with the magnetic field (which is created with the assistance of the power converter), resulting in a 60 hertz output at the stator.[11] Inasmuch as wind speed is subject to change, a DFIG's converter (specifically, the generator-side converter) must be ready to make variable adjustments to the current supplied to the rotor in order to assure a total of 60 hertz at the output. Collins (Tutorial) Tr. 45-47.

In addition to the challenges presented by the instability of the wind for connecting wind turbines to the grid, sometimes an event on the grid itself presents a problem for the electrical components associated with a wind turbine. Problems on the grid might have the potential to create an overcurrent or overvoltage in the turbine. For example, although a lightning strike is a rare grid event, when it does occur, it might cause a power line to break, resulting in a low voltage event on the grid. The grid usually reacts quickly to compensate for such occurrences (*e.g.,* by the use of circuit breakers near the event). Nevertheless, there may be short periods of time when wind turbines connected to the grid could be affected. Collins (Tutorial) Tr. 53-54.

One common concern during a low voltage event is that as voltage drops on the grid, high

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[10] In a DFIG, the current is fed to rotor windings. The rotor itself does not closely resemble a spinning wheel, and thus a DFIG is not called a squirrel cage generator. *See* Habetler (Tutorial) Tr. 67-71.

[11] In a DFIG, there are two points of connection through which power flows to the grid. Most of the power flows from the stationary part of the generator to the grid; and some of the power flows out of the rotor, through a power converter, and back to the grid. Thus, in contrast to the converter used with a squirrel cage generator, the power converter used for a DFIG does not handle all of the current from the generator. Consequently, the DFIG's power converter is a partial-power converter. Such a converter is referred to as "partially rated." *See* Collins (Tutorial) Tr. 45; Habetler (Tutorial) Tr. 68, 74-75.

current can develop in the rotor. Because current tends to travel from areas of high pressure (or voltage) to low pressure, a large current can then flow out of the rotor and into the power converter. Such a current could cause damage to some of the power converter components.[12] Therefore, various devices have been developed to clamp, or divert, energy coming from the rotor or from the grid in order to prevent damage to a power converter. One such device is a circuit called a "crowbar," with reference to the effect that it has on the flow of energy. *See* Collins (Tutorial) Tr. 56-57; Toliyat (Tutorial) Tr. 87-89.

Also, modern wind turbines are designed to "ride through" grid events, including drops in grid voltage (which may last for less than a second, or for up to a few seconds), *i.e.,* they are designed so that they will continue to operate and remain connected to the grid.[13] This is particularly important in areas in which wind turbines are significant suppliers of electricity. Accordingly, some utility operators have begun to hold wind energy generators to the high standards applied to conventional generators with respect to riding through grid events. For example, German utilities have developed wind turbine standards called "E.ON" that cover low voltage ride-throughs. Collins (Tutorial) Tr. 59-60; Collins Tr. 2311 (spelling of acronym).

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[12] The high current could reach at least as far as the DC bus within the converter. *See* Collins (Tutorial) Tr. 56-57; GE Tutorial Exs. at 26 (filed with the Comm'n Sec'y on April 30, 2009, and available on EDIS) (DC bus illustrated between the machine (or generator-side) converter and the grid converter).

[13] Low voltage ride-through may be referred to as "LVRT." *See* CX-6/RX-6 ('985 patent) at col. 1, lines 29-34; Lyons Tr. 243-245.

2. Overview of the Asserted Patents

a. The '039 Patent

United States Patent No. 5,083,039, entitled "Variable Speed Wind Turbine," issued on June 21, 1992, to Robert D. Richardson and William L. Erdman, and at that time was assigned to U.S. Windpower, Inc. CX-1/RX-1 ('039 patent). A reexamination certificate for the '039 patent issued on November 16, 1999, which states that no amendments had been made to the patent, and that the patentability of claims 1-138 (*i.e.,* all patent claims) had been confirmed. *See Id.*

The '039 patent relates to a variable speed wind turbine "comprising a turbine rotor that drives an AC induction generator, a power converter that converts the generator output to fixed-frequency AC power, a generator controller, and an inverter controller. The generator controller uses field orientation to regulate either stator currents or voltages to control the torque reacted by the generator. The inverter controller regulates the output currents to supply multi-phase AC power having leading or lagging currents at an angle specified by a power factor control signal." CX-1 ('039 patent), Abstract.

GE asserts claim 121 against Mitsubishi. GE Br. at 51; Tr. 155.

b. The '221 Patent

United States Patent No. 7,321,221, entitled "Method for Operating a Wind Power Plant and Method for Operating It," issued on January 22, 2008, to Andreas Bücker, Wilhelm Janssen and Henning Lütze, and at that time was assigned to GE. CX-9/RX-9 ('221 patent).

The '221 patent relates to "a method of operating a wind turbine, wherein rotor windings of an induction generator, which comprises stator coils coupled to a voltage grid, fed or supplied with rotor currents by a feed-in or supply unit are driven by a rotor of the wind turbine; wherein

the frequencies of the fed-in or supplied rotor currents are controlled depending on the rotor rotation frequency and the feed-in unit is electrically decoupled from the rotor windings in the case predetermined variations of the grid voltage amplitude." CX-9 ('221 patent) at col. 1, lines 10-19. The patent also relates to "a wind power plant operable with such a method." *Id.*

GE asserts claims 5, 7, and 8 against Mitsubishi. GE Br. at 38; Tr. 155.

c. <u>The '985 Patent</u>

United States Patent No. 6,921,985, entitled "Low Voltage Ride Through for Wind Turbine Generators," issued on July 26, 2005, to Wilhelm Janssen, Henning Luetze, Andreas Bruecker, Till Hoffmann and Ralf Hagedorn, and at that time was assigned to GE. CX-6/RX-6 ('985 patent).

The '985 patent relates to a wind turbine that "includes 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. A first power source is coupled with the turbine controller and with the blade pitch control system to provide power during a first mode of operation. Uninterruptible power supplies coupled to the turbine controller and with the blade pitch control system to provide power during a second mode of operation. The turbine controller detects a transition from the first mode of operation to the second mode of operation and causes the blade pitch control system to vary the pitch of the one or more blades in response to the transition." CX-6 ('985 patent), Abstract.

GE asserts claim 15 against Mitsubishi. GE Br. at 21; Tr. 155.

3. The Level of Ordinary Skill in the Art

With respect to each asserted patent, the parties have stipulated that a person of ordinary skill in the relevant art at the time that each patent application was filed would have had a B.S. degree in electrical engineering, or an equivalent degree program, with two to three years of experience in power electronics and, or, electronic machines. *See* Stips., ¶¶ 6, 9, and 13; Staff Br. at 11 & n.11.[14]

4. The Products Accused in This Investigation

GE accuses two models of Mitsubishi 2.4 MW wind turbines of patent infringement, *i.e.,* the MWT 92 and the MWT 95. GE Br. at 7, 11. The parties stipulated that these models are identical for the purposes of the infringement analysis to be conducted in this investigation. Stips., ¶¶ 4, 7, 10; Staff Br. at 7 & n.8. The MWT 92 and MWT 95 are referred to collectively as the "MWT."

In addition, Mitsubishi relies on a new version of its 2.4 MW wind turbines, *i.e.,* the EPSS wind turbine, as a design-around that allegedly precludes infringement of the '985 patent. *See* Order No. 43 (Denying GE's Motion *in Limine* to Preclude Evidence or Argument Regarding Respondents' Purported Design Around of U.S. Patent No. 6,921,985); Mitsubishi Br. at 70.[

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[14] Section III. A. (Claim Construction) contains a discussion of the legal significance of the hypothetical person of ordinary skill.

GE's infringement allegations are directed generally to the MWT, with no distinction as to the original version or the EPSS version. *See* GE Br. at 1. As indicated above, the changes made to the MWT that distinguish the EPSS version from the original version are relevant only to the asserted claim of the '985 patent. Thus, it is only with respect to the '985 patent that the parties' infringement arguments distinguish between the original MWT and the EPSS version. *See, e.g,* Mitsubishi Br. at 18-19, 42, 50, 68-70. Consequently, all findings regarding alleged infringement of the '039 patent and the '221 patent apply to the MWT, in both its original and EPSS versions. As for the '985 patent, separate infringement findings are made with respect to the original and EPSS versions of the MWT.

5. The Domestic Industry Products

In its domestic industry case, GE relies on three of its 1.5 MW wind turbine models, *i.e.*, the SLE, XLE, and SE. The parties have stipulated that these models are identical for the purpose of evaluating whether GE satisfies the technical prong of the domestic industry requirement for each of the asserted patents. *See* Stips., ¶¶ 5, 8, 12; Staff Br. at 6-7 & n.7. The SLE, XLE, and SE are referred to collectively as the "GE Turbine."[15]

II. Jurisdiction and Importation

No party has challenged the Commission's *in rem* jurisdiction over the accused products;[16] nor has any party contested the Commission's personal jurisdiction over it.

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[15] As discussed at page 3, *supra*, it already has been held that GE has satisfied the economic prong of the domestic industry requirement with respect to all three asserted patents.

[16] Although GE attempted through a motion *in limine* to preclude the Mitsubishi respondents from presenting evidence concerning the EPSS, the undersigned ruled in a pre-hearing order that the EPSS is within the scope of this investigation. *See* Order No. 43 (continued...)

In addition, GE and the Mitsubishi respondents entered into a stipulation that addressed some of the jurisdiction and importation questions relevant to this investigation. In particular, they stipulated that respondents MHI and MPSA have sold for importation, imported and, or, sold after importation into the United States, the accused MWTs. Further, GE and the Mitsubishi respondents stipulated that the Commission has jurisdiction over the accused products, as well as MHI and MPSA. *See* Joint Submission and Stipulation Regarding Complainant General Electric Company's Motion for Summary Determination of Importation (May 4, 2009). The Staff does not contest those stipulations. *See* Staff Br. at 8.

The stipulations, however, do not address the activities or status of Mitsubishi respondent MHIA. [

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[16](...continued)
(Denying GE's Motion *in Limine* to Preclude Evidence or Argument Regarding Respondents' Purported Design Around of U.S. Patent No. 6,921,985). Further, GE admits in its brief that an EPSS has been imported into the United States. *See* GE Br. at 16. Thus, it has been established that the EPSS has been imported and is subject to the Commission's jurisdiction.

[17] [

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It is undisputed that according to the plain language of the statute, and the notice of investigation (quoted above), any violation must pertain to the sale for importation, importation, or sale after importation of an accused product. GE has offered only scant argument in this regard. GE has not argued or demonstrated that MHIA has directly imported or sold an accused product; nor has GE advanced a legal theory under which the actions of its subsidiary, MPSA, would be chargeable to the parent company. *See* GE Br. at 98. Consequently, it cannot be found that MHIA is in violation of section 337.

III. General Principles of Patent Law

A. Claim Construction

Pursuant to the Commission's notice of investigation, this is a patent-based investigation. *See* 73 Fed. Reg. 16910 (2008). Accordingly, all of the unfair acts alleged by GE are instances of alleged infringement of the asserted patents. Any finding of infringement or non-infringement requires a two-step analytical approach. First, the asserted patent claims must be construed as a matter of law to determine their proper scope.[18] Second, a factual determination must be made as to whether the properly construed claims read on the accused devices. *See Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 976 (Fed. Cir. 1995) (*en banc*), *aff'd*, 517 U.S. 370 (1996).

Claim construction begins with the language of the claims themselves. Claims should be given their ordinary and customary meaning as understood by a person of ordinary skill in the art,

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[18] Only those claim terms that are in controversy need to be construed, and only to the extent necessary to resolve the controversy. *Vanderlande Indus. Nederland BV v. Int'l Trade Comm.*, 366 F.3d 1311, 1323 (Fed. Cir. 2004); *Vivid Tech., Inc. v. American Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999).

viewing the claim terms in the context of the entire patent. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312-13 (Fed. Cir. 2005), *cert. denied*, 546 U.S. 1170 (2006).[19] With respect to claim preambles, the Court of Appeals for the Federal Circuit has explained that:

> [A] claim preamble has the import that the claim as a whole suggests for it. In other words, when the claim drafter chooses to use both the preamble and the body to define the subject matter of the claimed invention, the invention so defined, and not some other, is the one the patent protects.

Eaton Corp. v. Rockwell Int'l Corp., 323 F.3d 1332, 1339 (Fed. Cir. 2003) (quoting *Bell Communications Research, Inc. v. Vitalink Communications Corp.*, 55 F.3d 615, 620 (Fed. Cir. 1995)).

In some instances, claim terms do not have particular meaning in a field of art, and claim construction involves little more than the application of the widely accepted meaning of commonly understood words. *Phillips*, 415 F.3d at 1314. "In such circumstances, general purpose dictionaries may be helpful." *Id.*

In many cases, claim terms have a specialized meaning and it is necessary to determine what a person of skill in the art would have understood the disputed claim language to mean. "Because the meaning of a claim term as understood by persons of skill in the art is often not immediately apparent, and because patentees frequently use terms idiosyncratically, the court looks to 'those sources available to the public that show what a person of skill in the art would

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[19] Factors that may be considered when determining the level of ordinary skill in the art include: "(1) the educational level of the inventor; (2) type of problems encountered in the art; (3) prior art solutions to those problems; (4) rapidity with which innovations are made; (5) sophistication of the technology; and (6) educational level of active workers in the field." *Environmental Designs, Ltd. v. Union Oil Co.*, 713 F.2d 693, 696 (Fed. Cir, 1983), *cert. denied*, 464 U.S. 1043 (1984).

have understood disputed claim language to mean.'" *Id.* (quoting *Innova/Pure Water, Inc. v. Safari Water Filtration Sys., Inc.*, 381 F.3d 1111, 1116 (Fed. Cir. 2004)). The "sources" identified by the *Phillips* Court include "the words of the claims themselves, the remainder of the specification, the prosecution history, and extrinsic evidence concerning relevant scientific principles, the meaning of technical terms, and the state of the art." *Id.*

In cases in which the meaning of a claim term is uncertain, the specification usually is the best guide to the meaning of the term. *Id.* at 1315. As a general rule, the particular examples or embodiments discussed in the specification are not to be read into the claims as limitations. *Markman*, 52 F.3d at 979. However, the specification is always highly relevant to the claim construction analysis, and is usually dispositive. *Id.* Moreover, "[t]he construction that stays true to the claim language and most naturally aligns with the patent's description of the invention will be, in the end, the correct construction." *Id.* at 1316.

Claims are not necessarily, and are not usually, limited in scope to the preferred embodiment. *RF Delaware, Inc. v. Pacific Keystone Techs., Inc.*, 326 F.3d 1255, 1263 (Fed. Cir. 2003); *Decisioning.com, Inc, v. Federated Dep't Stores, Inc.*, 527 F.3d 1300, 1314 (Fed. Cir. May 7, 2008) ("[The] description of a preferred embodiment, in the absence of a clear intention to limit claim scope, is an insufficient basis on which to narrow the claims").

Furthermore, claim interpretations that exclude the preferred embodiment are "rarely, if ever, correct and require highly persuasive evidentiary support." *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1583 (Fed. Cir. 1996). Such a conclusion can be mandated in rare instances by clear intrinsic evidence, such as unambiguous claim language or a clear disclaimer by the patentees during patent prosecution. *Elekta Instrument v. O.U.R. Sci. Int'l*, 214

F.3d 1302, 1308 (Fed. Cir. 2000); *Rheox, Inc. v. Entact, Inc.*, 276 F.3d 1319 (Fed. Cir. 2002).

If the intrinsic evidence does not establish the meaning of a claim, then extrinsic evidence may be considered. Extrinsic evidence consists of all evidence external to the patent and the prosecution history, including inventor testimony, expert testimony, and learned treatises. *Phillips*, 415 F.3d at 1317. Inventor testimony can be useful to shed light on the relevant art. In evaluating expert testimony, a court should discount any expert testimony that is clearly at odds with the claim construction mandated by the claims themselves, the written description, and the prosecution history, in other words, with the written record of the patent. *Id.* at 1318. Extrinsic evidence may be considered if a court deems it helpful in determining the true meaning of language used in the patent claims. *Id.*

This investigation involves a claim that is alleged to contain a means-plus-function limitation. When a claim uses the term "means" to describe a limitation, a presumption arises that the inventor used the term to invoke the means-plus function format authorized by 35 U.S.C. § 112, ¶ 6.[20] *Altiris, Inc. v. Symantec Corp.*, 318 F.3d 1363, 1375 (Fed. Cir. 2003). "This presumption can be rebutted when the claim, in addition to the functional language, recites structure sufficient to perform the claimed function in its entirety." *Id.*

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[20] The relevant portion of section 112 provides:

> An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.

35 U.S.C. § 112, ¶ 6.

Once a court concludes that a claim limitation is a means-plus-function limitation, two steps of claim construction remain: 1) the court must first identify the function of the limitation; and 2) the court must then look to the specification and identify the corresponding structure for that function. *Biomedino LLC v. Waters Technologies Corp.*, 490 F.3d 946, 950 (Fed. Cir. 2007). If there is no structure in the specification corresponding to the means-plus-function limitation, the claim will be found invalid as indefinite. *Id.*

While the specification must contain structure linked to claimed means: "[a]ll one needs to do in order to obtain the benefit of [§ 112, ¶ 6] is to recite some structure corresponding to the means in the specification, as the statute states, so that one can readily ascertain what the claim means and comply with the particularity requirement of [§ 112,] ¶ 2." *Id.* (citing *Atmel Corp. v. Info. Storage Devices, Inc.,* 198 F.3d 1374, 1382 (Fed. Cir. 1999)). Additionally, interpretation of what is disclosed in the specification must be made in light of the knowledge of one skilled in the art. *Atmel*,198 F.3d at 1380.

Thus, in order for a means-plus-function claim to be valid under section 112, the corresponding structure of the limitation "must be disclosed in the written description in such a manner that one skilled in the art will know and understand what structure corresponds to the means limitation. Otherwise, one does not know what the claim means." *Id.* at 1382. Further, "the testimony of one of ordinary skill in the art cannot supplant the total absence of structure from the specification." *Id.* (quoting *Default Proof Credit Card Sys., Inc. v. Home Depot U.S.A., Inc.*, 412 F.3d 1291, 1302 (Fed. Cir. 2005)).

"A means-plus-function claim encompasses all structure in the specification corresponding to that element and equivalent structures." However, "[t]he statute does not

permit limitation of a means-plus-function claim by adopting a function different from that explicitly recited in the claim. Nor does the statute permit incorporation of structure from the written description beyond that necessary to perform the claimed function." *Micro Chem. Inc. v. Great Plains Chem. Co., Inc.,* 194 F.3d 1250, 1258 (Fed. Cir.1999).

B. Patent Infringement

Under 35 U.S.C. §271(a), direct infringement consists of making, using, offering to sell, or selling a patented invention without consent of the patent owner. The complainant in a section 337 investigation bears the burden of proving infringement of the asserted patent claims by a "preponderance of the evidence." *Certain Flooring Products*, Inv. No. 337-TA-443, Comm'n Notice of Final Determination of No Violation of Section 337, 2002 WL 448690 at 59, (Mar. 22, 2002); *Enercon GmbH v. Int'l Trade Comm'n,* 151 F.3d 1376 (Fed. Cir. 1998).

Each patent claim element or limitation is considered material and essential. *London v. Carson Pirie Scott & Co.*, 946 F.2d 1534, 1538 (Fed. Cir. 1991).[21] Literal infringement of a claim occurs when every limitation recited in the claim appears in the accused device, *i.e.,* when the properly construed claim reads on the accused device exactly. *Amhil Enters., Ltd. v. Wawa, Inc.*, 81 F.3d 1554, 1562 (Fed. Cir. 1996); *Southwall Tech. v. Cardinal IG Co.*, 54 F.3d 1570, 1575 (Fed Cir. 1995).

If the accused product does not literally infringe the patent claim, infringement might be found under the doctrine of equivalents. The Supreme Court has described the essential inquiry of the doctrine of equivalents analysis in terms of whether the accused product or process

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[21] Thus, if an accused device lacks a limitation of an independent claim, the device cannot infringe a dependent claim. *See Wahpeton Canvas Co. v. Frontier, Inc.,* 870 F.2d 1546, 1552 n.9 (Fed. Cir. 1989).

contains elements identical or equivalent to each claimed element of the patented invention. *Warner-Jenkinson Co., Inc. v. Hilton Davis Chemical Co.*, 520 U.S. 17, 40 (1997).

Under the doctrine of equivalents, infringement may be found if the accused product or process performs substantially the same function in substantially the same way to obtain substantially the same result. *Valmont Indus., Inc. v. Reinke Mfg. Co.*, 983 F.2d 1039, 1043 (Fed. Cir. 1993). The doctrine of equivalents does not allow claim limitations to be ignored. Evidence must be presented on a limitation-by-limitation basis, and not for the invention as a whole. *Warner-Jenkinson*, 520 U.S. at 29; *Hughes Aircraft Co. v. U.S.*, 86 F.3d 1566 (Fed. Cir. 1996). Thus, if an element is missing or not satisfied, infringement cannot be found under the doctrine of equivalents as a matter of law. *See, e.g., Wright Medical*, 122 F.3d 1440, 1444 (Fed. Cir. 1997); *Dolly, Inc. v. Spalding & Evenflo Cos., Inc.*, 16 F.3d 394, 398 (Fed. Cir. 1994); *London*, 946 F.2d at 1538-39; *Becton Dickinson and Co. v. C.R. Bard, Inc.*, 922 F.2d 792, 798 (Fed. Cir. 1990).

The concept of equivalency cannot embrace a structure that is specifically excluded from the scope of the claims. *Athletic Alternatives v. Prince Mfg., Inc.*, 73 F.3d 1573, 1581 (Fed. Cir. 1996). In applying the doctrine of equivalents, the Commission must be informed by the fundamental principle that a patent's claims define the limits of its protection. *See Charles Greiner & Co. v. Mari-Med. Mfg., Inc.*, 92 F.2d 1031, 1036 (Fed. Cir. 1992). As the Supreme Court has affirmed:

> Each element contained in a patent claim is deemed material to defining the scope of the patented invention, and thus the doctrine of equivalents must be applied to individual elements of the claim, not to the invention as a whole. It is important to ensure that the application of the doctrine, even as to an individual element, is not

> allowed such broad play as to effectively eliminate that element in its entirety.

Warner-Jenkinson, 520 U.S. at 29.

Prosecution history estoppel may bar the patentee from asserting equivalents if the scope of the claims has been narrowed by amendment during prosecution. A narrowing amendment may occur when either a preexisting claim limitation is narrowed by amendment, or a new claim limitation is added by amendment. These decisions make no distinction between the narrowing of a preexisting limitation and the addition of a new limitation. Either amendment will give rise to a presumptive estoppel if made for a reason related to patentability. *Honeywell Int'l Inc. v. Hamilton Sundstrand Corp.*, 370 F.3d 1131, 1139-41 (Fed. Cir. 2004), *cert. denied*, 545 U.S. 1127 (2005) (citing *Warner-Jenkinson*, 520 U.S. at 22, 33-34; and *Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co.*, 535 U.S. 722, 733-34, 741 (2002)).

The presumption of estoppel may be rebutted if the patentee can demonstrate that: (1) the alleged equivalent would have been unforeseeable at the time the narrowing amendment was made; (2) the rationale underlying the narrowing amendment bore no more than a tangential relation to the equivalent at issue; or (3) there was some other reason suggesting that the patentee could not reasonably have been expected to have described the alleged equivalent. *Honeywell*, 370 F.3d at 1140 (citing, *inter alia*, *Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co.*, 344 F.3d 1359 (Fed. Cir. 2003) (*en banc*)).

As noted, one claim limitation at issue in this investigation is alleged to be in means-plus-function format. "Literal infringement of a § 112, ¶ 6 limitation requires that the relevant structure in the accused device perform the identical function recited in the claim and be

identical or equivalent" to the structure identified in the written description as corresponding to the recited function. *JVW Enter. v. Interact Accessories, Inc.*, 424 F.3d 1324, 1333 (Fed. Cir. 2005) (citing *Odetics, Inc. v. Storage Tech. Corp.*, 185 F.3d 1259, 1267 (Fed. Cir. 1999)). For the relevant structure in the accused device to be equivalent to the structure in the written description, differences between the two must be insubstantial. For example, the structure in the accused device must perform the claimed function in substantially the same way to achieve substantially the same result as the structure in the written description. *JVW*, 424 F.3d at 1333.

"The primary difference between structural equivalents under section 112, paragraph 6 and the doctrine of equivalents is a question of timing." *Frank's Casing, Crew & Rental Tools, Inc. v. Weatherford Int'l, Inc.*, 389 F.3d 1370, 1379 (Fed. Cir. 2004) (citing *Al-Site Corp. v. VSI Int'l, Inc.*, 174 F.3d 1308, 1321 n.2 (Fed. Cir. 1999)). As the Federal Circuit has explained, "[a] proposed equivalent must have arisen at a definite period in time, i.e., either before or after [patent filing]. If before, a § 112, ¶ 6 structural equivalents analysis applies and any analysis for equivalent structure under the doctrine of equivalents collapses into the § 112, ¶ 6 analysis. If after, a non-textual infringement analysis proceeds under the doctrine of equivalents." *Id.*

C. Validity

One cannot be held liable for practicing an invalid patent claim. *See Pandrol USA, LP v. AirBoss Railway Prods., Inc.*, 320 F.3d 1354, 1365 (Fed. Cir. 2003). However, the claims of a patent are presumed to be valid. 35 U.S.C. § 282; *DMI Inc. v. Deere & Co.*, 802 F.2d 421 (Fed. Cir. 1986). Although a complainant has the burden of proving a violation of section 337, it can rely on this presumption of validity. A respondent that has raised patent invalidity as an affirmative defense must overcome the presumption by "clear and convincing" evidence of

invalidity. *Checkpoint Systems, Inc. v. United States Int'l Trade Comm'n*, 54 F.3d 756, 761 (Fed. Cir. 1995).

1. Obviousness

Obviousness is grounded in 35 U.S.C. § 103, which provides, *inter alia*, that:

> A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, 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. Patentability shall not be negatived by the manner in which the invention was made.

35 U.S.C. § 103(a).

An allegation of obviousness is evaluated under the so-called *Graham* factors: (1) the scope and content of the prior art; (2) the differences between the prior art and the claims at issue; (3) the level of ordinary skill in the art; and (4) objective evidence of nonobviousness, the so-called "secondary considerations," *e.g.*, commercial success, long felt need, and failure of others. *See Graham v. John Deere Co.*, 383 U.S. 1, 13-17 (1966); *Dystar Textilfarben GmbH v. C.H. Patrick Co.*, 464 F.3d 1356, 1361 (Fed. Cir. 2006).[22]

"[E]vidence arising out of the so-called 'secondary considerations' must always when present be considered en route to a determination of obviousness." *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 1538 (Fed. Cir. 1983). Secondary considerations, such as commercial success, will not always dislodge a determination of obviousness based on analysis of the prior

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[22] "Before answering *Graham's* 'content' inquiry, it must be known whether a patent or publication is in the prior art under 35 U.S.C. § 102 – a legal question." *Panduit Corp. v. Dennison Mfg. Co.*, 810 F.2d 1561, 1568 (Fed. Cir. 1987).

art. *See KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 426 (2007) (commercial success did not alter conclusion of obviousness).

"One of the ways in which a patent's subject matter can be proved obvious is by noting that there existed at the time of invention a known problem for which there was an obvious solution encompassed by the patent's claims." *KSR*, 550 U.S. at 419-20. "[A]ny need or problem known in the field of endeavor at the time of invention and addressed by the patent can provide a reason for combining the elements in the manner claimed." *Id.*

Specific teachings, suggestions, or motivations to combine prior art may provide helpful insights into the state of the art at the time of the alleged invention. *Id.* at 1741. Nevertheless, "an obviousness analysis cannot be confined by a formalistic conception of the words teaching, suggestion, and motivation, or by overemphasis on the importance of published articles and the explicit content of issued patents. The diversity of inventive pursuits and of modern technology counsels against limiting the analysis in this way." *Id.* "Under the correct analysis, any need or problem known in the field of endeavor at the time of invention and addressed by the patent can provide a reason for combining the elements in the manner claimed." *Id.* at 420. A "person of ordinary skill is also a person of ordinary creativity . . . ." *Id.* at 421.

The Federal Circuit has harmonized the *KSR* opinion with many prior circuit court opinions by holding that when a patent challenger contends that a patent is invalid for obviousness based on a combination of 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) (citing *Medichem S.A. v. Rolabo S.L.*, 437 F.3d 1175, 1164 (Fed. Cir. 2006)); *see KSR*, 550 U.S. at 416 (a combination of elements must do more than yield a predictable result; combining elements that work together in an unexpected and fruitful manner would not have been obvious).[23]

The ultimate determination of whether an invention would have been obvious is a legal conclusion based on underlying findings of fact. *In re Dembiczak*, 175 F.3d 994, 998 (Fed. Cir. 1999).

2. <u>The Written Description Requirement of Section 112</u>

The first paragraph of Section 112 of the Patent Act provides:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.

35 U.S.C. § 112, ¶ 1.

To satisfy the written description requirement, the applicant must "convey with reasonable clarity to those skilled in the art that, as of the filing date sought, he or she was in possession of the invention." *Carnegie Mellon Univ. v. Hoffman-La Roche Inc.*, 541 F.3d 1115, 1122 (Fed. Cir. 2008). Nevertheless, a patent specification may contain a written description of a broadly claimed invention without describing all species that a claim encompasses. *Vas-Cath Inc. v. Mahurkar*, 935 F.2d 1555, 1563 n.6 (Fed. Cir. 1991).

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[23] Further, "when the prior art teaches away from combining certain known elements, discovery of a successful means of combining them is more likely to be nonobvious." *KSR*, 550 U.S. at 416 (citing *United States v. Adams*, 383 U.S. 39, 52 (1966)).

3. The Enablement Requirement of Section 112

A patent is enabled if its disclosure is sufficient to enable a person of ordinary skill in the art, after reading the specification, to make and use the claimed invention without undue experimentation. *In re Wands*, 858 F.2d 731, 736-37 (Fed. Cir. 1988); *Johns Hopkins Univ. v. Cellpro, Inc.*, 152 F.3d 1342, 1360 (Fed. Cir. 1998) (It is imperative when attempting to prove lack of enablement to show that one of ordinary skill in the art would be unable to make the claimed invention without undue experimentation.). A number of factors may be considered in determining whether a disclosure would require undue experimentation, including: (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. *Wands*, 858 F.2d at 737.

4. The Definiteness Requirement of Section 112

The definiteness requirement of 35 U.S.C. § 112 ensures that the patent claims particularly point out and distinctly claim the subject matter that the patentee regards to be the invention. *See* 35 U.S.C. § 112, ¶ 2; *Metabolite Labs., Inc. v. Laboratory Corp. of America Holdings*, 370 F.3d 1354, 1366 (Fed. Cir. 2004). If a claim's legal scope is not clear enough so that a person of ordinary skill in the art could determine whether or not a particular product infringes, the claim is indefinite, and is, therefore, invalid. *Geneva Pharm., Inc. v. GlaxoSmithKline PLC*, 349 F.3d 1373, 1384 (Fed. Cir. 2003). Thus, it has been found that:

> When a proposed construction requires that an artisan make a separate infringement determination for every set of circumstances in which the composition may be used, and when such determinations are likely to result in differing outcomes

> (sometimes infringing and sometimes not), that construction is likely to be indefinite.

Halliburton Energy Servs. v. M-I LLC, 514 F.3d 1244, 1255 (Fed. Cir. 2008).

5. The Best Mode Requirement of Section 112

As quoted above, the first paragraph of section 112 of the Patent Act places a best mode requirement on patentees. The Federal Circuit has set out a two-pronged test for determining whether an inventor has met the best mode requirement.

"First, the factfinder must determine whether, at the time of filing the application, the inventor possessed a best mode for practicing the invention." *Eli Lilly and Co. v. Barr Labs., Inc.*, 251 F.3d 955, 963 (Fed. Cir. 2001) (citing *Chemcast Corp. v. Arco Indus. Corp.*, 913 F.2d 923, 927-28 (Fed. Cir.1990)). This involves a subjective inquiry whereby the factfinder focuses on the inventor's state of mind at the time of filing. *Id.*

"Second, if the inventor possessed a best mode, the factfinder must determine whether the written description disclosed the best mode such that one reasonably skilled in the art could practice it." *Id.* This involves an objective inquiry focused on the scope of the claimed invention and the level of skill in the art. *Id.*

D. Inequitable Conduct

Applicants for patents have a duty to prosecute patents in the U.S. Patent and Trademark Office ("PTO") with candor and good faith, which includes a duty to disclose information known to the applicants to be material to patentability. *Pharmacia Corp. v. Par Pharm, Inc.*, 417 F.3d 1369, 373 (Fed. Cir. 2005). A breach of this duty may render the patent that issues unenforceable for inequitable conduct. *Cargill, Inc. v. Canbra Foods, Ltd.*, 476 F.3d 1359, 1363 (Fed. Cir. 2007). Thus, a patent is unenforceable if the patentee withheld material information with an

intent to deceive or mislead the PTO. *See Purdue Pharma L.P. v. Endo Pharms., Inc.*, 438 F.3d 1123, 1128 (Fed. Cir. 2006).

The Federal Circuit has rejected a "but for" standard of materiality (*i.e.,* the patent would not have issued but for the omission of art from the prosecution). *Merck & Co. v. Danbury Pharmacal, Inc.*, 873 F.2d 1418, 1421 (Fed. Cir. 1989). Instead, information is deemed material "if there is a substantial likelihood that a reasonable examiner would consider it important in deciding whether to allow the application to issue as a patent." *Brasseler, U.S.A. L.L.P. v. Stryker Sales Corp.,* 267 F.3d 1370, 1380 (Fed. Cir. 2001).

Intent is a subjective inquiry based on all the evidence, including evidence of good faith. *See Kingsdown Med. Consultants, Ltd. v. Hollister, Inc.*, 863 F.2d 867, 876 (Fed. Cir. 1988) (*en banc* in relevant part). A finding of deceptive intent requires clear and convincing evidence. *See Northern Telecom, Inc. v. Datapoint Corp.*, 908 F.2d 931, 939 (Fed. Cir. 1990). "[G]eneralized allegations lack the particularity required to meet the threshold level of deceptive intent necessary for a finding of inequitable conduct." *Sanofi-Synthelabo v. Apotex, Inc.* 470 F.3d 1368, 1381 (Fed. Cir. 2006). Indeed, an intent to deceive, "cannot be 'inferred solely from the fact that information was not disclosed; there must be a factual basis for a finding of deceptive intent.'" *Purdue Pharma, L.P.*, 438 F.3d at 1134 (quoting *Hebert v. Lisle Corp.*, 99 F.3d 1109, 1116 (Fed. Cir. 1996)).

In determining whether there has been inequitable conduct, a court (1) determines whether the withheld information meets a threshold level of materiality and whether the applicant's conduct at issue meets a threshold level of intent to deceive, and (2) weighs the materiality and intent in light of the circumstances to determine whether the applicant's conduct

is so culpable that the patent should be held unenforceable. *Cargill*, 476 F.3d at 1363.

IV. United States Patent No. 5,083,039

A. Claim Construction

The specification of the'039 patent states that the claimed invention "relates generally to wind turbines that operate at variable speed under varying wind conditions, and relates more particularly to a power converter for converting wind energy into AC electrical power at a controlled power factor and for controlling the torque generated by the wind turbine." CX-1 ('039 patent) at col. 1, lines 11-16 (Field of the Invention). Independent claim 121, the only claim of the '039 patent asserted by GE, is directed to a variable speed wind turbine, and provides, as follows:

> **121.** A variable speed wind turbine comprising:
>
> a turbine rotor including at least one blade mounted to a rotatable shaft;
>
> a multiphase induction generator having a rotor coupled to the turbine shaft for rotation therewith;
>
> a power converter for converting variable frequency electricity generated by the generator into fixed frequency electricity, the power converter including an inverter for supplying output electricity, wherein the inverter has active switches; and
>
> inverter controller means coupled to the inverter and responsive to a power factor control signal for controlling the active switches to supply electricity at a desired angle between voltage and current.

Id. at col. 41, lines 35-48.

There is no dispute among the parties concerning the meaning of the claim preamble and the first claim element. There are, however, disputes concerning the construction of the

remaining claim elements, which are discussed in the following four categories: induction generator, power converter, inverter for supplying output electricity, and inverter controller means.

"induction generator"

GE argues that the induction generator required by the second element of claim 121 does not require a special construction, and that one of ordinary skill in the art would understand that the term refers to a generator with either a squirrel cage or a DFIG configuration.[24] GE Br. at 51 -53. Mitsubishi argues that the language of claim 121, and the explicit statements of the specification, make it clear that the induction generator is limited to a squirrel cage induction generator, and cannot read on a doubly-fed generator such as a DFIG. Mitsubishi Br. at 11-12. The Staff argues that the term "induction generator" should be construed to mean "squirrel cage generator." Staff Br. at 16-18.

The plain language of claim 121 does not expressly require that the induction generator have a squirrel cage design, or any other specific design.[25] Nor is there any claim language that expressly excludes a doubly-fed induction generator, or any other specific configuration of an induction generator.

Indeed, Mitsubishi and the Staff argue that the limitation they propose for the claim is evident, not through the term "induction generator," *per se,* but rather by reading and considering

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[24] The terms "squirrel cage" and "DFIG" are basic to the art, and are not in dispute. Both terms are discussed, *supra,* in Section I.B.1. (Technological Background).

[25] The claim does require a "multiphase" induction generator, but that term is not in dispute. Further, the fact that the claimed generator must be multiphase (which refers to the phases, or timing, of current) does not relate to the squirrel cage generator versus doubly-fed generator question raised by Mitsubishi and the Staff.

the language of "claim 121 as a whole and the explicit statements of the '039 patent specification." *See* Mitsubishi Br. at 11; Staff Br. at 16-17. In particular, Mitsubishi points out that another limitation of claim 121 requires a converter (which is depicted in the specification's Figure 2) to convert variable frequency energy into fixed frequency energy. It is argued that the requirement of such a converter makes sense only in the context of a squirrel cage generator because the energy flowing from a squirrel cage generator needs that type of conversion. In contrast, the stator of a doubly-fed generator (such as a DFIG) is connected directly to the grid, and does not require any conversion. Thus, Mitsubishi argues, a doubly-fed generator cannot be included in the term "induction generator." The Staff uses similar reasoning with respect to the "inverter controller means," arguing that it cannot work with a DFIG, only with a squirrel cage generator. *See* Staff Br. at 17-18.[26]

The constructions proposed by Mitsubishi and the Staff cannot be reconciled with the claim language, the specification, and applicable law.

An induction generator is a class of machines called induction machines. The word "induction" is used because voltage is induced in the rotor of the machine as it moves relative to a magnetic field. *See* Kirtley Tr. 417-418. The term "induction generator" is used in the art to refer to both a squirrel cage generator and a doubly-fed generator (such as a DFIG) because they both induce voltages according to the same basic principle. That was the case when the application for the '039 patent was filed in 1991, when the patent issued, and has remained the case. *See* Habetler Tr. 1236; Kirtley Tr. 419.

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[26] The terms "power converter" and "inverter controller means" are disputed, and are thus construed separately.

It is undisputed that the embodiment disclosed in the specification has a squirrel cage generator, and the power converter and inverter controller means, as described in the specification, are configured to interact with it. However, the particular examples or embodiments discussed in a specification generally are not to be read into the claims as limitations. *See Markman*, 52 F.3d at 979. Additionally, the '039 specification does not clearly manifest an intention to limit the claims to a particular embodiment. *See Innova/Pure Water*, 381 F.3d at 1117. In fact, while the specification indicates that the claimed invention should not be restricted to the embodiments disclosed therein, it goes well beyond any boilerplate statement, and provides, as follows:

> From the above description, it will be apparent that the invention disclosed herein provides a novel and advantageous variable speed wind turbine. The foregoing discussion discloses and describes merely exemplary methods and embodiments of the present invention. As will be understood by those familiar with the art, the invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. For example, some aspects of the current controller can be performed in various ways equivalent to those disclosed herein, including using hysteresis control or forced oscillation with triangular intersection. ***The generator need not be a three-phase squirrel-cage induction generator, but may be any multiphase generator, including a synchronous generator.*** Certain aspects of the generator control could be performed open-loop, instead of the closed loop control disclosed herein. Also, the power converter could have a DC current link, or could be a cyclo-converter instead of a DC voltage link. In addition, the torque monitor could directly measure torque with a transducer, instead of inferring torque from the measured stator currents. Accordingly, the disclosure of the present invention is intended to be illustrative, but not limiting, of the scope of the invention, which is set forth in the following claims.

CX-1 ('039 patent), col. 19, lines 1-26 (emphasis added).

Thus, rather than seeking to confine the claimed invention to a turbine with a squirrel cage generator, the specification is consistent with the broad language of the claim, which literally reads on any multiphase induction generator.

Consequently, the term "induction generator" is construed to mean an induction generator. The induction generator need not be a squirrel cage induction generator.

"power converter"

GE argues that the term "power converter" in claim 121 should be accorded its plain and ordinary meaning as understood by one of ordinary skill in the art, and thus no formal claim construction should be required. GE argues that Mitsubishi's proposed construction is an effort to limit claim 121 to the preferred embodiment of the specification. GE further argues that "if 'power converter' must be construed, the construction should be no narrower than 'an AC-DC-AC power converter.'" GE Br. at 54-55.

Mitsubishi argues that "the 'power converter' of claim 121 should be construed as a power converter with a rectifier connected to the stator of the generator and with an inverter connected to the grid, wherein the power converter acts to convert the variable frequency generated by the generator into fixed frequency electricity." Mitsubishi Br. at 8-11.[27]

The Staff argues that "'power converter' means 'an AC/DC/AC full power converter *with an inverter*.'" Staff Br. at 19 (emphasis by Staff). It is argued that GE's construction of "power converter" is too broad, and is based on a construction that addresses the term in isolation without consideration of claim 121 as a whole. The Staff argues that the "induction generator"

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[27] *See* Habetler Tr. 1132-1134 (with reference to a squirrel cage embodiment as disclosed in the '039 patent specification: "The rectifier has active switches in a bridge configuration that control the currents and while the inverter has active switches in a bridge configuration that control the currents at the line side of the power converter.").

must be a squirrel-cage generator, and thus all of the power from the turbine must go through the power converter before reaching the grid (in contrast to a DFIG, in which case some of the power goes directly from the generator to the grid without passing through the power converter). *Id.* at 19-20.

The constructions proposed by Mitsubishi (and to a lesser extent, the Staff) would add limitations not found in the claim language, including the requirement that the power converter be a full power converter. Claim 121 contains no requirement that the power converter be fully rated. Indeed, it need not be fully rated if a generator other than a squirrel cage generator is used. Further, claim 121 never mentions the stator at all, let alone in connection with the power converter. *See* Kirtley Tr. 437-439.[28]

Mitsubishi and the Staff base their proposed constructions on the requirements of a squirrel cage generator whose induced output is destined for the utility grid. *See* Habetler Tr. 1127-1128 (testimony of Mitsubishi expert based on a squirrel cage generator). Yet, as discussed above, there is no requirement that the "multiphase induction generator" of claim 121 be so limited.

Consequently, the "power converter" is construed to mean a power converter that may be used in connection with the multiphase induction generator required in the preceding claim element (which need not be a squirrel cage generator). Further, there is no dispute that the power converter is an AC-DC-AC power converter, and, as expressed in the claim language, it includes an inverter.

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[28] In contrast, claim 130 mentions the stator, and specifically a rectifier that includes "a pair of active switches for each phase of the generator coupled between the DC voltage link and a stator power tap." *See* CX-1 ('039 patent), col. 14, lines 30-43.

"inverter for supplying output electricity"

GE argues that the term "inverter for supplying output electricity" should be construed to mean "[a]n inverter whose operation allows electricity to be supplied to the grid." GE Br. at 56. It contends that claim 121 does not require the inverter to be connected directly to the grid (*i.e.*, through a direct or "copper-to-copper" connection), but that other components may be located between the inverter and the grid. GE further contends that Mitsubishi has not only impermissibly imported limitations from the specification concerning the location of the inverter, but also limitations concerning the inverter's function (such as a requirement that the inverter supply both real and reactive power). *Id.* at 56-57.

Mitsubishi argues that the "inverter for supplying output electricity" must be construed to be a grid-side inverter connected to the grid that supplies both real and reactive power to the grid. It submits that such a construction is consistent with the term "inverter" as it is used in the specification and claims, and with the understanding of one of ordinary skill that an "inverter for supplying output electricity" is a grid-side inverter in a full power AC-DC-AC power converter. Mitsubishi Br. at 8-10. Mitsubishi states that, in fact, the '039 specification "explicitly defines the term 'inverter' as used in claim 121 to be the line-side or grid-side portion of the power converter." *Id.* at 9 (citing CX-1 ('039 patent), col. 2, lines 44-49).

The Staff argues that "inverter for supplying output electricity" is unambiguous and should be given its plain and ordinary meaning, which is "an inverter connected to the grid that can supply both real and reactive power to the grid." Staff Br. at 21. The Staff "does not object to the scope of Complainant's construction *per se*," but argues that it is vague and could be misleading because the point of the entire system is to make sure that power gets from the

generator to the grid. *Id.* at 20-21.

The only limitations that the plain language of claim 121 expressly places on the inverter are: (1) that it must supply output electricity, and (2) that it must have active switches. Further, the specification passages relied upon by Mitsubishi to argue that the specification requires a line-side (*i.e.,* grid-side) inverter refer to a preferred embodiment, including the statement found within the "Summary of the Invention" portion of the specification.[29] The Summary portion of the specification is written in terms of "one illustrated embodiment," and how it is "preferably" configured. *See* CX-1 ('039 patent), col. 1, line 64; col. 2, lines 43, 63; col. 3, line 9. Thus, even the statement in the Summary portion of the specification, which places the inverter on the line side, cannot be read to define the inverter limitation for all embodiments of the claimed invention and all claims of the patent.[30]

Accordingly, there is no limitation in the claim or the specification that requires the inverter to be located on the grid or line side; and no limitation should be placed on the inverter other than those required by the plain claim language.

"inverter controller means"

GE argues that while "this term uses the word 'means' (though that word is dropped in dependent claim 122), the claim itself easily recites sufficient structure such that it does not meet

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[29] *See* CX-1 ('039 patent), col. 2, lines 44-49 ("The rectifier has active switches in a bridge configuration that control the currents and voltages at the generator side of the power converter, while the inverter has active switches in a bridge configuration that control the currents at the line side of the power converter.").

[30] Mitsubishi's arguments are based in large part on portions of the specification that relate specifically to squirrel cage generators, and which, according to Mitsubishi, preclude claim 121 from reading on a "doubly-fed system." *See* Mitsubishi Br. at 9. As stated, *supra,* in connection with other claim construction issues, it is not found that the "multiphase induction generator" required by claim 121 is limited to a squirrel cage generator.

the statutory requirements for construction under 35 U.S.C. § 112, ¶ 6." GE Br. at 58-59 (citing, *inter alia, Mass. Inst. of Tech. v. Abacus Software*, 462 F.3d 1344, 1356 (Fed. Cir. 2006)).[31] GE further argues that the inverter controller is not a general-purpose computer, and that the patent provides an example of a specialized part (identified by part number) that one of ordinary skill would be able to buy or build and then program to perform the desired functions set forth in claim 121, *i.e.,* controlling the active switches to supply electricity at a desired angle between voltage and current. GE argues that claim 121 also specifies that the inverter controller must be responsive to a power factor control signal that establishes the desired angle. *Id.* at 59-60.

Mitsubishi argues that GE has failed to rebut the presumption that the "inverter controller means" is a means-plus-function element, and further that the specification and prosecution history confirm the understanding that it is such an element. Indeed, the Mitsubishi respondents contend that the algorithms or structure necessary to accomplish control of the inverter are not disclosed within claim 121. As a result, the "inverter controller means" must be construed according section 112, paragraph 6, as a mean-plus-function element. In addition, Mitsubishi argues that the structure for the inverter controller means is shown in the specification to be "a power controller 54 connected to the grid-side inverter control unit 88 shown in Figure 2, where the required structure for the inverter control unit 88 is given in Figure 13." Mitsubishi Br. at 5-8.[32]

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[31] GE elaborates on its claim comparison argument by comparing the language of claims 121, 122, and 124, and stating that the fact that the terms "inverter controller" and "inverter controller means" are used interchangeably further evidences that "inverter controller means" is not a means-plus-function term. *See* GE Br. at 60-61.

[32] In view of its contention that the "inverter controller means" is not a means-plus-function element, GE argues that Mitsubishi's reference to a "grid-side" inverter (continued...)

The Staff argues that the "inverter controller means" is a means-plus-function element as provided for in 35 U.S.C. § 112, ¶6. It further argues that the function is "controlling the inverter switches to supply electricity at a desired angle between the voltage and current," and the corresponding structure is "a power factor controller connected to the line-side inverter control unit shown in Figure 2; and the inverter control unit that operates by controlling the power factor angle shown in Figure 13, and equivalents thereof." Staff Br. at 11-15 (citing, *inter alia*, CX-1 ('039 patent), col. 5, lines 43-46, col. 18, lines 44-58 & Figs. 2, 13).[33]

By arguing that the "inverter controller means" is a means-plus-function limitation, Mitsubishi and the Staff refer to the embodiment of the specification not only to supply a structure for the limitation, but also to read into claim 121 the specific requirements of a system based on a squirrel cage generator. It would be remarkable if a squirrel cage limitation were to be read into claim 121 in this manner, inasmuch as other claim limitations, discussed above, are not limited by the claim language or the specification to a squirrel cage system.[34]

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[32](...continued)
impermissibly imports a limitation into the claim. *See* GE Br. at 61-62; GE Reply at 29.

[33] GE argues that the power factor controller cannot be part of the inverter controller means because Figure 1 of the '039 patent shows two inverter controllers (items 50 and 52) yet only one power factor controller (item 54). Thus, it is argued, the Staff's proposed construction would read out a disclosed embodiment, and such constructions are rarely, if ever, correct. *See* GE Br. at 62 (citing *Vitronics,* 90 F.3d at 1583). In response, the Staff argues that the claim itself provides that the inverter controller means must be responsive to a power factor control signal, and that Figure 13 shows that the only device responsive to the power factor control signal is the power factor controller. Thus, the Staff argues, regardless of whether or not the "inverter controller means" is ultimately construed to be a means-plus-function element, in any event, "it must include the power factor controller in order to cover the patent's preferred embodiment." *See* Staff Br. at 3 (citing *Vitronics,*90 F.3d at 1583).

[34] Mitsubishi makes a passing reference to a remark made by the examiner during a reexamination proceeding to the effect that claim 121 is a means-plus-function claim. *See*
(continued...)

In any event, before looking to the preferred embodiment to define the structure of the inverter controller means, one must first decide whether or not the inverter controller means is in fact a means-plus-function limitation. *See Net MoneyIn, Inc. v. Verisign, Inc.*, 545 F.3d 1359, 1366 (Fed. Cir. 2008).

There can be no dispute that the word "means" appears in the claim limitation at issue. GE points out, however, that other claims refer to an inverter controller, including dependent claim 124 (which refers to "the inverter controller means"), but also dependent claim 122 (which refers to the "inverter controller" without the word "means"). GE Br. at 60. That argument is entitled to some weight, but the fact remains that claim 121 does refer to a particular "means" whose function, according to the claim, is "controlling the active switches to supply electricity at a desired angle between voltage and current." The question is whether or not the claim language itself discloses a structure that is sufficient to perform the required function in its entirety. *See Altiris*, 318 F.3d at 1375.

If one looks to claim 121 for a detailed structure, or an algorithm (as suggested by Mitsubishi), one will find nothing. Indeed, the only structure in the claim identified by GE for the "inverter controller means" are the words "inverter controller" themselves. *See* GE Br. at 59. At first, this argument may seem circular, *i.e.,* that the structure for the claimed inverter controller means is the inverter controller. However, the specification confirms that an "inverter

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[34](...continued)
Mitsubishi Br. at 6-7 (citing RX-76 at GEWT00006127)). Without citing hearing testimony to put the remark in context, or providing a thorough quotation of the remark and discussion of its meaning, it is not possible to give the statement much weight. Moreover, it is the statements of the applicant during the prosecution of the patent, rather than those of the examiner, that are usually accorded weight when narrowing the interpretation of claim terms. *See Southwall* 54 F.3d at 1576.

controller" as contained in the language of the claim is in fact the required structure. In particular, the specification provides:

> Turning now to the inverter side of the wind turbine system, the details of the inverter control unit **88** are shown in FIGS. **13-15**. Like the generator control unit **76**, ***the inverter control unit is preferably implemented with a digital signal processor, a Texas Instruments model TMS320C25.*** Computer code for implementing the inverter control function in a DSP is disclosed in the microfiche appendix.

CX-1, col. 16, lines 48-55 (emphasis added).

Thus, the specification shows that the inverter control unit is simply an inverter controller which, in the case of the preferred embodiment, is implemented in the form of a digital processor, specifically a TI TMS320C35, programmed to function according to the algorithms or other detailed information provided in the Figures. The disclosure of the specification is consistent with the knowledge of one of ordinary skill in the art, who would recognize an inverter controller as a piece of equipment or a component, and also would be able to buy a processor. The claim instructs one where to locate the controller, *i.e.,* "coupled to the inverter." Further, one of ordinary skill would already know how to program such a processor. One would need only to know what the processor should be programmed to do, but that information is explicitly provided by the claim language, *i.e.,* respond "to a power factor control signal for controlling the active switches to supply electricity at a desired angle between voltage and current." *See* Kirtley Tr. 483-483, 659-661.

According to the specification, the information disclosed in connection with inverter control unit 88, and depicted in Figures 13-15, is an example of how the digital processor should be programmed in the preferred embodiment. Those examples are not to be confused with a

structure needed to complete a means-plus-function claim limitation. Nor has any reason been shown to restrict the claim to the preferred embodiment by reading that particular information from the specification into the claim.[35]

Accordingly, the "inverter controller means" is not a means-plus-function limitation. It is an inverter controller, *i.e.,* a piece of equipment that may be implemented in the form of a digital processor. Further, the inverter controller means and its operations are not restricted to the examples, algorithms or other programming information contained in the specification for the preferred embodiment. However, as required by the plain language of claim 121, the inverter controller means must control the active switches to supply electricity at a desired angle between voltage and current.

B. Infringement Determination

GE accuses Mitsubishi's MWT of literal infringement of claim 121 of the '039 patent. GE Br. at 51-68. Further, GE argues that if claim 121 were limited to the specification's preferred embodiment (which is the way that GE characterizes Mitsubishi's proposed claim construction), the MWT would infringe under the doctrine of equivalents. *Id.* at 68-69.

Mitsubishi argues that the MWT does not infringe claim 121 either literally, or under the doctrine of equivalents. Mitsubishi Br. at 18-26. The Staff also argues that the MWT does not infringe either literally, or under the doctrine of equivalents. Staff Br. at 27-34.

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[35] Even in the case of a means-plus-function limitation covering a computer or controller, the algorithm itself is not the structure. Rather, the structure is a special computer or controller that has been programmed to perform the disclosed algorithm. *See MoneyIn*, 545 F.3d at 1367 (quoting *Aristocrat Techs. Austl. Pty Ltd. v. Int'l Game Tech.*, 521 F.3d 1328, 1333 (Fed. Cir. 2008)).

The dispute concerning the question of infringement centers around the following four limitations (which were also areas of dispute with respect to claim construction): induction generator, power converter, inverter for supplying output electricity, and inverter controller means. Each disputed element is discussed below.

1. Literal Infringement

"induction generator"

As noted, no party disputes the fact that the MWT uses an induction generator, specifically, a multiphase induction generator. In fact, the MWT uses a doubly-fed induction generator, or DFIG, that produces three-phase electricity. *See* Kirtley Tr. 387-388, 430-432. The noninfringement arguments of Mitsubishi and the Staff with respect to this limitation are based on their proposed claim constructions that would limit the "induction generator" to a squirrel cage generator. As discussed above in connection with claim construction, those proposals were rejected in favor of a construction that allows squirrel cage and other generators (in particular DFIGs) to meet this claim limitation.

Accordingly, it is found that the MWT practices the "induction generator" limitation literally.

"power converter"

The evidence shows that the DFIG of the accused MWT directly converts variable frequency electricity from the generator into fixed electricity. In fact, the MWT has an AC-DC-AC power converter with an inverter. *See* Kirtley Tr. 441-445, 699-700; Habetler Tr. 1195-1196, 1241-1242.

Thus, the MWT practices this claim limitation literally.

"inverter for supplying output electricity"

As discussed above in connection with claim construction, the stator of a doubly-fed generator (such as a DFIG) is connected directly to the grid. Thus, the path of output electricity from a DFIG differs from that of the squirrel cage generator to which Mitsubishi and the Staff would limit claim 121. However, as also discussed above, the claim is not so limited. Further, there is no limitation in the claim language (or in the specification) that requires the inverter to be located on the grid (*i.e.,* line) side.

[[36]

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Accordingly, the MWT practices this claim limitation literally.

"inverter controller means"

[

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[36] [ ]

According to the express claim language, the inverter controller must be "responsive to a power factor control signal for controlling the active switches to supply electricity at a desired angle between voltage and current." [

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Accordingly, the MWT practices this claim limitation literally.

2. Doctrine of Equivalents

Because the MWT practices each limitation of claim 121 literally, there is no need to conduct an analysis under the doctrine of equivalents to determine whether or not the MWT practices the claim. In any event, based on the sparse analysis presented by GE on this issue, it is unclear whether infringement could be found under the doctrine of equivalents on a limitation-by-limitation basis. *See* GE Br. at 68-69.

3. Summary Concerning Infringement of Claim 121

It is found by a preponderance of the evidence that the accused MWT practices claim 121 of the '039 patent literally. It has not been found that the MWT would practice claim 121 under the doctrine of equivalents.

C. Domestic Industry

As detailed in Section I.A., it already has been found in an unreviewed initial determination that the economic prong of the domestic industry requirement is satisfied with respect to each asserted patent. Further, as detailed in Section I.B.5., GE relies on the GE Turbine to argue that the technical prong has been satisfied with respect to each asserted patent. GE Br. at 69-71 (arguing that the GE Turbine literally practices claim 121 of the '039 patent, as well as under the doctrine of equivalents, if the claim were limited to a squirrel cage configuration).[37]

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[37] In its brief, GE advances a two-paragraph, alternative argument concerning domestic industry. It is argued that licensing of the asserted patents establishes a domestic industry, apparently with respect to each patent-in-suit. GE also argues that the undersigned erroneously sustained Mitsubishi's objection during the hearing to the testimony of GE witness McGinness concerning licensing. In arguing that the ruling at the hearing was "improper," GE criticizes the "extra-statutory distinction between 'technical' and 'economic' prongs" of the domestic industry requirement. *See* GE Br. at 97-98.

GE's latest argument concerning the testimony of Mr. McGinness (who did testify on other subjects) is remarkable because during the hearing, it was GE that insisted, on more than one occasion, that there was indeed a distinction between the technical and economic prongs of the domestic industry requirement, and further that somehow the admission of the disputed testimony on licensing would assist GE in establishing the "technical prong" of the domestic industry requirement. *See* Tr. 315 ("For the purposes of Mr. McGinness's testimony, we're soliciting domestic industry information for application to the technical prong."), Tr. 375-376 ("We were offering it solely for the technical prong and for secondary considerations, which he will testify to during our rebuttal case."), Tr. 1817 ("our ill-fated campaign of last week regarding the technical prong"). *See also* Staff Br. at 20-21 (arguing waiver because GE had failed in a timely fashion to plead domestic industry based on licensing).

At the hearing, GE's response to Mitsubishi's objection, in which GE attempted to link

(continued...)

Mitsubishi, in an abbreviated argument, takes the position that the GE Turbine does not practice any asserted patent, including the '039 patent. Mitsubishi Br. at 27-28. Similarly, the Staff argues that GE has not satisfied the technical prong of the domestic industry requirement with respect to any asserted patent, including the '039 patent. Staff Br. at 70.

Both Mitsubishi and the Staff argue that the GE Turbine fails to practice claim 121 for the same reasons set forth with respect to the MWT. They argue that, like the MWT, the GE Turbine lacks the required "induction generator," "power converter," "inverter for supplying output electricity," and "inverter controller means." Mitsubishi Br. at 27-28 ("Thus, for at least the same reasons the Mitsubishi Wind Turbine does not infringe, the GE wind turbine does not practice claim 121."); Staff Br. 71 ("In sum, the GE wind turbine is more similar to the accused MHI Wind Turbine than it is to the patent. Thus, for the reasons that the MHI Wind Turbine does not infringe, the GE wind turbine does not practice the '039 patent.").

Yet, as discussed previously, the proposed claim constructions of Mitsubishi and the Staff were not adopted, and the MWT was found to infringe claim 121 of the '039 patent. For example, the GE Turbine, like the MWT, [

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[37](...continued)
licensing to the technical prong, was unclear. In view of GE's new statements (in its post-hearing brief) concerning the technical prong of the domestic industry requirement, GE's arguments made at the hearing appear to be abandoned.

In any event, GE has not established a domestic industry based on licensing for the '039 patent, or any other patent asserted in this investigation for that matter.

] is an induction generator and supplies multiphase power, thus satisfying the "multiphase induction generator" limitation of the claim. *See* Kirtley Tr. 544-545.

The record evidence shows that the GE Turbine practices each of the additional limitations of claim 121, including the disputed limitations. [

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Accordingly, it is found that the GE Turbine literally practices claim 121, and thus the technical prong of the domestic industry requirement is met with respect to the '039 patent.[38]

1. **Summary Concerning Domestic Industry Under the '039 Patent**

GE has demonstrated by a preponderance of the evidence that the domestic industry requirement is satisfied with respect to the '039 patent.

D. Validity Determination

Mitsubishi argues that if GE's proposed claim constructions are adopted, claim 121 of the '039 patent should be found invalid on three grounds: lack of enablement; lack of adequate written description; and obviousness. Mitsubishi Br. at 12-18, 28-35; Mitsubishi Reply at 35-42. GE argues that Mitsubishi has failed to establish that the asserted claim is invalid due to obviousness, lack of enablement, or lack of written description. GE Br. at 71-81; GE Reply at

[38] GE's brief does not offer a thorough doctrine of equivalents analysis, and is generally based on the arguments made in connection with the MWT. *See* GE Br. at 71.

36-42. The Staff disagrees with Mitsubishi as to certain prior art raised in connection with alleged obviousness; and further argues that if claim 121 is construed to contain a means-plus-function element, the invalidity defenses need not be reached. Staff Br. at 35-36.

1. Enablement

Mitsubishi argues that if GE's proposed claim constructions were adopted, claim 121 of the '039 patent would be invalid for lack of enablement. In particular, it is argued that GE's own expert, Dr. Kirtley, admitted that to the extent there is any novelty in claim 121, it is found within the inverter control unit shown in Figure 13, and how that element uses the power factor angle, φ, to control the power factor. [

]

GE argues that Mitsubishi has failed to meet its burden of proving by clear and convincing evidence that claim 121 lacks enablement. GE Br. at 80-81.

As discussed above, the Staff does not reach the enablement defense under its proposed claim construction. Staff Br. 35-36.

Mitsubishi's argument rests on a faulty characterization of Dr. Kirtley's testimony. He did not testify that any novelty in claim 121 is found within the particular inverter control unit shown in Figure 13. Rather, Dr. Kirtley testified that Figure 13 illustrates only one embodiment of an inverter controller. *See* Kirtley Tr. 658 ("I guess I would have to say this is a description of an embodiment of an embodiment. This is one way of doing the -- that inverter controller."). Dr. Kirtley further testified: "It's a combination of elements that makes up the novelty of this invention. * * * I think the novelty in this invention is in the combination of elements, including the notion of operating a machine at a -- a desired power factor angle." Kirtley Tr. 657. Additionally, it has not otherwise been shown that the novelty of claim 121 lies only in Figure 13.

Thus, Mitsubishi's argument that other embodiments cannot be enabled simply because they are not disclosed in the specification, *i.e.,* Figure 13, must fail. Moreover, the use of inverters to control DFIGs and squirrel cage generators was well known in the art. With the teachings of the '039 patent, one of ordinary skill would have been able to implement the inverter controller aspects of claim 121. *See* Kirtley Tr. 659-661, 2333.[39] Indeed, in GE's rebuttal case, Dr. Kirtley reviewed the state of the art when the application was filed to support his testimony

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[39] Relying on *Auto. Techs. Int'l, Inc. v. BMW*, 501 F.3d 1274, (Fed. Cir. 2007), Mitsubishi places little or no value on the knowledge of one of ordinary skill. *See* Mitsubishi Br. at 14-15. In its *Auto. Techs.* opinion, the Federal Circuit stated that "[i]t is the specification, not the knowledge of one skilled in the art, that must supply the novel aspects of an invention in order to constitute adequate enablement." 501 F.3d at 1283. However, as discussed, *supra,* Mitsubishi's characterization of the claimed invention, and of the related testimony of GE's expert, is erroneous. It has not been established that the only possible point of novelty of claim 121 resides solely in the implementation of an inverter controller shown in Figure 13. Thus, the particular aspect of the *Auto. Techs.* opinion relied upon by Mitsubishi is inapplicable here. It is also noted that even in the *Auto. Techs.* analysis, "the knowledge of one skilled in the art is indeed relevant." *Id.*

that he did not believe that "a doubly-fed machine would be any harder to get working than the full power conversion shown in the preferred embodiment." *See* Kirtley Tr. 2330-2333.

Accordingly, it has not been shown by clear and convincing evidence that claim 121 of the '039 patent is invalid due to a lack of enablement.

2. Written Description

Mitsubishi argues that if claim 121 were construed broadly enough to include a doubly-fed induction generator, partially-rated power converter, an

d, or, an inverter controller means [

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GE argues that Mitsubishi has failed to meet its burden of proving by clear and convincing evidence that claim 121 lacks an adequate written description. GE Br. at 79-80. The Staff does not reach the enablement defense, given its proposed claim construction. Staff Br. 35-36.

As discussed above in connection with the claim construction issue, claim 121 and the specification in no way limit the claim's required "induction generator" to a squirrel cage generator. In fact, at the time that the application was filed,[40] one of ordinary skill understood

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[40] There is no argument that claim 121 was ever amended, had new matter added to it, or in any way depends upon a parent or any other additional specification. Thus, the circumstances surrounding claim 121 are not analogous to those of *Pandrol USA, LP v. Airboss Ry. Prods. Inc.*, 424 F.3d 1161, 1165 (Fed. Cir. 2005), *PowerOasis, Inc. v. T-Mobile USA, Inc.*, 522 F.3d 1299, 1308 (Fed. Cir. 2008), or other cases relied on by Mitsubishi, in which one had to search through amendments or earlier-filed applications to support (or attempt to support) a claim.

that doubly-fed induction generators were one of only two types of induction generators used in variable-speed wind turbines. *See* Habetler Tr. 1236; Kirtley Tr. 419. Indeed, DFIGs were well known in the art prior to the filing of the application for the '039 patent. The use of inverters to control DIFGs, as well as squirrel cage generators, likewise was well known in the art. Literature concerning the use and control of DFIGs was widely available (a fact that Mitsubishi argues, *infra*, in connection with alleged obviousness). *See* Kirtley Tr. 419-423; Habetler Tr. 1236, 1273.

A patentee is not required to describe all species encompassed by a claim. *See Cordis Corp. v. Medtronic AVE, Inc.*, 339 F.3d 1352, 1365 (Fed. Cir. 2003). In this instance, there is no indication that the patentees were required to discuss (or illustrate) a DFIG embodiment in order to inform a person of ordinary skill that they were in possession of the claimed invention, including an invention that may be implemented with a DFIG.

Accordingly, it has not been shown by clear and convincing evidence that claim 121 is invalid due to a failure to provide an adequate written description.

3. Obviousness

Mitsubishi does not argue that claim 121 should necessarily be found invalid due to obviousness. Rather, Mitsubishi argues that "under the expansive claim constructions argued by GE, claim 121 would also be invalid as obvious in light of the dissertation of Arsudis, 'Double-Fed Three-Phase Generator with Voltage Link Converter in the Rotor Circuit' (1989) [(Arsudis) (RX-323; RX-324 (translation))], either alone, or in combination with the other prior art cited at the hearing." Mitsubishi Br. at 28. The other prior art items specifically cited by Mitsubishi are: Warneke, Otto, "Use of a Double-Fed Induction Machine in the Growian Large

Wind Energy Converter," Siemens Power Engineering, Vol. VI, No. 1, pp. 56-59 (Jan./Feb. 1984) ("Warneke") (RX-39); Mohan et al., "Power Electronics, Converters, Applications, and Design," John Wiley & Sons (1989) ("Mohan") (RX-85); and Ooi et al., "A Three-Phase Controlled Current PWM Converter with Leading Power Factor," IEEE Transactions on Industry Applications, Vol. 1A-23 (Jan./Feb. 1987) ("Ooi") (RX-86).[41] *Id.* at 32-35.

GE argues that Mitsubishi has failed to prove by clear and convincing evidence that claim 121 is obvious. GE Br. at 71-79. The Staff does not join with Mitsubishi as to certain prior art and argues that Mitsubishi's invalidity arguments need not be reached because, in its view, claim 121 should not be construed in the manner proposed by GE. Staff Br. at 35-36.

As discussed in the claim construction section above, it has not been found that claim 121 must contain the limitations proposed by Mitsubishi, such as requirements that the claim read only on a wind turbine with a squirrel cage generator, only on a turbine with a fully rated power converter, and only on the inverter controller means disclosed in the specification. Thus, it is necessary to consider Mitsubishi's alternate arguments relating to alleged obviousness, including the prior art upon which Mitsubishi relies.

A theme common to the '039 patent and much of the prior art in question is the ability to supply electricity at a desired angle between voltage and current. In general, the ability to control the angle between voltage and current is important to many applications, including the management of reactive power. The record shows that power plants must manage reactive power because it significantly affects voltage on the grid. *See* Lyons Tr. 238. With so-called "weak

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[41] The Staff does not dispute the private parties' stipulation that Arsudis, Warneke, Mohan and Ooi qualify as prior art to the '039 patent under 35 U.S.C. § 102(b). *See* Joint Submission and Stipulation Regarding Prior Art ("Prior Art Stips."), ¶ 1 (May 7, 2009).

grids" (such as remote locations where wind turbines tend to be located), reactive power management helps prevent rapid and random fluctuations in the grid voltage, known as "voltage flicker." Voltage flicker may, among other things, cause bulbs to flicker. Lyons Tr. 219-220, 238-240.

Specifically with respect to the '039 patent, GE's expert, Dr. Kirtley, described in his direct hearing testimony how, in 1991 (when the patent application was filed), conventional power plants used reactive power (represented as Q*, in contrast to real power P*) to obtain a steady voltage at the point of interconnection to the grid. Dr. Kirtley testified as follows:

> A. Yes. There really were two methods that were used in large power plants. One was a voltage regulator, which was simply a feedback loop that measured output voltage and readjusted field currents to achieve the right terminal voltage.
>
> And another method that was sometimes used was to operate the plant to a defined level of reactive power; that is, the system operator would ask the power plant to generate to a specific level of reactive power.

Kirtley Tr. 2338.

Furthermore, according to Dr. Kirtley, the '039 patent offered something new:

> Q. What about controlling to a constant power factor where P and Q would move up and down together?
>
> A. I don't believe that -- I had -- I have never heard of that being done before -- before this was invented for wind turbines.
>
> Q. Okay. Do you think that one of ordinary skill in the art in 1991 would have been motivated to try this fixed power factor control for a wind turbine?
>
> A. I don't think -- I think that was really an inventive thing. I think one of ordinary skill in the art would probably have thought about the two methods that had already been used for other kinds

of power plants.

Kirtley Tr. 2338-2339.

Indeed, in hindsight, the use of fixed power control for wind turbines is a useful innovation. It is practiced by both Mitsubishi and GE, as discussed above in connection with the infringement and domestic industry issues. However, in analyzing the prior art, one must avoid using hindsight knowledge to determine whether or not a patent claim is obvious. *See Graham,* 383 U.S. at 36; *Sanofi-Synthelabo v. Apotex, Inc.*, 550 F.3d 1075, 1088 (Fed. Cir. 2008).

In arguing that claim 121 is obvious, Mitsubishi relies primarily upon the Arsudis dissertation because, as explained by GE's expert during cross-examination at the hearing, it contains all the elements and limitations of claim 121, except the final element, *i.e.,* "inverter controller means coupled to the inverter and responsive to a power factor control signal for controlling the active switches to supply electricity at a desired angle between voltage and current." *See* Kirtley Tr. 2375-2376.

Mitsubishi does not raise invalidity under 35 U.S.C. § 102 (anticipation), but it does argue that Arsudis alone, as read by one of ordinary skill, would render claim 121 obvious under section 103. Further, Mitsubishi argues that the inverter controller limitation would have been supplied by a number of other prior art teachings as reflected in the documents identified above, *i.e.,* Warneke, Mohan, and Ooi.

For the reasons discussed below, it has not been shown that any single prior art item, or combination of prior art, identified by Mitsubishi renders claim 121 obvious.[42]

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[42] The record also contains some evidence relating to secondary considerations that, although not of great weight, supports the validity of the claim 121. Most significantly, the '039 (continued...)

Arsudis

Arsudis (RX-323; RX-324 (translation)) does not disclose an "inverter controller means coupled to the inverter and responsive to a power factor control signal," or "controlling the active switches to supply electricity at a desired angle between voltage and current," which are both required by claim 121. *See* Kirtley Tr. 2376. In fact, no power factor control signal is disclosed in the Arsudis dissertation, so the output electricity is not controlled to a desired angle between voltage and current. Kirtley Tr. 2391.

Mitsubishi's obviousness arguments are built primarily upon supposed admissions by GE's Dr. Kirtley to the effect that (quoting Mitsubishi's brief): "the ability to control the power factor of the electricity output to the grid using a power factor control was what was new in the '039 patent and a significant departure from the independent control of real and reactive power used in conventional power plants." Mitsubishi Br. at 30 (citing Kirtley Tr. 2338). The portion of Dr. Kirtley's testimony at issue is quoted at length above.

In no portion of his testimony did Dr. Kirtley opine that the mere ability to control the power factor was an inventive concept. As already discussed in connection with the enablement defense, Dr. Kirtley testified that "novelty in this invention is in the combination of elements, including the notion of operating a machine at a -- a desired power factor angle." *See* Kirtley Tr. 657. According to the actual testimony of Dr. Kirtley, a key element of claim 121 is "controlling to a constant power factor where P and Q would move up and down together." *See*

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[42](...continued)
patent is the subject of 10 licenses. The licenses cover more than the '039 patent, but eight of them specifically enumerate the patent. Additionally, according to a GE witness involved in license negotiations, inclusion of the '039 patent is requested by potential licensees. *See* McGinness Tr. 2269-2277, 2290.

Kirtley Tr. 2338, 2342-2343.

Yet, Arsudis discloses P output from the turbine that changes with the wind, but Q does not do so. Thus, P and Q do not move up and down together. Indeed, no power factor control signal is disclosed in the Arsudis dissertation inasmuch as power factor control like that claimed by the '039 patent is not taught in the dissertation. *See* Kirtley Tr. 2340-2341, 2391. It has not been shown that Arsudis alone, as read by one of ordinary skill, discloses the required power factor control.

Thus, it has not been shown that to one of ordinary skill, claim 121 would have been obvious in view of the Arsudis dissertation alone. Nor, as discussed below, has it been established that the other prior art relied upon by Mitsubishi supplies the claim limitations missing from Arsudis, let alone that one of ordinary skill would combine the art in the manner argued by Mitsubishi.

Warneke

The Warneke article (RX-39) discusses the use of a specific doubly-fed induction generator in the "Growian large wind energy converter" built in Germany. As in the case of other doubly-fed induction generators discussed herein, "[t]he stator of the induction generator is connected to the system." *See* RX-39 (Warneke) at MHI4002403. Warneke states that "[t]he rotor is fed via sliprings from a cycloconverter that controls the frequency, amplitude and phase angle of the rotor currents. The frequency is controlled so that the sum of the rotor rotational frequency and rotor current frequency is always equal to the system frequency. By changing the phase angle between the cycloconverter output voltage and rotor current, the active and reactive power of the double-fed induction machine can be controlled independently." *Id.* While some

aspects of this description are similar to the DFIG technology already discussed, and also include some limitations of claim 121, it is noted that a cycloconverter, unlike the power converter of claim 121, does not contain an inverter. *See* Kirtley Tr. 2356.

Moreover, Warneke does not teach control to a desired angle between voltage and current or responsiveness to a power factor control signal. *See* Kirtley Tr. 2354- 2357. There is vague reference to "power factor control" in the Warneke text and accompanying figure, but there is no disclosure of the power factor control signal required by claim 121. *See* Kirtley Tr. 2356-2358.

While it might be tempting to assume that Warneke's mention of power factor control must refer to power factor control as disclosed in the '039 patent (as Mitsubishi has done), such would be an exercise of impermissible hindsight. Additionally, even assuming that Warneke's reference to power factor control refers to something similar to the power factor control claimed by the '039 patent, Warneke would fail to disclose to one of ordinary skill how to put it to use, specifically to obtain fixed power-factor control for a variable-speed wind turbine. *See* Kirtley Tr. 2354, 2356-2359.

Mohan

Mitsubishi argues that "the purportedly 'new' power factor control of claim 121 was being taught to college students in textbooks," as in the Mohan text (RX-85) that Mitsubishi relies upon in this investigation. Mitsubishi Br. at 34. Mohan was already before PTO during the reexamination of the '039 patent, during which the patentability of the claim was confirmed. *See* CX-1 (includes reexamination certificate); RX-76 (patent prosecution) at GEWT00006095. In fact, the applicant for reexamination made some of the same arguments concerning Mohan that Mitsubishi's expert made during the hearing in this investigation. *See* Habetler Tr. 1212-

1213.

Further, although Mitsubishi argues that Mohan discloses the "purportedly 'new' power factor control of claim 121," as already discussed twice, Mitsubishi has a narrow and incorrect view of GE's argument concerning the novelty of claim 121. Thus, Mitsubishi's argument concerning Mohan, and a combination of Arsudis and Mohan, is based on a faulty characterization of GE's argument.

While Mohan, within its many hundred of pages, does contain a section relating to wind power and the grid, that section does not mention power factor. Moreover, even the figure in that section would not work with a multiphase induction generator due to its lack of active switches to excite the generator. *See* Kirtley Tr. 2345-2346; Habetler Tr. 1133, 1212-1213. The section of Mohan upon which Mitsubishi principally relies discusses utility interfaces and electric locomotives, and specifically refers to a single-phase circuit, rather than adapting its teachings to a multiphase induction generator. It is unclear whether one of ordinary skill could modify Mohan's teaching for use with a multiphase generator, as required by claim 121. *See* Kirtley Tr. 2345-2347; Habetler Tr. 1193; RX-85 (Mohan) MHI0000437 (Mohan, pp. 424-25).

Finally, the section of Mohan (in chapter 17) that Mitsubishi relies upon for disclosures relating to power factor, discusses how to produce power only at a unity power factor, but does not show control to other desired angles between voltage and current. Nor does it disclose control in response to a power factor control signal, which is also required by claim 121. *See* Kirtley Tr. 2347-2348.

Thus, not only has Mitsubishi selectively pieced together portions of the Mohan text based on the teachings of the '039 patent, Mitsubishi has not managed to assemble together all of

the limitations of claim 121 that are absent from the Arsudis dissertation.

Ooi

Finally, Mitsubishi also relies upon Ooi (RX-86) in combination Arsudis, or Arsudis and Mohan, in connection with its obviousness defense. Mitsubishi Br. at 33-35. Ooi, along with Mohan, was before the PTO during reexamination of the '039 patent. The patentability of all claims of the '039 patent was confirmed. *See* CX-1 (includes reexamination certificate); RX-76 (patent prosecution) at GEWT00006095; Habetler Tr. 1212-1213.

Ooi describes the results of an experiment to teach how to use an inverter to make reactive power. Ooi taught "that you could actually inject current into the power system with both real and reactive power being controllable." Kirtley Tr. 2352. However, Ooi does not address considerations particular to wind turbines and how they connect to the grid, especially not to one of ordinary skill. Moreover, Ooi does not suggest the control of output electricity to a desired power factor angle in response to a power factor control signal, which is required by claim 121, and which similarly is absent from the Arsudis dissertation (with which Mitsubishi would combine Ooi). *See* Kirtley Tr. 2353-2354.

4. Summary on Obviousness

It has not been established by clear and convincing evidence that any single prior art item, or any combination of prior art, identified by Mitsubishi renders claim 121 obvious.

E. Summary as to Claim 121

It has been shown by at least a preponderance of the evidence that claim 121 of the '039 patent is infringed by the MWT, and is practiced by the GE Turbine. The domestic industry requirement is satisfied with respect to the '039 patent. It has not been shown by clear and

convincing evidence that claim 121 is invalid. Accordingly, a violation of section 337 has occurred with respect to the '039 patent.

V. United States Patent No. 7,321,221

A. Claim Construction

The entire specification of the '221 patent occurs under the heading "CROSS REFERENCE TO OTHER APPLICATIONS," and begins by stating, "The present application is a continuation of German Patent Application No. 102 32 423.9, filed Jul. 17, 2002." CX-9 ('221 patent), col. 1, lines 5-9.

The specification provides, in part, that:

> With the increasing use of regenerative sources of energy, e.g. wind power plants, for electric power production, the problem arises that the duration of supply voltage drops substantially increases since not enough power can be provided to quickly stabilize the supply voltage after voltage drops caused, e.g., by a short-circuit.
>
> In view of these problems in the prior art, it is an object of the invention to provide an improvement of the known methods for operating a wind power plant, which improvement can be used for stabilizing the supply voltage after voltage drops without jeopardizing the electrical components of the wind power plant, as well as to provide a wind power plant capable of executing such methods.
>
> Regarding the method aspect, this object is solved by an improvement of the known methods for operating a wind power plant which is substantially characterized in that the feeding of the rotor current is resumed after the decoupling of the feed-in unit caused by the variation of the supply voltage amplitude as soon as the currents created in the rotor windings by this variation have dropped to a predetermined value.

Id. at col. 2, lines 20-41.

Independent claim 5, and dependent claims 7 and 8, are the only claims of the '221 patent asserted by GE. They claim a wind turbine, and provide, as follows:

> **5.** A wind turbine, comprising:
>
> a rotor with at least one rotor blade, the rotor being rotatably arranged with regard to a substantially horizontal rotor axis;
>
> an induction generator whose rotor windings are coupled to the rotor and whose stator coils can be coupled to a voltage grid;
>
> a feed-in unit for feeding currents into the rotor windings;
>
> a control unit for controlling the frequency of the fed-in currents depending on the rotor rotation frequency, and
>
> an emergency unit which can be operated to electrically decouple the feed-in unit from the rotor windings in case of variations of the grid voltage amplitude, wherein the emergency unit comprises a release arrangement for releasing the rotor current feed-in after decoupling, when the currents generated in the rotor windings by variation of the grid voltage amplitude triggering the decoupling are declined to a predetermined value.
>
> * * *
>
> **7.** The wind turbine according to claim **5**, wherein the feed-in unit comprises a converter coupled to the grid voltage.
>
> **8.** The wind turbine according to claim **7**, wherein the converter is an intermediate DC voltage converter with a rotor-sided rotor current converter and a grid-sided grid converter.

Id. at col. 5, line 58 - col. 6, line 16; col. 6, lines 18-25.

There is no dispute among the parties with respect to any element contained in the asserted claims, except for the final, "emergency unit" element of claim 1. Even with respect to that element, there is no dispute that in the claimed wind turbine, a feed-in unit normally supplies, or feeds, current to the turbine's rotor winding. As stated in the patent specification,

this concept was commonly known in the prior art. *See* CX-9 ('221 patent), col. 1, lines 36-43.[43] Nor is a there a dispute that in an emergency caused by an unsafe variation in the amplitude of the grid voltage, the feed-in unit is decoupled from the rotor windings, according to the plain language of the "emergency unit" claim element. According to the specification, such decoupling was also known in the prior art. *See Id.* at col. 1, line 61 - col. 2, line 2. Further, there is also no dispute that such decoupling may be achieved by the use of a crowbar circuit that was generally known in the prior art, and is mentioned in the specification. *Id.* at col. 3, lines 46-49.

The parties' dispute stems from the limitation that requires "releasing" the rotor current feed-in after the decoupling has taken place. It is not surprising that the dispute is centered on this limitation because, according to the specification, one object of the claimed invention is an improvement in the way that a turbine resumes the feeding of rotor current. *Id.* at col. 2, line 26 - col. 3, line 6.

GE's brief does not present a comprehensive and independent statement of how it proposes that the "emergency unit" element should be construed. Instead, GE intertwines its claim construction arguments with its infringement arguments, and does so mostly as a critique of the non-infringement arguments set forth by Mitsubishi's expert, Dr. Toliyat. The closest that GE comes to offering a proposed construction for this element is found on page 38 of its brief where GE (mostly quoting from the claim language) takes the position that "(i) the 'emergency unit' limitation' . . . requires an 'emergency unit,' or crowbar, that can be operated to 'electrically decouple' the 'feed-in unit' from the rotor windings 'in case of variations of the grid voltage

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[43] *See* Section I.B.1. (Technological Background).

amplitude,' and (ii) the 'releasing limitation' . . . requires an arrangement for releasing the crowbar and resuming the rotor current feed-in 'when the currents generated in the rotor windings by variation of the grid voltage amplitude triggering the decoupling are declined to a predetermined value.'" GE Br. at 38 (citing Toliyat Tr. 1438, 1445).

In GE's more detailed discussion of specific claim construction and infringement issues, GE proposes that, although the crowbar "can be operated" in response to grid voltage changes, claim 5 does not require measurement of grid voltage, or at least not direct measurement. Rather, GE argues that the specification shows that the claim is broad enough to allow grid voltage to be monitored indirectly [ ] Further, it argues that although claim 5 refers to the release of the decoupling (or crowbar) circuit when the currents generated in the rotor windings by variation of the grid voltage amplitude have declined to a "predetermined value," the specification shows that in practice, [ ]

[ ]

Mitsubishi briefed the issue of claim construction separately from the issue of infringement. Yet, like GE, its claim construction arguments consist almost entirely of an explanation of what is allegedly wrong with the arguments made at the hearing by the other side (in this case, GE), and the error that would come from adopting the other side's interpretation. Nevertheless, it is clear that Mitsubishi takes the position that "predetermined value" refers to a value fixed prior to operation of the turbine, and not to a more open-ended construction such as "any value that prevents damage." Further, Mitsubishi argues that to be consistent with the specification and prosecution history, the emergency unit must turn off, and the driving of rotor currents must resume, "when" (*i.e.,* immediately or as soon as) current created in the rotor

windings drops "to" (*i.e.,* as soon as they drop to) a predetermined value. Mitsubishi Br. at 36-42. Mitsubishi argues that one of ordinary skill would understand the words of claim 5 to mean what they say, "and nothing more." *Id.* at 42.

The Staff also argues that the "emergency unit" element is unambiguous and should be construed according to the express meaning of the claim language. The Staff argues that the feeding of rotor current should resume when (*i.e,* as soon as) the currents created by the current variation have dropped to a predetermined value, and not when all fluctuations have ceased. Further, the Staff argues that a "predetermined value" is one set in advance, and not necessarily "to or below" a value that prevents damage to the electrical components of the wind turbine. Staff Br. at 50-54. Indeed, the Staff, relying on a portion of the '221 patent's prosecution history, argues that "any predetermined value – even if riskier than the value prescribed by Rebsdorf [a prior art patent[44]] – is allowed by the claims." *Id.* at 54 (emphasis by Staff).

Thus, there are claim construction questions as to: (1) whether grid voltage amplitude must be directly measured, or whether one may measure other values that relate to grid voltage; (2) the meaning of "a predetermined value;" and in view of the claim terms "when" and "to," whether the release of the rotor current feed-in must occur as soon as the predetermined decline has occurred.

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[44] The private parties have stipulated that United States Patent No. 6,566,764, entitled "Variable Speed Wind Turbine Having a Matrix Converter," which issued to Rebsdorf et al. on May 20, 2003 ("Rebsdorf"), is prior art to the asserted '221 patent, under 35 U.S.C. § 102(b). *See* Prior Art Stips., ¶ 2.A.; Staff Br. at 54 n.30 (the Staff does not contest the stipulations of the private parties); RX-19 (Rebsdorf).

measurement of grid voltage amplitude

Nowhere in the plain language of claim 121, including the language of the "emergency unit" element, is there an explicit requirement that grid voltage amplitude be measured directly. Indeed, it is widely known in the art that there is a relationship between variations in grid voltage and [ ]

[.]

Moreover, the '221 patent specification shows that grid voltage variations can be monitored indirectly [ ] Specifically, in one embodiment, the specification teaches that due to high rotor currents, "intermediate circuit voltage in converter **50** exceeds a predetermined value," thus firing the crowbar circuit. *See* CX-9 ('221 patent), col. 5, lines 8-14; *see also Id.* at col. 5, lines 11-16 ("When the intermediate circuit voltage in converter **50** exceeds a predetermined value due to exceedingly high rotor currents, the crow bar formed as a B6 bridge is fired. Then, the same procedure as in the case of a short-circuit of the grid is executed.").

When Mitsubishi's expert was questioned at the hearing concerning the fact that the '221 patent specification provides an embodiment in which the crowbar is turned on (*i.e.,* decoupling occurs) as a result of the value of voltage on the DC bus capacitor (rather than as a result of directly monitoring grid voltage), he admitted that fact but was unable to reconcile it with his proposed construction of claim 5. Thus, he testified that he would exclude the preferred embodiment from the claim based upon his understanding of how one of ordinary skill would read the claim. *See* Toliyat Tr. 1765-1768. Yet, any claim construction that excludes an embodiment disclosed in a specification rarely, if ever, is correct. *See Vitronics,* 90 F.3d at 1583.

In this instance, there is nothing in the claim language, the specification, or extrinsic evidence to require a claim construction that excludes [ ] to determine when the emergency unit must be activated.

Consequently, the emergency unit of claim 5 need not operate only as a result of the direct measurement of grid voltage amplitude. Rather, electric decoupling may occur as a result of indirect measurement, [ ]

a predetermined value; whether the release of the rotor current feed-in must occur as soon as the predetermined decline has occurred

There is no doubt, based upon the plain meaning of the term "predetermined," that the value in question must be determined prior to the decoupling of the feed-in unit. Thus, to paraphrase the claim language, when "variation of the grid voltage amplitude trigger[s] the decoupling" one has already "predetermined" the value at which decoupling will be reversed, and the feed-in unit will be released. Further, release of the feed-in will occur "when" (*i.e.,* not "before," or "after," but rather "when") the currents that triggered the decoupling in the first place "are declined to" a predetermined value.

The plain language of the claim is supported by the specification, which states that an object of the claimed invention is to help stabilize the power supply after a voltage drop. To that end, the specification discusses the fact that "the feeding of the rotor current is resumed after the decoupling of the feed-in unit caused by the variation of the supply voltage amplitude ***as soon as*** the currents created in the rotor windings by this variation have dropped to a predetermined value." CX-9 ('221patent), col. 2, lines 26-41 (emphasis added).[45]

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[45] Nevertheless, this is an art in which the frequency of current is measured in cycles per (continued...)

Thus, it is crucial to know what the predetermined value is so that feed-in can resume as soon as the currents in the rotor windings caused by variation in the supply voltage have declined sufficiently. Interestingly, claim 5 characterizes these events within the context of an "emergency," and presumably, operation will return to normal as soon as the emergency has passed. Indeed, the specification discusses the harm that can come to a wind turbine during a low voltage event. *See* CX-9 ('221 patent), col. 1, lines 53-61 (destruction of the rotor power converter). Further, the specification states: "In view of these problems in the prior art, it is an object of the invention to provide an improvement of the known methods for operating a wind power plant, which improvement can be used for stabilizing the supply voltage after voltage drops ***without jeopardizing the electrical components of the wind power plant***, as well as to provide a wind power plant capable of executing such methods." *Id.* at col. 2, lines 27-33 (emphasis added). Thus, one must find the predetermined value at which the release referred to in the claim will not jeopardize the electrical components of the turbine.

The specification provides at least one answer as to how one may derive the predetermined value. The specification states that, "[b]asically, resuming the feeding of rotor current can be accomplished under consideration of a predetermined time constant." *Id.* at col. 3, lines 4-6. The constants in question are expressed in the specification in terms of a time range,

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[45](...continued)
second, and voltage fluctuation is measured in milliseconds. Thus, one of ordinary skill would know that even a term such as "as soon as" carries with it a connotation of engineering practicality. *See* Collins Tr. 922-923. Even the specification of the '221 patent, when addressing voltage drop and the resumption of the feed-in, indicates ranges of time, albeit measured in milliseconds, but nonetheless ranges that account for factors such as resistance. *See* CX-9 ('221 patent), col. 2, lines 42-49, col. 3, lines 37-38, 54-56; *see also* Holley Tr. 354 (variables to consider with respect to turning off the crowbar circuit, such as the phases of the generated current).

measured in milliseconds. In fact, the specification teaches that "[w]hen the amplitude of the rotor current has dropped sufficiently after 100 to 200 msec, the feeding of the rotor current can be resumed on recurrence of the supply voltage within the framework of the method according to the invention." *Id.* at col. 3, lines 35-40. The specification explains that exact times depend upon resistance in the system. *See* CX-9 ('221 patent), col. 3, lines 53-56; *see also* Collins Tr. 906 (The resistance probably can be calculated, but "in a complex system like this, it would be modeled or simulated.").

In summary, an examination of the plain language of the claim and the specification shows that the "emergency unit" of claim 5 is construed to require releasing the rotor current feed-in as soon as the currents generated in the rotor windings by variation of the grid voltage amplitude triggering the decoupling are declined to a predetermined value. Further, the predetermined value is to be determined before operation of the emergency unit, and the value should be determined so as not to jeopardize the electrical components of the turbine. A time constant, in the form of a specific time range, may be considered when determining that predetermined value.

B. Infringement Determination

GE accuses Mitsubishi's MWT of literal infringement of claims 5, 7, and 8 of the '221 patent. GE Br. at 38-44. GE also argues that the evidence presented at the hearing would support a finding of infringement under the doctrine of equivalents with respect to the "emergency unit" and "releasing" limitations. *Id.* at 44-45.

Mitsubishi argues that its turbines do not literally infringe independent claim 5 because they do not decouple the feed-in unit "in case of variations of grid voltage amplitude," and nor do

they release rotor current feed-in "when [rotor currents] . . . are declined to a predetermined value." Mitsubishi Br. at 42-50. Further, Mitsubishi argues that GE narrowed claim 5 during prosecution of the '221 patent such that it surrendered the equivalents it now seeks to assert. Thus, it is argued, the turbines cannot infringe under the doctrine of equivalents. *See Id.* at 50-51. Additionally, Mitsubishi argues that inasmuch as its turbines do not infringe independent claim 5, they cannot infringe dependent claims 7 and 8. Mitsubishi does not, however, set forth any other defense to GE's argument that the accused turbines infringe claims 7 and 8. *Id.* at 50.

The Staff argues that Mitsubishi's turbines fail to satisfy two limitations of claim 5, either literally or under the doctrine of equivalents: (1) "emergency unit which can be operated to electrically decouple the feed-in unit from the rotor windings in case of variations of the grid voltage" and (2) "releasing the rotor current feed-in after decoupling, when the currents generated in the rotor windings by variation of the grid voltage amplitude triggering the decoupling are declined to a predetermined value." Staff Br. at 54-58. Further, the Staff argues that dependent claim 7 and 8 cannot be infringed inasmuch as independent claim 5 is not infringed. *Id.* at 58.

1. Claim 5

Literal Infringement

[

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Accordingly, the MWT practices claim 5 of the '221 patent literally.

Doctrine of Equivalents

The evidence shows that even if the MWT did not practice claim 5 literally, it would practice claim 5 under the doctrine of equivalents. In that regard, the MWT has the required "emergency unit" because, for the reasons discussed above regarding claim construction, [

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Further, at the very least, when comparing the MWT to claim 5, one finds that the MWT (1) performs the same function, *i.e.,* releasing the rotor current feed-in; (2) in the same way, *i.e.,* resuming the feed-in of current into the rotor windings after the rotor currents have declined to a safe level; and (3) achieves the same result, *i.e.,* resuming normal rotor current feed-in operation, while avoiding damage to the power converter from excess rotor currents. *See* Collins Tr. 955 -959.

Mitsubishi argues that GE is precluded from arguing that [ ] is substantially similar to the claimed "release arrangement" because, during prosecution of the '221 patent, the applicants distinguished the claimed invention over the prior art Rebsdorf patent (cited above). In particular, Mitsubishi argues that the applicants told the examiner that although Rebsdorf resumes control of the generator when the grid disturbance disappears, and allows the generator to be operated immediately after a disturbance has ended, Rebsdorf does not disclose resuming the driving of the rotor when the rotor currents have declined to a predetermined value (as claimed by the '221 patent). *See* Mitsubishi Br. 50-51 (citing RX-10 (prosecution history) at MHI4019510).

The statement relied upon by Mitsubishi, however, simply repeats the claim language, and is in no way a disclaimer of any equivalent thereof. In fact,[ ] [ ] is entirely consistent with the distinction made by applicants between the disclosure of the Rebsdorf patent and the claimed invention of the '221 patent with its use of a predetermined value. Accordingly, GE would not be precluded from arguing that the MWT infringes under the doctrine of equivalents.

Thus, infringement of claim 5 by the MWT could be found under the doctrine of equivalents.

2. Claims 7 and 8

Specific disputes have not arisen concerning the MWT's practice of the limitations added by dependent claims 7 and 8. *See* Mitsubishi Br. at 50. In addition, the record contains evidence concerning the MWT's practice of those limitations. *See* GE PFF 8.10 & 8.11; Collins Tr. 926-927. Consequently, it is found that the MWT practices claims 7 and 8 of the '221 patent literally.

3. Summary Concerning Infringement of Claims 5, 7, and 8 of the '221 Patent

It is found by a preponderance of the evidence that the MWT practices claims 5, 7, and 8 of the '221 patent literally. Further, if it were not found that the MWT literally practices claim 5, it would be found that the MWT practices claim 5 under the doctrine of equivalents.

C. Domestic Industry

As detailed in Section I.A., an unreviewed initial determination has already found that the economic prong of the domestic industry requirement is satisfied with respect to each asserted patent. Further, as detailed in Section I.B.5., GE relies on the GE Turbine to establish that the

technical prong has been satisfied with respect to each asserted patent. With respect to the GE patent, GE argues that its turbines practice the same claims that it asserts against Mitsubishi. *See* GE Br. at 45-48 (arguing that the GE Turbine practices claims 5, 7, and 8 of the '221 patent).

Mitsubishi argues that the GE Turbine does not practice any asserted patent, including independent claim 5 of the '221 patent, either literally or under the doctrine of equivalents. Mitsubishi's argument concerning dependent claim 7 and 8 is that they cannot be practiced because the GE Turbine does not practice claim 5. Mitsubishi Br. at 52-59.

The Staff argues that GE has not satisfied the technical prong of the domestic industry requirement with respect to any asserted patent, including the '221 patent. Staff Br. at 70, 74-78.

1. Claim 5

The issue of whether or not the GE Turbine practices claim 5 pertains to four terms or limitations contained in the "emergency unit" element of the claim. These four limitations are discussed below.

a. Whether GE Turbine operates "to electrically decouple the feed-in unit from the rotor windings"

Mitsubishi and the Staff argue that the GE Turbine fails "to electrically decouple the feed-in unit from the rotor windings," as required by claim 5. GE admits many of the allegations made by the other parties, such as the fact that [

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The term "crowbar," while used in the '221 patent in connection with the preferred embodiment, is not defined therein. The specification, however, states:

> As has been explained above, it has been shown within the framework of the invention to be particularly advantageous that the rotor windings are short-circuited for decoupling from the feed-in or supply unit so that the currents induced in the rotor windings can diminish particularly rapidly. Therefore, a so-called "crow bar" can be used which short-circuits the rotor windings via a resistor of low impedance, particularly an impedance, and reduces the excitation of the engine.

CX-9 ('221 patent), col. 3, lines 41-48.

Thus, the specification states that creating a short circuit is one way of implementing the claimed invention, and a crowbar, which creates a short circuit, is one way of accomplishing that. The specification in no way requires any particular circuitry for accomplishing the task of decoupling. In fact, the plain language of claim 5 does not claim a particular circuit, and places very little limitation on the necessary electrical decoupling, except to require that the feed-in unit be decoupled from the rotor winding during an emergency.[46]

The critical allegation by Mitsubishi and the Staff is that even when the short circuit, or crowbar, is activated, "rotor currents continue to flow through switching elements in the rotor-side converter." Mitsubishi Br. at 52; Staff Br. at 76. GE's expert, Dr. Collins, admitted that is the case. Collins Tr. 1029-1030. However, that is only because some components within the rotor-side converter do more than act as part of the feed-in unit.

In the GE Turbine, [

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[46] *But see* CX-9, col. 6, lines 26-28 (non-asserted, dependent claim 9) ("The wind turbine according to claim **5**, wherein the emergency unit comprises a crow bar for short-circuiting the rotor windings.").

] and the GE Turbine literally practices the decoupling limitation of claim 5.

b. Whether activation of the short-circuit mode (or crowbar) in the GE Turbine is based on grid voltage amplitude variations

There is no dispute that the GE Turbine [

] Mitsubishi's argument that the GE Turbine cannot practice claim 5 is based on its claim construction and noninfringement arguments concerning direct measurement of grid voltage, which were rejected above. Claim 5, as correctly construed in light of the specification, does not require that grid voltage be directly monitored. Further, the record shows that the GE Turbine [

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c. Whether the GE Turbine releases rotor current feed-in "when the currents generated in the rotor windings by variation of the grid voltage amplitude triggering the decoupling are declined to a predetermined value"

(i) The parties' arguments

Although GE makes a broad statement that the GE Wind Turbine literally satisfies the "emergency unit" and "releasing limitations," it provides little analysis relating to literal practice. In that regard, GE argues that Mitsubishi's expert proposes an incorrect construction of the claim. GE also cites to a portion of the '221 patent specification that, as characterized by GE, "explicitly discloses an embodiment of an emergency unit [ ] which, like the GE crowbar, is ***triggered*** by a rise in the DC bus voltage." GE Br. at 46 (emphasis added) (citing CX-9 ('221 patent), col. 5, lines 11-14).

GE, however, does argue that its turbine satisfies the "releasing" limitation of claim 5 under the doctrine of equivalents and it provides a brief analysis. *See* GE. Br. at 46. As discussed below, GE has failed to show that the GE Turbine practices claim 5 even under the doctrine of equivalents, let alone literally.

GE admits that [

]

Neither Mitsubishi, nor the Staff, accept GE's argument that DC bus voltage can be used to determine rotor current, or that release occurs in the GE Turbine when rotor current has declined to 1300 amps. Mitsubishi Br. at 56-58; Staff Reply Br. 12-14.

In addition, as a threshold issue, Mitsubishi argues that GE cannot rely on the doctrine of equivalents for the "release arrangement" because during prosecution of the '985 patent, the applicants relied on this feature to distinguish claim 5 and thereby overcome the prior art Rebsdorf patent cited by the examiner. Citing *Cordis Corp. v. Medtronic AVE, Inc.*, 511 F.3d 1157, 1177 (Fed. Cir. 2008), Mitsubishi argues that the applicants clearly and unmistakably surrendered any equivalent structures for the release arrangement. Mitsubishi Br. 58-59. This argument is similar to one advanced by Mitsubishi in connection with infringement.

(ii) Whether GE disavowed all equivalents for the "release arrangement" during patent prosecution

In the Federal Circuit's *Cordis* opinion, relied upon by Mitsubishi, the Court succinctly

reviewed the relevant law concerning the disavowal of equivalents that an applicant may make during patent prosecution. The Court stated:

> [A]n applicant can make a binding disavowal of claim scope in the course of prosecuting the patent, through arguments made to distinguish prior art references. Such argument-based disavowals will be found, however, only if they constitute clear and unmistakable surrenders of subject matter. *Conoco, Inc. v. Energy & Envtl. Int'l, L.C.*, 460 F.3d 1349, 1364 (Fed. Cir.2006); *Pharmacia & Upjohn Co. v. Mylan Pharms., Inc.*, 170 F.3d 1373, 1376 (Fed. Cir. 1999); *Litton Sys., Inc.*[*v. Honeywell, Inc*]., 140 F.3d [1449,] 1458 [(Fed. Cir. 1998)]. Moreover, the scope of such a disavowal will depend on the nature of the argument made by the patentee. As the court explained in *Omega* [*Engineering, Inc. v. Raytek Corp.*, 334 F.3d 1314,] 1324 [(Fed. Cir .2003)], even in the case of an unequivocal disavowal of claim scope, the court must construe the claim "congruent with the scope of the surrender." In order to constitute binding surrenders of claim scope, the statements in question must be such that "a competitor would reasonably believe that the applicant had surrendered the relevant subject matter." *Cybor Corp. v. FAS Techs., Inc.*, 138 F.3d 1448, 1457 (Fed. Cir. 1998) (en banc). If the court finds that the patentee made a clear disavowal of the subject matter that is subsequently asserted to be equivalent to the limitation in question, it will preclude the patentee from asserting equivalency as to that subject matter. *See Bayer AG v. Elan Pharm. Res. Corp.*, 212 F.3d 1241, 1252 (Fed. Cir. 2000).

511 F.3d at 1176.

In this instance, Mitsubishi has established only that the applicants argued that the emergency unit and release arrangement were novel, and patentable over the prior art, such as Rebsdorf. *See* Mitsubishi Br. at 59-60 (citing RX-10 (prosecution history) at MHI4019511). Indeed, this is all that is shown by the prosecution history relevant to this point. The applicants, tracking claim language very closely in their Remarks, argued that the emergency unit with its release limitation can be distinguished from the prior art, but they did not make any argument to

narrow the scope of claim 5, or its equivalents, beyond the limitations imposed by the claim when read in view of the specification. Indeed, the applicants drew a distinction between the claimed invention and Rebsdorf based on the fact that the claimed invention electrically decouples the feed-in unit. *See* RX-10 (prosecution history) at MHI4019511.[47] The arguments made to the PTO are entirely consistent with the arguments that GE makes in this investigation concerning decoupling, as well as the use of rotor current, or proxy values for rotor current, in connection with the release of rotor current feed-in.

Moreover, no disavowal was made during prosecution of the '221 patent that is relevant to the specific arguments that GE makes in this investigation concerning the "release

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[47] The substance of the applicants' argument is contained in two paragraphs, as follows:

> Applicant respectfully submits that claim 5 requires an emergency unit which can be operated to electrically decouple the feed-in unit from the rotor windings in case of variations of the grid voltage amplitude, and that includes a release arrangement for releasing the rotor current feed-in after decoupling, when the currents generated in the rotor windings by variation of the grid voltage amplitude triggering the decoupling are declined to a predetermined value. Rebsdorf fails to disclose at least this limitation of the claim.
>
> As described above, Rebsdorf is directed to a variable speed wind turbine that includes a matrix converter, a control unit, and a protection unit. See Rebsdorf, Abstract. Rebsdorf, however, does not disclose that the protection unit of Rebsdorf *electrically decouples* a feed-in unit, which provides feeding currents into the rotor windings, in case of in case of [sic] variations of the grid voltage amplitude. In addition, Rebsdorf does not disclose that the protection unit includes a release arrangement for releasing the rotor current feed-in after decoupling, when the currents generated in the rotor windings by variation of the grid voltage amplitude triggering the decoupling are declined to a predetermined value.

RX-10 (prosecution history) at MHI40119511 (emphasis in original).

arrangement" in its own turbines and whether they practice claim 5 under the doctrine of equivalents. *See* RX-10 at MHI4019510-511. Consequently, GE's arguments concerning its alleged practice of claim 5 under the doctrine of equivalents will be considered.

(iii) It has not been established that the GE Turbine practices the "release arrangement" limitation under the doctrine of equivalents

GE argues that just as DC bus voltage determines when its "crowbar" circuitry should be activated, DC bus voltage also determines when deactivation should occur and the feed-in should be released. Indeed, during the hearing, Dr. Holley, GE's chief consulting engineer for wind systems (*see* Holley Tr. 333), described how the "crowbar" circuitry is deactivated, as follows:

> Q. How does the converter control unit know when to turn the crowbar circuit off?
>
> A. [
>
>]
>
> Q. Was the rotor current taken into account in designing the control logic for this crowbar circuit?
>
> A. [ ]
>
> Q. [ ]
>
> A. [
>
>]
>
> Q. Can you explain that a little further, sir.
>
> A. Yes. [
>
>]
>
> Q. And is there any particular value of rotor current that was

considered in the design of the crowbar circuit?

A. [

]

Q. [

]

A. [

]

Holley Tr. 346-347.

[

].[48]

---

[48] Dr. Holley testified:

Q. [

A

]

Q. And by acceptable level, what do you mean?

(continued...)

[

[48](...continued)
A. [ ]

Holley Tr. 355-356.

Consequently, the evidence of record fails to show that the GE Turbine practices the "release arrangement" limitation of claim 5, either literally or under the doctrine of equivalents.

d. Summary Concerning the GE Turbine and Claim 5

The GE Turbine does not practice all of the limitations of claim 5, and thus does not practice that claim.

2. Claims 7 and 8

There is no requirement that the domestic industry be based on the same claim or claims alleged to be infringed. Nor is there a requirement that a domestic industry practice more than one claim of an asserted patent. 19 U.S.C. § 1337(a)(2). Nevertheless, with respect to the domestic industry requirement, GE relies on dependent claims 7 and 8, in addition to independent claim 5. GE Br. at 45.

Mitsubishi and the Staff do not dispute that the GE Turbine practices the specific limitations added by claims 7 and 8, but rather hinge their arguments solely on their position that GE does not practice claim 5. Mitsubishi Br. at 59; Staff Br. at 75 n.46. Thus, GE's practice of claims 7 and 8 is undisputed, provided that GE's practice of claim 5 has been established. GE cannot prevail on claims 7 or 8, however, if it does not practice claim 5 inasmuch as claims 7 and 8 include the limitations of claim 5. *See Wahpeton*, 870 F.2d at 1552 n.9.

As discussed above, it has not been shown that the GE Turbine practices claim 5 of the '221 patent. Accordingly, it has not been shown that the GE Turbine practices claim 7 or claim 8 of the '221 patent.

3. Summary Concerning Domestic Industry Under the '221 Patent

It has not been established that GE practices a claim of the '221 patent. Thus, it has not

been established that the technical prong of the domestic industry requirement is met. Accordingly, it has not been shown that the domestic industry requirement is satisfied with respect to the '221 patent.

D. Validity Determination

Mitsubishi argues that the asserted claims of the '221 patent are obvious in view of the prior art. Mitsubishi Br. at 59-63. With respect to independent claim 5, it asserts that the structural elements of the claim, as well as the use of crowbar circuits, were well known in the art. Indeed, Mitsubishi argues that when the PTO examiner rejected the claim during prosecution over Rebsdorf (stipulated prior art, cited above in connection with claim construction), the applicants responded that only the emergency unit and release arrangement were novel.

Mitsubishi further argues that decoupling and the release arrangement recited in claim 5 were taught by published Japanese Patent Application No. 07-194196 ("JP-196") (RX-223) and United States Patent No. 5,734,256 to Larsen et al. ("Larsen") (RX-44).[49] Thus, Mitsubishi submits that the combination of JP-196 or Larsen with prior art such as Rebsdorf or Kühn[50] would render claim 5 obvious to one of ordinary skill in the art. *Id.* at 60-63. In addition, it is argued that the limitations added by dependent claims 7 and 8 were well known in the art, and thus those claims are also obvious over the combination of prior art as exemplified by Rebsdorf or Kühn in combination with JP-196 or Larsen. *Id.* at 63.

GE asserts that Mitsubishi has failed to prove that claims 5, 7, and 8 are obvious,

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[49] JP-196 and Larsen are stipulated prior art to the '221 patent. *See* Prior Art Stips., ¶ 2.

[50] Mitsubishi describes Kühn (RX-580) as an article whose structural features were well known in the art. *See* Mitsubishi Br. at 62.

especially in view of the heavy burden of proving invalidity by clear and convincing evidence. GE Br. at 48-50. First, as a threshold matter, it submits that Mitsubishi failed to prove that Kühn is prior art to the '221 patent because Kühn is undated. Furthermore, Mitsubishi's expert had no personal knowledge of this paper, did not attend the conference where the paper was allegedly presented and disseminated, and had not seen any physical evidence showing when the paper was published. *Id.* at 48-49.

Second, GE argues that JP-196 (which requires a "chopper circuit" that stays on until *after* grid voltage has stabilized) and Larsen (which has nothing to do with generators or rotor currents, and discloses a "series compensator" that injects voltage into a load during a grid voltage drop) actually teach away from the "emergency unit" and "releasing" limitations of claim 5. GE additionally contends that Mitsubishi failed to explain at the hearing why someone skilled in the art, without benefit of hindsight, would be motivated to combine two references that teach away from the claimed invention. *Id.* at 49-50.

The Staff argues that Mitsubishi has failed to show by clear and convincing evidence that the prior art discloses the "releasing arrangement" of claim 5, specifically, releasing the rotor current feed-in when currents in the generator windings are declined to a predetermined value. Staff Br. at 59-62. Further, the Staff argues that Mitsubishi has failed to establish Kühn as prior art. *Id.* at 59-60 (citing Toliyat Tr. 1536-1538).

1. Kühn

It is Mitsubishi's burden to prove that the art relied upon should be considered prior art, as that term is used in the Patent Act, in order to evaluate the validity of a particular patent claim. *See Loral Fairchild Corp., v. Matsushita Elec. Indus. Co.*, 266 F.3d 1358, 1361 (Fed. Cir. 2001).

In that regard, a question has been raised as to whether or not Kühn (RX-580) should be considered prior art to the '221 patent.

Kühn is an article or paper that was allegedly published in April 2002, *i.e.,* more than one year prior to July 17, 2003, which is the priority date of the '221 patent. However, the article itself bears no date, and a publication date for the article was not established on the record. An attempt was made to establish Kühn's publication through its presentation at a conference, but Mitsubishi was not able to present any witness who had personal knowledge of Kühn's publication or presentation at the conference. Nor did Mitsubishi offer a document that established the fact that Kühn was actually presented on a certain date. *See* Toliyat Tr. 1536-1541, 1687-1691.

Thus, it has not been established that Kühn is prior art to the '221 patent. In any event, it appears from the parties' arguments (including those of Mitsubishi), that even if Kühn were accepted as prior art, the decoupling and release arrangement limitations of claim 5 would still have to be supplied by JP-196 or Larsen for the claim to be found invalid as obvious.

2. Claim 5

JP-196 (RX-223) discloses a so-called chopper circuit, not a crowbar or other circuit suitable for use in the claimed invention of the '221 patent. In particular, the chopper circuit in JP-196 does not electrically decouple the feed-in unit from the rotor windings. *See* RX-223 (JP-196) at 8-9; *see also* Toliyat Tr. 1799. Further, JP-196 requires the chopper circuit to remain on until after grid voltage has stabilized. *See* Toliyat Tr. 1801; Collins Tr. 2301. Thus, JP-196 not only fails to disclose the limitations at issue of claim 5 of the '221 patent, but it teaches away from the "releasing" limitation of claim 5 which permits the crowbar to be released before grid

stabilization so that feed-in can be resumed and the wind turbine can contribute to grid recovery. *See* CX-9 ('221 patent), col. 2, lines 52-67.

Larsen (RX-44) also fails to disclose the limitations of claim 5, and teaches away from the invention claimed in the '221 patent. Larsen discloses a "series compensation device" connected to a load such as a factory or piece of equipment. The series compensation device in Larsen is not involved in power generation, and one of ordinary skill in the art relevant to the '221 patent would not look to the disclosure in Larsen for application in a wind turbine. *See* Collins Tr. 2301-2305.

The series compensator in Larsen is designed to inject voltage into the load during a grid voltage drop so that the voltage to the load stays steady. *See* Toliyat Tr. 1787, 1791. There is a crowbar circuit in Larsen, but it is not designed to activate when the grid voltage drops (and, of course, has nothing to do with rotor currents). It is instead activated when there is a fault between the load and the series compensation device which could cause damage to it. *See* Collins Tr. 2302-2303; Toliyat Tr. 1793-1794; RX-44 (Larsen) at Fig. 1.

Mitsubishi failed to present evidence at hearing to establish that one skilled in the art, without benefit of hindsight, would combine JP-196 or Larsen with Rebsdorf or similar prior art. In any event, neither JP-196 nor Larsen supplies the claim limitation related to decoupling and the release arrangement of claim 5 of the '221 patent.

Accordingly, it has not been established by clear and convincing evidence that claim 5 of the '221 patent is invalid due to obviousness.

3. <u>Claims 7 and 8</u>

Mitsubishi argues that the added limitations of claims 7 and 8 were well known in the art

and thus those claims are also invalid over the combination of prior art such as Rebsdorf or Kühn, with JP-196 and Larsen. Mitsubishi Br. at 63.[51] GE has not set forth arguments and evidence specifically with respect the validity of claims 7 and 8. *See* GE Br. at 78-51; GE Reply at 26-27. Nevertheless, neither claim 7 nor claim 8 is found to be invalid for at least the reasons indicated above with respect to the limitation of claim 5.

4. Summary on Validity

It has not been established by clear and convincing evidence that claim 5, 7, or 8 of the '221 patent is invalid due to obviousness. No other basis for invalidity has been argued with respect to these claims.

E. Summary

It has been shown by at least a preponderance of the evidence that claims 5, 7, and 8 are infringed by the MWT.

It has not been established that GE practices any claim of the '221 patent. Thus, it has

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[51] The Patent Act provides, in part:

> A patent shall be presumed valid. Each claim of a patent (whether in independent, dependent, or multiple dependent form) shall be presumed valid independently of the validity of other claims; dependent or multiple dependent claims shall be presumed valid even though dependent upon an invalid claim.

35 U.S.C. § 282.

With respect to this provision, the Federal Circuit has stated: "Such an independent evaluation is necessary because dependent claims necessarily add limitations to the claims from which they depend and may therefore not be subject to the same asserted grounds of invalidity." *Dana Corp. v. American Axle & Mfg., Inc.*, 279 F.3d 1372, 1376 (Fed. Cir. 2002). In this instance, independent claim 5 has not been shown to be invalid. Yet, even if claim 5 were found invalid, dependent claims 7 and 8 would have to be analyzed independently to determine whether they had also been shown to be invalid.

not been established that the technical prong of the domestic industry requirement is met. Consequently, it has not been shown that the domestic industry requirement is satisfied with respect to the '221 patent.

It has not been shown by clear and convincing evidence that claim 5, 7, or 8 of the '221 patent is invalid.

Accordingly, due to a failure by GE to establish that the domestic industry requirement has been satisfied, it has not been found that a violation of section 337 has occurred with respect to the '221 patent.

VI. United States Patent No. 6,921,985

A. Claim Construction

The specification of the '985 patent states that the claimed invention relates to wind turbine generators. "More particularly, the invention relates to supporting low voltage ride through for wind turbine generators coupled with a power distribution grid." CX-6 ('985 patent), col. 1, lines 6-9.

The specification explains that although "[h]istorically, wind turbines have been very small contributors to overall power generation to supply electrical grids," modern wind turbine generators have ratings of 1.5 MW or more, and may be installed on a farm with one hundred or more such generators. Such a farm provides a "block" of power comparable to the output of a modern gas turbine generator. *See* CX-6 ('985 patent), col. 1, lines 12-22. Thus, wind turbines are no longer permitted to trip offline during a low voltage event, but must satisfy low voltage ride-through (LVRT) requirements. *See Id.* at col. 1, lines 41-56. According to the specification (filed in 2003):

> Currently, wind turbine generators specifications can require connection and synchronization with the power grid down to levels of 70% of rated voltage. These requirements can be accommodated through, for example, increased capacity in various components (motors, generators, converters, etc.) and by use of uninterruptible power supplies (UPSs) for sensitive control circuits. However, more severe voltage fluctuations, for example, voltages at 15% of rated voltage cannot be accommodated using these techniques.

Id. at col. 1, lines 58-67.

According to the "Detailed Description" of the specification, the techniques described therein allow a wind turbine 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.

Id. at col. 2, lines 24-34.

Independent claim 15 of the '985 patent, the only claim asserted by GE, provides for a wind turbine, as follows:

> **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.

Id. at col. 7, line 58 - col. 8, line 3.

GE's brief provides a proposed claim construction for the term "uninterruptible power supply." Based on the testimony of its expert, Dr. Kirtley, GE argues that the uninterruptible power supply (or "UPS") is a device that can provide an alternate source of short term power during a grid voltage drop so that the load can continue to function without interruption. Although GE does not devote a specific portion of its brief to the phrase "shunt current from the inverter and generator rotor," GE does argue that "the 'shunting' limitation should be construed according to its plain meaning to require a circuit that diverts rotor current that would otherwise flow through and potentially damage the power converter." GE rejects any construction of claim 15 that would require a separate crowbar circuit located outside the inverter. GE Br. at 21-33.

Mitsubishi's brief offers specific proposed constructions for the phrases "uninterruptible power supply" and "during a low voltage event." Mitsubishi argues that an uninterruptible power supply is "a power storage system, such as a battery, capacitors, or a photovoltaic system, that provides an alternate source of power." Based on the specification and the prosecution history of another patent[52] (which, upon a rejection by the PTO, distinguished the later-filed application from the '985 patent), Mitsubishi argues that the UPS of the '985 patent does not encompass anything other than a power storage system, [ ] Mitsubishi Br. at 63-68. Mitsubishi argues that "during a low voltage event" means "throughout

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[52] The other patent referred to by Mitsubishi issued as United States Patent No. 7,218,012 ('012 patent), entitled "Emergency Pitch Drive Power Supply." *See* Mitsubishi Br. at 65-66 (quoting RX-59 ('012 patent prosecution history)).

a period when there is a low voltage event." *Id.* at 66-67.

In its reply, Mitsubishi notes the portion in GE's main brief in which it states that the shunting limitation "requires merely that the shunt circuit divert the current that would otherwise flow through the inverter." Mitsubishi argues, however, that the plain language of claim 15 requires shunting current from both "the inverter and the generator rotor." Mitsubishi Reply at 1-3.

The Staff's brief offers proposed constructions for the terms "uninterruptible power supply" (*i.e.,* "a power storage system that supplies alternative power during a drop in grid voltage and cannot be interrupted during such drops") and "during a low voltage event" ("throughout a period when there is a low voltage event"). Staff Br. at 37-40. In its reply, the Staff argues that "the claimed 'inverter' must correspond to the rotor-side converter because the claimed circuit must protect both the rotor and grid-side converters. To accomplish this, the claim and the specification disclose that the circuit between the rotor and the rotor-side converter protects the entire converter." *Id.* at 37, 41-43; Staff Reply at 11.

The words "uninterruptible power supply" and "during a low voltage event" flow together in the patent claim, and the arguments concerning the latter cluster of words are closely related to the UPS. Accordingly, the following two phrases are construed below: (1) "uninterruptible power supply during a low voltage event," and (2) "shunt current from the inverter and generator rotor."

"uninterruptible power supply during a low voltage event"

There should be no dispute that the required "uninterruptible power supply" provides an alternate source of power, at least in the sense that it is available "during a low voltage event," as

opposed to normal grid conditions. Indeed, claim 15 refers to the UPS only in the context of "a low voltage event."

Furthermore, the plain language of the claim requires the UPS to supply power "during a low voltage event," and not merely at the outset of the event, or at some later point. In fact, the specification explains that a modern low voltage ride-through utility standard "typically requires that a power generation unit must remain connected and synchronized to the grid when the voltage at the terminals of the generation unit fall to prescribed levels." CX-6 ('985 patent), col. 1, lines 29-33. There is no contemplation in the claim language or the specification of a UPS that works during only part of a low voltage event – rather, as specified by the claim, it supplies power "during a low voltage event."[53]

With respect to how such a UPS must be implemented, claim 15 contains no express limitation to indicate that it must be restricted to storage system, such as battery system, capacitors, or a photovoltaic system (although it is clearly undisputed by the parties that batteries, capacitors and photovoltaic can satisfy the UPS limitation). [ ]

[ ]

[ ]. While much has been made of the testimony of GE's expert, Dr. Kirtley, on this point in which he stated that uninterruptible power supplies *include* energy storage, he did not testify that they consist entirely of energy storage. *See* Kirtley Tr. at 776.

In arguing that an uninterruptible power supply must be a storage system, Mitsubishi and

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[53] The phrase "during a low voltage event," must be understood within the proper context. As indicated several times already, in this art, low voltage events typically last for only a few seconds or less. Thus, it is not contemplated that a UPS will work indefinitely. Further, at some point, even a battery-based UPS (such as that proposed by Mitsubishi and the Staff) will run out of stored energy. *See* Toliyat Tr. 1656, 1707.

the Staff turn to the specification, which states, in pertinent part:

> In one embodiment, LVDP **320** provides 24 V DC power to turbine controller **340** through uninterruptible power supply (UPS) **330**. UPS **330** provides power to turbine controller 340 in the event that LVDP **320** is unable to provide necessary power to turbine controller **340**. UPS **330** can be any type of uninterruptible power supply known in the art, for example, a battery system, a photovoltaic system or any other power storage system known in the art. In one embodiment, UPS **330** does not have sufficient capacity to energize all of the electrical loads served by LVDP **320**.

CX-6 ('985 patent), col. 3, line 60 - col. 4, line 2.

The specification portion quoted above clearly pertains only to particular embodiments of the claimed invention, and thus does not exclude [ ] from any possible embodiment of claim 15. Indeed, as GE's expert was quick to point out during the hearing, photovoltaic systems are not actually energy storage systems. *See* Kirtley Tr. 776. Rather, photovoltaic systems generate electricity. Further, even for that particular embodiment the specification suggests a power storage system by way of example, stating that the UPS in that embodiment "can be any type of uninterruptible power supply known in the art."[54]

Accordingly, the "uninterruptible power supply" is not restricted to a power storage system. Further, an uninterruptible power supply must operate during a low voltage event, and

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[54] Additionally, Mitsubishi points out that the '985 patent was raised during prosecution of the '012 patent (which is not asserted here). Yet, there is no suggestion that the '012 patent prosecution history is intrinsic to the '985 patent. Indeed, there is no formal relationship or incorporation of one patent into the other. Thus, it would be error to narrow a claim of the '985 patent based on the prosecution of the '012 patent. *See Goldberg v. Cytogen, Inc*, 373 F.3d 1158, 1167-68 (Fed. Cir. 2004); *Abbott Labs. v. Dey, L.P.*, 287 F.3d 1097, 1105 (Fed. Cir. 2002) (a common assignee and one shared inventor insufficient to create a "formal relationship").

In any event, Mitsubishi's arguments concerning the prosecution of the '012 patent would not be persuasive. Mitsubishi's brief refers to instances in which GE told the examiner that a battery system is an "example" of an uninterruptible power supply. *See* Mitsubishi Br. at 66.

not for only a portion of the event.

"shunt current from the inverter and generator rotor"

As indicated above, although the shunting limitation was addressed by the parties with respect to the infringement and domestic industry aspects of the investigation, the claim construction aspect of their dispute did not take shape until the reply round of briefing. The claim construction dispute ultimately centers around the issue of where the shunting of current occurs (and thus where, according to the claim, the shunt circuit must be located), and relatedly, from which components the current is shunted.

On its face, the claim language addresses both issues. Claim 15 expressly provides for "a circuit coupled with the input of the inverter and with the converter controller," and also that the circuit is "to shunt current from the inverter and generator rotor." Thus, as far as the location of the circuit is concerned, it must be coupled with the input of the inverter and the converter controller. Further, current must be shunted "from the inverter and generator rotor."

As indicated above, GE argues against any construction that would require a crowbar circuit outside the inverter. While such a limitation is not apparent from the claim language, whether a particular shunting circuit located within the inverter (as opposed to outside it) meets the claim limitation will depend upon whether it is found to be "coupled with the input of the inverter and the converter controller," as required by the claim.

Also as indicated above, the Staff clearly articulates the argument that the "inverter" in question must correspond to the rotor-side converter because the claimed circuit must protect both the rotor-side and grid-side converters. Further, the Staff argues, the claim and the specification disclose that placing a crowbar circuit between the rotor and the rotor-side

converter protects the entire converter. Staff Reply at 11. While the claim does not expressly require the design referred to by the Staff, the specification does show how one can meet the claim limitations in the manner described by the Staff. In that regard, the specification provides as follows:

> FIG. **4** is a block diagram of one embodiment of a power converter having functionality to respond to a low voltage event. In one embodiment, power converter **400** includes inverters **410** and **420**, converter controller **430** and crowbar circuit **440**. Other components can also be included in power converter **400**.
>
> Inverter **410** is coupled with the generator (not illustrated in FIG. **4**) and to inverter **420** which is coupled with the power grid. ***Crowbar circuit 440 is coupled with the output of the generator rotor.*** Converter controller **430** is coupled to receive data indicating the current flowing in inverter **410** and to control crowbar circuit **440**. In one embodiment, converter controller **430** selectively activates and deactivates crowbar circuit **440** to maintain the current in inverter **410** within an acceptable range.

CX-6 ('985 patent), col. 4, lines 44-58 (emphasis added).

Clearly, the specification provides this example in connection with one embodiment of the claimed invention. It cannot require a crowbar (or other shunting circuit) between the rotor and the rotor-side converter, as though that were a claim limitation. Whether another design that differs from the embodiment of the specification practices claim 15 will depend upon whether or not such a design meets all the other claim limitations while also being able (in the words of the claim) "to shunt current from the inverter and generator rotor."

B. <u>Infringement Determination</u>

GE argues that both the original and EPSS versions of the MWT infringe claim 15 of the '985 patent. The argument in GE's main brief is based only on literal infringement. GE Br. at

21-30. GE raises the doctrine of equivalents in its reply, with reference to the "uninterruptible power supply" limitation. GE Reply at 6-7.

The only claim limitations disputed by Mitsubishi are "uninterruptible power supply for use during a low voltage event" and "circuit coupled with the input of the inverter . . . to shunt current from the inverter and the generator rotor." Mitsubishi Br. at 68, 70; *see* Toliyat Tr. 1571-1572 (concerning limitations practiced by the MWT).

With respect to the shunt limitation, Mitsubishi argues that its products do not have a circuit coupled to the input inverter to shunt current from the inverter and generator rotor. Mitsubishi Br. at 68-70. [

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The Staff argues that the evidence shows the original version of the MWT to infringe claim 15, but that the EPSS version does not infringe. Staff Br. at 41-46. With respect to the EPSS version, the Staff argues [

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The "uninterruptible power supply" and "shunt current from the inverter and generator rotor" limitations are discussed below.

1. "<u>uninterruptible power supply</u>"

[

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[55] [

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[56] [

]

[57]

]

Accordingly, it is found that both the original and EPSS versions of the MWT practice this limitation literally.

As indicated above, GE argues in its reply that the EPSS version could also be found to practice this limitation under the doctrine of equivalents. However, GE's argument is not sufficiently supported by its rather brief analysis (relying on the testimony of Mitsubishi's expert). Its doctrine of equivalents argument must therefore fail.

2. "<u>shunt current from the inverter and generator rotor</u>"

Mitsubishi argues that the MWT (in both its original and EPSS versions) do not practice

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[57] [

]

this limitation [

[58]

, [59]

[58] [
]

[59] [

]

.] [60]

Accordingly the MWT practices the shunt limitation of claim 15 literally.

3. Summary Concerning Infringement of Claim 15 of the '985 Patent

It is found by a preponderance of the evidence that both the original and EPSS versions of the MWT infringe claim 15 of the '985 patent literally. It is not found that the EPSS version would practice the "uninterruptible power supply" limitation under the doctrine of equivalents.

C. Domestic Industry

1. Background

As detailed in Section I.A., an unreviewed initial determination has already found that the economic prong of the domestic industry requirement is satisfied with respect to each asserted patent. Further, as detailed in Section I.B.5., GE relies on the GE Turbine to establish that the technical prong has been satisfied with respect to each asserted patent. *See* GE Br. at 30-33 (arguing that the GE wind turbine practices claim 15 of the '985 patent).

The basic structure relied upon by GE to satisfy the limitations of claim 15 corresponds to the [

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[60] [
].

].

Mitsubishi argues that the GE Turbine does not practice claim 15 of the '985 patent. Mitsubishi Br. at 78-83. In particular, Mitsubishi argues that claim 15 requires a circuit, "separate and apart from the inverter," to be coupled to the input of the inverter. [

]

Further, Mitsubishi argues that the GE Turbine does not shunt current as required by claim 15. A significant portion of Mitsubishi's argument relies on the same interpretation of "shunt current from the inverter and generator rotor" that was disputed by GE and Staff, and was rejected herein. Nevertheless, Mitsubishi argues that even if its understanding of the claim is not adopted, the GE Turbine cannot practice claim 15 because [

.]

The Staff argues that GE has not satisfied the technical prong of the domestic industry requirement with respect to any asserted patent, including the '985 patent. It argues that the GE Turbine does not practice claim 15 literally or under the doctrine of equivalents. The Staff, like Mitsubishi, argues that the GE Turbine [

]

2. Discussion

As discussed above in connection with claim construction, there is no requirement that the shunting circuit be located outside the inverter. Indeed, there is no express limitation in the plain language of claim 15 that requires the circuit "coupled with the input of the inverter and with the converter controller" to be "separate and apart" from the inverter (as argued by Mitsubishi) or located outside the inverter at all. Nor has any party cited a portion of the evidence intrinsic to the '985 patent that would require such a configuration.

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62

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[61] [

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[62] *See* Kirtley Tr. 623 ("[A]ll of these things are connected together. The inverter has two inputs, if you will. It's got the AC input and the DC input. And the shunt circuit that we're describing here, made up of the devices, the active switches of the rotor side converter, is coupled through the DC link to the DC input of the grid side converter – inverter.").

Power converters contain inverters. Thus, the '985 patent, and the witnesses, have used the terms interchangeably, even though the claim refers specifically to inverters. *See* Kirtley Tr. 623-624; Toliyat Tr. 1597.

[

]

Consequently, the GE Turbine literally practices claim 15 of the '985 patent.

In addition, if it were found that claim 15 literally requires a circuit outside the inverter to shunt current, the GE Turbine could nonetheless be found to practice this limitation of claim 15 under the doctrine of equivalents inasmuch as the GE Turbine would not differ substantially from the express limitations of the claim. In particular, [

]

3. Summary Concerning Domestic Industry Under the '985 Patent

GE has demonstrated that the domestic industry requirement is met with respect to the '985 patent.

D. Validity and Enforceability Determinations

Mitsubishi argues that claim 15 is invalid as obvious over the prior art. Mitsubishi also argues that claim 15 is invalid due to a failure to disclose the best mode for the claimed invention, as subjectively contemplated by one of the five named inventors (all of whom reside in Germany), even though there was no genuine invention. *See* Mitsubishi Br. at 83-89. Further, Mitsubishi argues that the '985 patent is unenforceable due to inequitable conduct "in failing to disclose Thomas Wilkins's inventive contributions to the PTO," even though it is Mitsubishi's contentions that there is no invention at all. *Id.* at 89-90.[63] The Staff argues that while claim 15 is not invalid, it is unenforceable. Staff Br. at 46-49, 63-69. GE rejects all of the invalidity and unenforceability arguments. GE Br. at 71-97.

As discussed below, it is not found that claim 15 of the '985 patent is invalid. Further, it has not been shown that the name of Thomas Wilkins was removed from the application for the

[63] No party raised inventorship as an independent issue.

'985 patent with an intent to deceive the PTO. Thus, it has not been established that the '985 patent is unenforceable.

1. Validity

Mitsubishi argues that claim 15 of the '985 patent is invalid due to obviousness and failure to disclose the best mode. *See* Mitsubishi Br. at 83-89. GE argues that Mitsubishi failed to prove by clear and convincing evidence that claim 15 is obvious, or invalid for failure to disclose a best mode. GE Br. at 33-38. The Staff also argues that Mitsubishi has failed to prove either obviousness or failure to disclose a best mode. *See* Staff Br. at 46-49.

a. Obviousness

Mitsubishi argues that two prior art publications that were not considered by the PTO during prosecution of the '985 patent "teach or suggest all the limitations of claim 15, including the use of an uninterruptible power supply to provide power to a converter controller during a low voltage event." The publications are Hofmann et al., "Control of a Double-Fed Induction Generator for Wind-Power Plants," PCIM 1998, Nuremberg, Power Quality Proceedings (1998) ("Hofmann") (RX-40) and Dittrich, Hofmann et al., "Design and Control of a Wind Power Station with Double Fed Induction Generator," EPE '97 (Sept. 1997) ("Dittrich & Hofmann") (RX-46).[64] Mitsubishi Br. at 83-88.

GE argues, among other things, that while Hofmann and Dittrich & Hofmann generally disclose a wind turbine with a DFIG generator, neither makes mention of a low voltage event, low voltage ride-through, or how to achieve LVRT "with a crowbar circuit coupled to a converter

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[64] The parities have stipulated that Hofmann and Dittrich & Hofmann are prior art to the '985 patent. *See* Prior Art Stips., ¶ 3; Staff Br. at 46.

controller that is itself coupled to an uninterruptible power supply." It is argued by GE that Mitsubishi has failed to prove obviousness by clear and convincing evidence. GE Br. at 33-37.

The Staff argues that Mitsubishi has failed to demonstrate that a combination of Hofmann and Dittrich & Hofmann provides all required limitations of claim 15. Staff Br. at 46-47.

Hofmann and Dittrich & Hofmann (collectively, the "Hofmann articles") disclose a wind turbine with a DFIG generator. *See* Toliyat Tr. 1731-1732. They also disclose a crowbar circuit. Kirtley Tr. 2403. However, GE has never argued that the invention of claim 15 lies in the use of a DFIG in a wind turbine, or even the use of a crowbar (or similar) circuit. Rather, as discussed above in the section on claim construction, claim 15 is specifically limited, among other things, to an uninterruptible power supply, as well as a circuit, such as a crowbar, to shunt current during a low voltage event. Yet, neither article concerns a low voltage event, and, in contrast to the requirements of the claim 15, the crowbar circuit is not used to shunt current from the inverter and generator rotor in response to a control signal from the converter controller in connection with a low voltage event. Kirtley Tr. 2400-2407. This was admitted by Mitsubishi's expert who testified that there is no mention of low voltage ride-through in the articles. Toliyat Tr. 1742-1743.[65]

Thus, the Hofmann articles do not disclose a crowbar circuit responsive to a control signal from the CCU. GE's expert, Dr. Kirtley, testified that Figure 11 of the Hofmann references (which was raised by Mitsubishi to satisfy the control signal limitation) shows that the crowbar circuit is not in fact controlled by a CCU, but rather by signals from voltage and current

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[65] Indeed, Mitsubishi's expert never relied on the Hofmann references alone for any of the obviousness opinions expressed in his expert reports. *See* Toliyat Tr. 1741-1742.

sensors. Kirtley Tr. 2403-2404 (concerning Fig. 11 of Hofmann (RX-40)). The controller disclosed in the Hofmann articles, even assuming it is a "converter controller," is not coupled to both the inverter and the circuit that shunts current. Kirtley Tr. 2402-2404 (Figure 11 shows that the crowbar circuit is not coupled to anything that controls the inverter).

In contrast, the testimony of Mitsubishi's expert on this point is unpersuasive because rather than establishing that Figure 11 and other portions of the Hofmann articles actually disclosed the limitations of claim 15 in the prior art, his testimony amounts merely to conjecture as to how certain limitations of claim 15 might be referenced in the Hofmann articles if one set out in hindsight to find some representation of them in the prior art. *See* Toliyat Tr. 1409-1410, 1732-1733, 1745-1747.

In addition, Hofmann does not disclose the required uninterruptible power supply, or a UPS connected to a CCU. *See* Kirtley Tr. 2401; Toliyat Tr. 1410 (converter controller is powered by the grid). Hofmann & Dittrich refers to "short-time energy storage," without any description of the purpose of that storage, or how to implement it. Toliyat Tr. 1412-1413 (discussing RX-46), 1747-1749. During cross-examination, Mitsubishi's expert pointed to "large DC bus capacitors" that are illustrated in a figure and testified that they are "probably" used for short-term storage. Toliyat Tr. 1750-1751.

Consequently, it has not been shown by clear and convincing evidence that the Hofmann articles, either alone or in combination, render claim 15 invalid as obvious.

b. Best Mode

Mitsubishi argues that claim 15 is invalid because "Henning Lütze, one of the inventors named on the '985 patent, subjectively contemplated a best mode for practicing the shunt circuit

of claim 15, namely, a specific crowbar design that was described in the '221 patent specification. The '985 patent, however, contains no disclosure of this specific crowbar design for implementing the shunt circuit" of the claim. Mitsubishi Br. at 88-89.

GE argues that Mr. Lütze did not testify as to a crowbar preference for the '985 patent, whose application was filed six months after the priority application for the '221 patent. It is argued that there is no evidence that Lütze or any other inventor believed that the crowbar they described in the '221 patent was the best mode for practicing claim 15. GE Br. at 37. In fact, GE argues that the testimony of Dr. Fogarty, who drafted the disclosure and assisted in preparing the application for the '985 patent, is consistent with the statement contained in the specification to the effect that "any appropriate (e.g., a circuit having sufficient power ratings) crowbar circuit can be used." *Id.* at 38 (quoting CX-6 ('985 patent) at col. 4, lines 59-61).

The Staff argues that Mitsubishi has failed to prove that claim 15 is invalid for failure to disclose a best mode. Staff Br. at 48-49.

Henning Lütze lives in Germany and did not testify at the hearing in this investigation. All of his testimony was presented through the parties' deposition designations. *See* Lütze Dep. (JX-10) Tr. 7. He was an employee of Enron Wind, which in 2002, was acquired by GE. *See* Lütze Dep. (JX-10) Tr. 13. He is a named inventor on both the '221 and '985 patents. *See* CX-6 ('985 patent); CX-9 ('221 patent).

Lütze testified that in 2002, he thought that the crowbar shown in Figure 3 of the '221 patent should be used in GE's 1.5 MW wind turbines because "[b]y this crowbar design, it is

possible to control the currents in the rotor circuit." *See* Lütze Dep. (JX-10) Tr. 101-104.[66]

Although Lütze testified about the crowbar design disclosed in the '221 patent, and GE turbines in general, he was not asked whether the design disclosed in the '221 patent is best for the invention claimed in the '985 patent, specifically with respect to claim 15. Mitsubishi simply infers that the illustrated crowbar in the '221 patent must be the best mode for the '985 patent.

Mitsubishi's reasoning, however, comes up short of providing the proof necessary to show that claim 15 of the '985 patent is invalid. Even assuming that the crowbar design in question is the best mode for the claims of the '221 patent, the fact remains that the '985 patent, and claim 15 in particular, concern a different invention. Thus it is not clear that an embodiment from the '221 patent necessarily constitutes the best mode for claim 15, even in the opinion of Mr. Lütze.[67]

Accordingly, it is not found by clear and convincing evidence that claim 15 of the '985 patent is invalid for a failure to disclose the best mode.

2. Enforceability

Mitsubishi argues that the '985 patent is unenforceable due to inequitable conduct before

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[66] During his deposition, Lütze was not sure whether the crowbar design of the '221 patent was actually implemented in GE 1.5 MW turbines installed in the spring of 2003. In fact, he pointed out that while the principle of the crowbar used in Figure 3 of the '221 patent would have been used in GE's turbines, the exact design would have to be modified due to the design of other components. *See* Lütze Dep. (JX-10) Tr. 101-104.

[67] In connection with one embodiment disclosed in the '985 patent, the specification states: "Crowbar circuits are known in the art and any appropriate (e.g., a circuit having sufficient power ratings) crowbar circuit can be used." CX-6, col. 4, lines 59-61. Indeed, Dr. Fogarty, who participated in drafting the application for the '985 patent, testified that another named inventor, Wilhelm Janssen, provided him with alternate crowbar designs but never singled out one as preferred over the others. *See* Fogarty Tr. 2038-2039.

the PTO. In particular, [

]

Mitsubishi argues that [

[

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Thus, the identity of each inventor is material to the prosecution of a patent. Indeed, "[i]n practice, patent examiners do not normally engage in determination of the respective contributions of the individual members of an inventive entity as part of making an *ex parte*

examination; rather, it is the responsibility of the applicants and their attorneys to ensure that the inventors named in a patent application are the only true inventors." *Board of Educ. v. American Bioscience, Inc.*, 333 F.3d 1330, 1344 (Fed. Cir. 2003) (footnote omitted).

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3. Conclusion on Unenforceability

It has not been established by clear and convincing evidence that the '985 patent is

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[71] [

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unenforceable due to inequitable conduct.

E. Summary

It is found by at least a preponderance of the evidence that the MWT infringes claim 15 of the '985 patent, and that the GE Turbine practices the claim. The domestic industry requirement has been satisfied with respect to the '985 patent. It has not been established by clear and convincing evidence that claim 15 is invalid. Accordingly, a violation of section 337 has occurred with respect to the '985 patent.

VII. Conclusions of Law

1. The Commission has personal jurisdiction over the parties, and subject-matter jurisdiction over the investigation.

2. The importation or sale requirement of section 337 has been met with respect to the accused products.

3. Respondents MHI and MPSA have sold for importation, imported and, or, sold after importation into the United States, the accused products.

4. It has not been established that respondent MHIA has directly or indirectly imported or sold an accused product. Consequently, it cannot be found that MHIA is in violation of section 337.

5. It has not been shown by clear and convincing evidence that claim 121 of the '039 patent is invalid.

6. It has been shown by at least a preponderance of the evidence that the accused Mitsubishi turbines infringe claim 121 of the '039 patent.

7. It has been established that the domestic industry requirement is satisfied with respect

to the '039 patent.

8. A violation of section 337 has occurred with respect to the '039 patent.

9. It has not been shown by clear and convincing evidence that claim 5, 7, or 8 of the '221 patent is invalid.

10. It has been shown by at least a preponderance of the evidence that the accused Mitsubishi turbines infringe claim 5, 7, and 8 of the '221 patent.

11. It has not been established that GE practices any claim of the '221 patent. It has not been established that the domestic industry requirement is satisfied with respect to the '221 patent.

12. It has not been shown that a violation of section 337 has occurred with respect to the '221 patent.

13. It has not been shown by clear and convincing evidence that claim 15 of the '985 patent is invalid.

15. It has not been established by clear and convincing evidence that the '985 patent is unenforceable due to inequitable conduct.

16. It has been shown by at least a preponderance of the evidence that the accused Mitsubishi turbines (both the original and EPSS versions) infringe claim 15 of the '985 patent.

17. It has been established that the domestic industry requirement is satisfied with respect to the '985 patent.

18. A violation of section 337 has occurred with respect to the '985 patent.

VIII. Initial Determination and Order

Based on the foregoing, it is the INITIAL DETERMINATION ("ID") of the undersigned that a violation of section 337 of the Tariff Act of 1930, as amended, has occurred in the importation into the United States, the sale for importation, or the sale within the United States after importation of certain variable speed wind turbines and components thereof by reason of infringement of claim 121 of United States Patent No. 5,083,039 and claim 15 of United States Patent No. 6,921,985.

Further, this ID, together with the record of the hearing in this investigation consisting of:

(1) the transcript of the hearing, with appropriate corrections as may hereafter be ordered, and

(2) the exhibits received into evidence in this investigation, as listed in the attached exhibit lists, is CERTIFIED to the Commission.

In accordance with 19 C.F.R. § 210.39(c), all material found to be confidential by the undersigned under 19 C.F.R. § 210.5 is to be given *in camera* treatment.

The Secretary shall serve a public version of this ID upon all parties of record and the confidential version upon counsel who are signatories to the Protective Order (Order No. 1) issued in this investigation, and upon the Commission investigative attorney.

To expedite service of the public version, each party is hereby ORDERED to file with the Commission Secretary by no later than August 14, 2009, a copy of this ID with brackets that show any portion considered by the party (or its suppliers of information) to be confidential, accompanied by a list indicating each page on which such a bracket is to be found. At least one copy of such a filing shall be served upon the Administrative Law Judge, and the brackets shall

be marked in red. If a party (and its suppliers of information) considers nothing in the ID to be confidential, and thus makes no request that any portion be redacted from the public version of this ID, then a statement to that effect shall be filed in lieu of a document with brackets.

Pursuant to 19 C.F.R. § 210.42(h), this Initial Determination shall become the determination of the Commission unless a party files a petition for review pursuant to § 210.43(a) or the Commission, pursuant to § 210.44, orders on its own motion a review of the ID or certain issues herein.

Carl C. Charneski
Administrative Law Judge

Issued: August 7, 2009

CERTAIN VARIABLE SPEED WIND TURBINES AND COMPONENTS THEREOF
INV. NO. 337-TA-641

PUBLIC CERTIFICATE OF SERVICE

I, Marilyn R. Abbott, hereby certify that the attached **INITIAL DETERMINATION** has been served upon the Commission Investigative Attorney, Erin D. Joffre, Esq., and the following parties as indicated, on

OCT 21 2009

Marilyn R. Abbott, Secretary
U.S. International Trade Commission
500 E Street, SW, Room 112A
Washington, D.C. 20436

FOR COMPLAINANT GENERAL ELECTRIC CO.:

V. James Adduci, II., Esq.
ADDUCI, MASTRIANI & SCHAUMBERG, L.L.P.
1200 Seventeenth St., N.W., Fifth Floor
Washington, D.C. 20036

( ) Via Hand Delivery
(✓) Via Overnight Mail
( ) Via First Class Mail
( ) Other: _____

FOR RESPONDENTS MITSUBISHI HEAVY INDUSTRIES, LTD., MITSUBISHI HEAVY INDUSTRIES AMERICA, INC., AND MITSUBISHI POWER SYSTEM, INC.:

Thomas W. Winland, Esq.
FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER, L.L.P.
901 New York Ave., N.W.
Washington, D.C. 20001

( ) Via Hand Delivery
(✓) Via Overnight Mail
( ) Via First Class Mail
( ) Other: _____

CERTAIN VARIABLE SPEED WIND TURBINES AND COMPONENTS THEREOF
INV. NO. 337-TA-641

PUBLIC MAILING LIST

Heather Hall
Lexis-Nexis
9443 Springboro Pike
Miamisburg, OH 45342

Kenneth Clair
Thomson West
1100 Thirteen Street, NW, Suite 200
Washington, D.C. 20005

PUBLIC VERSION

UNITED STATES INTERNATIONAL TRADE COMMISSION
Washington, D.C.

In the Matter of **CERTAIN VARIABLE SPEED WIND TURBINES AND COMPONENTS THEREOF**	**Inv. No. 337-TA-641**

RECOMMENDED DETERMINATION ON REMEDY AND BONDING

Administrative Law Judge Carl C. Charneski

Pursuant to the notice of investigation, 73 Fed. Reg. 16910 (2008), this is the Recommended Determination in the matter of *Certain Variable Speed Wind Turbines and Components Thereof*, United States International Trade Commission Investigation No. 337-TA-641. *See* 19 C.F.R. § 210.42(a)(1)(ii).

For the reasons stated herein, it is recommended that a limited exclusion order issue. It is not recommended that a cease and desist order issue as to any respondent. Additionally, it is recommended that if the Commission issues an exclusion order as a result of this investigation, the Presidential review period bond should be set at 100% (one hundred percent) of the entered value of any covered product.

Table of Contents

I. Procedural Background

The Commission's Rules provide that subsequent to an initial determination on the question of violation of section 337 of the Tariff Act of 1930, as amended (19 U.S.C. § 1337), the Administrative Law Judge shall issue a recommended determination ("RD") containing findings of fact and recommendations concerning: (1) the appropriate remedy in the event that the Commission finds a violation of section 337, and (2) the amount of bond to be posted by respondents during Presidential review of Commission action under section 337(j). *See* 19 C.F.R. § 210.42(a)(1)(ii).

On August 7, 2009, the undersigned issued the initial determination ("ID") in this investigation, finding that a violation of section 337 has occurred in the importation into the United States, the sale for importation, or the sale within the United States after importation of certain variable speed wind turbines or components thereof.

The notice of investigation named as the complainant General Electric Company ("GE") of Fairfield, Connecticut. 73 Fed. Reg. 16910 (2008). The following companies were named as the respondents: Mitsubishi Heavy Industries, Ltd. ("MHI") of Tokyo, Japan; Mitsubishi Heavy Industries America, Inc. ("MHIA") of New York, New York; and Mitsubishi Power Systems Americas, Inc. ("MPSA") of Lake Mary, Florida (collectively, "Mitsubishi" or "Mitsubishi respondents"). *Id.* The Commission Investigative Staff ("Staff") of the Commission's Office of Unfair Import Investigations is also a party in this investigation. *Id.*

II. Remedy

A. Summary Of The Parties' Arguments

GE argues that "upon a finding of violation, the proper remedy is a limited exclusion

order barring Respondents from importing the Mitsubishi Wind Turbines, [

] GE also requests a cease and desist order against MPSA. *Id.* at 99. It is further argued that the importation bond for the Presidential review period should be set at 100% of a product's entered value. *Id.* at 99-100. GE argues that the Mitsubishi respondents' bond proposal is based on a mean licensing fee, without a showing that it would be reasonable to apply such a calculation in the present circumstances. *See* GE Reply at 50.

The Mitsubishi respondents do not address the question of a limited exclusion order. They argue that a cease and desist order is not appropriate because GE did not request a cease and desist order in its prehearing statement (and in no case should such an order prevent MHI from providing turbines that have already been imported with replacement parts, servicing and repairs). They also argue that Commission precedent would allow the importation bond to be set according to the rate of a "reasonable royalty,"[

]

The Staff argues that if a violation of section 337 is found, a limited exclusion order should issue, and should apply to the infringing products of MHI and MPSA. It is argued that under Commission precedent, the limited exclusion order should apply to affiliated companies, parents, subsidiaries or other related business entities, and their successors and assigns, and thus would include MHIA inasmuch as it is wholly owned by MHI and wholly owns MPSA. *See*

Staff Br. at 79.

With respect to a cease and desist order, the Staff notes that GE did not address the issue in its prehearing statement. Further, it is argued that there is insufficient evidence of a "commercially significant" inventory required for the issuance of such an order, and thus GE has not established that it is warranted. *See Id.*; Staff Reply at 21-22.

Finally, with respect to bond, the Staff argues that the licenses related to the asserted patents "have a number of markedly different conditions, including number of patents licensed, lump sum payments, settlement concessions, cross-licensing, and varying per unit running royalty rates." Staff Br. at 80-81. Thus, it is argued that "the record lacks sufficient information to conclude anything but the 100% entered value would be appropriate." *See Id.* at 81.

B. Limited Exclusion Order

The Commission has broad discretion in selecting the form, scope, and extent of the remedy in a section 337 proceeding. *Viscofan, S.A. v. United States Int'l Trade Comm'n*, 787 F.2d 544, 548 (Fed. Cir. 1986). A limited exclusion order directed to respondents' infringing products is among the remedies that the Commission may impose. *See* 19 U.S.C. § 1337(d).

As indicated in the ID, MHI and MPSA have stipulated that they have sold for importation, imported and, or, sold after importation into the United States, the accused Mitsubishi turbines. *See* ID at 15. Consequently, if a violation of section 337 is found, a limited exclusion order should issue that is directed at MHI and MPSA.

As found in the ID, however, GE has not argued or demonstrated that MHIA has directly imported or sold an accused product; nor has GE advanced a legal theory under which the actions of MHIA's subsidiary, MPSA, would be chargeable to the parent company. MHIA was not

found in violation of section 337. *See* ID at 16. Nevertheless, a limited exclusion order normally includes named respondents and their affiliated companies, parents, subsidiaries, or other related business entities, and their successors or assigns. *See, e.g.*, *Certain Automotive Measuring Devices, Products Containing Same, and Bezels for Such Devices*, Inv. No. 337-TA-494, Limited Exclusion Order (Jan. 24, 2005); *Certain Variable Speed Wind Turbines*, Inv. No. 337-TA-376, Order (Aug. 30, 1996). It is undisputed that MHIA is wholly owned by MHI, and that it wholly owns MPSA. *See* Resp. to Compl., ¶¶ 12, 14. Thus, for any limited exclusion order naming MHI and, or, MPSA to have real effect it must also cover importations and sales of accused products by MHIA. Otherwise an evasion of any limited exclusion order is possible [ ]

C. Cease And Desist Order

Section 337 provides that in addition to, or in lieu of, the issuance of an exclusion order, the Commission may issue a cease and desist order as a remedy for violation of section 337. *See* 19 U.S.C. § 1337(f)(1). The Commission generally issues a cease and desist order directed to a domestic respondent when there is a "commercially significant" amount of infringing, imported product in the United States that could be sold so as to undercut the remedy provided by an exclusion order. *See Certain Crystalline Cefadroxil Monohydrate*, Inv. No. 337-TA-293, USITC Pub. No. 2391, Comm'n Op. on Remedy, the Public Interest and Bonding at 37-42 (June 1991); *Certain Condensers, Parts Thereof and Products Containing Same, Including Air Conditioners for Automobiles*, Inv. No. 337-TA-334, Comm'n Op. at 26-28 (Aug. 27, 1997).

GE requests that a cease and desist order issue against MPSA. GE Br. at 99. This

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[1] [

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request for a cease and desist order, however, was not raised by GE in its prehearing statement. *See* GE Prehr'g Statement at vii, 212-15. Instead, it was raised for the first time in complainant's post-hearing brief. Indeed, there the cease and desist order issue is addressed very briefly,[2] and not at all in complainant's reply brief. Thus, the issue of whether a cease and desist order should issue here was untimely raised, and the request must be rejected. *See* Order No. 2, Ground Rule 4d (issues to be addressed at hearing to be set forth in prehearing statement).

Accordingly, the issuance of a cease and desist order is not recommended.

D. Bond

The Administrative Law Judge and the Commission must determine the amount of bond to be required of a respondent, pursuant to section 337(j)(3), during the 60-day Presidential review period following the issuance of permanent relief, in the event that the Commission determines to issue a remedy. The purpose of the bond is to protect the complainant from any injury. 19 C.F.R. § 210.42(a)(1)(ii), § 210.50(a)(3).

When reliable price information is available, the Commission has often set the bond by eliminating the differential between the domestic product and the imported, infringing product. *See Certain Microsphere Adhesives, Processes for Making Same, and Products Containing Same, Including Self-Stick Repositionable Notes*, Inv. No. 337-TA-366, Comm'n Op. a 24 (1995). In other cases, the Commission has turned to alternative approaches, especially when the level of a reasonable royalty rate could be ascertained. *See Certain Integrated Circuit*

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[2] In any event, little evidence was adduced at the hearing that would be relevant to the issue of a cease and desist order. [

] Thus, even if properly raised, there would be insufficient evidence upon which to grant relief.

Telecommunication Chips and Products Containing Same, Including Dialing Apparatus, Inv. No. 337-TA-337, Comm'n Op. at 41-43 (1995). A 100 percent bond has been required when no effective alternative existed. *See Certain Flash Memory Circuits and Products Containing Same*, Inv. No. 337-TA-382, USITC Pub. No. 3046, Comm'n Op. at 26-27 (July 1997) (a 100% bond imposed when price comparison was not practical because the parties sold products at different levels of commerce, and the proposed royalty rate appeared to be *de minimis* and without adequate support in the record).

In this case, no party relies on price information with respect to the issue of bond. In addition, there is inadequate evidence to permit an alternate method of bond calculation, such as the calculation of a reasonable royalty rate. The Mitsubishi respondents have calculated the midpoint dollar amount of the royalties required by various GE licenses. *See* Mitsubishi Reply at 50. However, it is has not been established that the licenses used in the calculation are comparable to the extent that the midpoint accurately represents a reasonable royalty rate.

Consequently, it is recommended that a 100% bond be required of respondents during the Presidential review period.

III. Conclusions And Recommended Determination

In accordance with the discussion of the issues contained herein, it is the RECOMMENDED DETERMINATION of the undersigned that in the event the Commission determines that respondents have committed a violation of section 337, the Commission should issue a limited order. In addition, if the Commission imposes a remedy that prohibits importation, in order to import subject products during the Presidential review period, respondents should be required to post a bond of 100% of the entered value of the imported

products.

The Secretary shall serve a confidential version of this RD upon counsel who are signatories to the Protective Order issued in this investigation (Order No. 1), and upon the Commission investigative attorney.

To expedite service of the public version, counsel for each party shall file by no later than August 28, 2009, a copy of this RD with those sections considered by the party to be confidential bracketed in red, or if confidential treatment is not requested for any portion of this RD, a statement to that effect.

SO ORDERED.

Carl C. Charneski
Administrative Law Judge

Issued: August 21, 2009

CERTAIN VARIABLE SPEED WIND TURBINES AND COMPONENTS THEREOF
INV. NO. 337-TA-641

PUBLIC CERTIFICATE OF SERVICE

I, Marilyn R. Abbott, hereby certify that the attached **RECOMMENDED DETERMINATION** has been served upon the Commission Investigative Attorney, Erin D. Joffre, Esq., and the following parties as indicated, on

OCT 21 2009

Marilyn R. Abbott, Secretary
U.S. International Trade Commission
500 E Street, SW, Room 112A
Washington, D.C. 20436

FOR COMPLAINANT GENERAL ELECTRIC CO.:

V. James Adduci, II., Esq.
ADDUCI, MASTRIANI & SCHAUMBERG, L.L.P.
1200 Seventeenth St., N.W., Fifth Floor
Washington, D.C. 20036

( ) Via Hand Delivery
(✓) Via Overnight Mail
( ) Via First Class Mail
( ) Other: _____

FOR RESPONDENTS MITSUBISHI HEAVY INDUSTRIES, LTD., MITSUBISHI HEAVY INDUSTRIES AMERICA, INC., AND MITSUBISHI POWER SYSTEM, INC.:

Thomas W. Winland, Esq.
FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER, L.L.P.
901 New York Ave., N.W.
Washington, D.C. 20001

( ) Via Hand Delivery
(✓) Via Overnight Mail
( ) Via First Class Mail
( ) Other: _____

CERTAIN VARIABLE SPEED WIND TURBINES AND COMPONENTS THEREOF
INV. NO. 337-TA-641

PUBLIC MAILING LIST

Heather Hall
Lexis-Nexis
9443 Springboro Pike
Miamisburg, OH 45342

Kenneth Clair
Thomson West
1100 Thirteen Street, NW, Suite 200
Washington, D.C. 20005

UNITED STATES INTERNATIONAL TRADE COMMISSION
Washington, D.C. 20436

In the Matter of **CERTAIN VARIABLE SPEED WIND TURBINES AND COMPONENTS THEREOF**	**Investigation No. 337-TA-641**

NOTICE OF COMMISSION DETERMINATION TO REVIEW A FINAL INITIAL DETERMINATION OF THE ADMINISTRATIVE LAW JUDGE

AGENCY: U.S. International Trade Commission.

ACTION: Notice.

SUMMARY: Notice is hereby given that the U.S. International Trade Commission has determined to review the final initial determination ("ID") of the presiding administrative law judge ("ALJ") in the above-captioned investigation under section 337 of the Tariff Act of 1930, as amended, 19 U.S.C. § 1337 ("section 337"). The ALJ found a violation of section 337.

FOR FURTHER INFORMATION CONTACT: James A. Worth, Office of the General Counsel, U.S. International Trade Commission, 500 E Street, S.W., Washington, D.C. 20436, telephone (202) 205-3065. Copies of non-confidential documents filed in connection with this investigation are or will be available for inspection during official business hours (8:45 a.m. to 5:15 p.m.) in the Office of the Secretary, U.S. International Trade Commission, 500 E Street, S.W., Washington, D.C. 20436, telephone (202) 205-2000. General information concerning the Commission may also be obtained by accessing its Internet server (*http://www.usitc.gov*). The public record for this investigation may be viewed on the Commission's electronic docket (EDIS) at *http://edis.usitc.gov*. Hearing-impaired persons are advised that information on this matter can be obtained by contacting the Commission's TDD terminal on (202) 205-1810.

SUPPLEMENTARY INFORMATION: This investigation was instituted on March 31, 2008, based upon a complaint filed on behalf of General Electric Company ("GE") of Fairfield, Connecticut on February 7, 2008. The complaint alleged violations of section 337 of the Tariff Act of 1930 (19 U.S.C. § 1337) in the importation into the United States, the sale for importation, and the sale within the United States after importation of certain variable speed wind turbines and components thereof that infringe claims 121-125 of U.S. Patent No. 5,083,039 ("the '039 patent") and claims 1-12, 15-18, and 21-28 of U.S. Patent No. 6,921,985 ("the '985 patent").

The notice of investigation named as respondents Mitsubishi Heavy Industries, Ltd. ("MHI") of Tokyo, Japan; Mitsubishi Heavy Industries America, Inc. ("MHIA") of New York, New York; and Mitsubishi Power Systems, Inc. ("MPSA") of Lake Mary, Florida.

On October 8, 2008, the Commission issued notice of its determination not to review an ID (Order No. 10) granting GE's motion to amend its complaint and the notice of investigation to add claims 1-19 of United States Patent No. 7,321,221 ("the '221 patent") to this investigation.

On April 21, 2009, the Commission issued notice of its determination not to review an ID (Order No. 30) granting GE's amended motion for summary determination that it had satisfied the economic prong of the domestic industry requirement with respect to all three asserted patents.

The ALJ conducted an evidentiary hearing commencing on May 11, 2009. At the hearing, GE narrowed the number of asserted claims to: claim 121 of the '039 patent; claims 5, 7, and 8 of the '221 patent; and claim 15 of the '985 patent.

On August 7, 2009, the ALJ issued a final ID finding a violation of section 337 in this investigation. The ALJ found that there was a violation in the sale for importation, importation, or sale after importation by respondents MHI and MPSA with respect to claim 121 of the '039 patent and claim 15 of the '985 patent. The ALJ found that there was no violation with respect to these claims by MHIA. The ALJ also found that there was no violation of section 337 by any party with respect to claims 5, 7, and 8 of the '221 patent.

On August 24, 2009, the parties filed three petitions and/or contingent petitions for review: (1) MHI, MPSA, and MHIA; (2) GE; and (3) the Commission investigative attorney. On September 1, 2009, each of the parties filed responses thereto.

Having examined the final ID, the petitions for review, the responses thereto, and the relevant portions of the record in this investigation, the Commission has determined to review the final ID, except the issue of importation and the intent finding underlying the ALJ's inequitable conduct determination.

The Commission requests briefing based on the evidentiary record on the issues on review. The Commission is particularly interested in responses to the following questions:

(1) If the Commission were to adopt the claim constructions presented to the administrative law judge by Mitsubishi or the Commission investigative attorney, would the Mitsubishi Wind Turbines or the GE Wind Turbines satisfy these claim constructions under the doctrine of equivalents?

(2) Does the Commission need to address the issue of inventorship to determine whether GE has standing to assert infringement of the '985 patent?

(3) Does claim 15 of the '985 patent require that the device shunt current away from both the inverter and the generator rotor? Can the shunt circuit be located within the inverter?

In connection with the final disposition of this investigation, the Commission may issue (1) an order that could result in the exclusion of the subject articles from entry into the United States, and/or (2) cease and desist orders that could result in respondents being required to cease and desist from engaging in unfair acts in the importation and sale of such articles. Accordingly, the Commission is interested in receiving written submissions that address the form of remedy, if any, that should be ordered. If a party seeks exclusion of an article from entry into the United States for purposes other than entry for consumption, the party should so indicate and provide information establishing that activities involving other types of entry either are adversely affecting it or are likely to do so. For background information, see the Commission Opinion, *In the Matter of Certain Devices for Connecting Computers via Telephone Lines*, Inv. No. 337-TA-360.

If the Commission contemplates some form of remedy, it must consider the effects of that remedy upon the public interest. The factors the Commission will consider include the effect that an exclusion order and/or cease and desist orders would have on (1) the public health and welfare, (2) competitive conditions in the U.S. economy, (3) U.S. production of articles that are like or directly competitive with those that are subject to investigation, and (4) U.S. consumers. The Commission is therefore interested in receiving written submissions that address the aforementioned public interest factors in the context of this investigation.

If the Commission orders some form of remedy, the President has 60 days to approve or disapprove the Commission's action. During this period, the subject articles would be entitled to enter the United States under a bond, in an amount to be determined by the Commission and prescribed by the Secretary of the Treasury. The Commission is therefore interested in receiving submissions concerning the amount of the bond that should be imposed.

WRITTEN SUBMISSIONS: The parties to the investigation are requested to file written submissions on the issues under review. The submissions should be concise and thoroughly referenced to the record in this investigation, including references to exhibits and testimony. Additionally, the parties to the investigation, interested government agencies, and any other interested persons are encouraged to file written submissions on the issues of remedy, the public interest, and bonding. Such submissions should address the ALJ's recommended determination on remedy and bonding. Complainant and the Commission investigative attorney are also requested to submit proposed remedial orders for the Commission's consideration. Complainant is requested to supply the expiration dates of the patents at issue and the HTSUS numbers under which the accused products are imported. The written submissions and proposed remedial orders must be filed no later than the close of business on October 22, 2009. Reply submissions must be filed no later than the close of business on November 2, 2009. No further submissions will be permitted unless otherwise ordered by the Commission.

Persons filing written submissions must file with the Office of the Secretary the original and 12 true copies thereof on or before the deadlines stated above. Any person desiring to submit a document (or portion thereof) to the Commission in confidence must request confidential treatment unless the information has already been granted such treatment during the proceedings. All such requests should be directed to the Secretary of the Commission and must include a full statement of the reasons why the Commission should grant such treatment. *See* 19 C.F.R § 201.6. Documents for which confidential treatment is granted by the Commission will be treated accordingly. All nonconfidential written submissions will be available for public inspection at the Office of the Secretary.

This action is taken under the authority of section 337 of the Tariff Act of 1930, as amended (19 U.S.C. § 1337), and under sections 210.42 - .46 of the Commission's Rules of Practice and Procedure (19 C.F.R. §§ 210.42 - .46).

By order of the Commission.

Marilyn R. Abbott
Secretary to the Commission

Issued: October 8, 2009

CERTAIN VARIABLE SPEED WIND TURBINES AND COMPONENTS THEREOF **337-TA-641**

CERTIFICATE OF SERVICE

I, Marilyn R. Abbott, hereby certify that the attached **NOTICE OF COMMISSION DETERMINATION TO REVIEW A FINAL INITIAL DETERMINATION OF THE ADMINISTRATIVE LAW JUDGE** has been served by hand upon the Commission Investigative Attorney Erin D. Joffre, Esq., and the following parties as indicated, on OCT 09 2009.

Marilyn R. Abbott, Secretary
U.S. International Trade Commission
500 E Street, SW
Washington, DC 20436

On Behalf of Complainant General Electric Company:

V. James Adduci, II, Esq.
ADDUCI, MASTRIANI & SCHAUMBERG LLP
1200 Seventeenth Street, NW – 5th Floor
Washington, DC 20036

( ) Via Hand Delivery
( ) Via Overnight Mail
(✓) Via First Class Mail
( ) Other: _____

On Behalf of Respondents Mitsubishi Heavy Industries, Ltd., Mitsubishi Heavy Industries America, Inc., and Mitsubishi Power Systems America, Inc.:

Thomas W. Winland, Esq.
FINNEGAN HENDERSON FARABOW GARRETT & DUNNER, LLP
901 New York Avenue, NW
Washington, DC 20001

( ) Via Hand Delivery
( ) Via Overnight Mail
(✓) Via First Class Mail
( ) Other: _____