

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

STELLAR ENERGY AMERICAS, INC.,
Petitioner,

v.

TAS ENERGY, INC.,
Patent Owner.

Case IPR2015-01212
Patent 6,318,065 B1

Before JOSIAH C. COCKS, BARRY L. GROSSMAN, and
MICHAEL L. WOODS, *Administrative Patent Judges*.

GROSSMAN, *Administrative Patent Judge*.

FINAL DECISION
35 U.S.C. § 318(a) and 37 C.F.R. § 42.73

I. INTRODUCTION

Stellar Energy Americas, Inc. (“Petitioner”) filed a Petition requesting an *inter partes* review of claims 1–11 of U.S. Patent No. 6,318,065 B1 (“the ’065 patent”). Paper 2 (“Pet.”). Patent owner, TAS Energy, Inc. (“Patent Owner”), filed a Preliminary Response. Paper 8 (“Prelim. Resp.”). We instituted an *inter partes* review of claims 1, 3–6, 8, and 9. Paper 13 (“Decision”). Petitioner requested a rehearing of our Decision. Paper 15. We denied the request. Paper 16 (“Reh’g Decision”). Patent Owner filed a response. Paper 19 (“Response”). Petitioner filed a Reply. Paper 25 (“Reply”). Petitioner (Paper 33) and Patent Owner (Paper 28) each filed motions to exclude evidence.

An oral hearing occurred on August 18, 2016. The record includes a transcript of the hearing. Paper 42 (“Tr.”).

We have jurisdiction under 35 U.S.C. § 6. This final written decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73.

Petitioner has the burden of proving a proposition of unpatentability by a preponderance of the evidence. 35 U.S.C. § 316(e). For the reasons that follow, we determine Petitioner has shown, by a preponderance of the evidence, that claims 1, 3–6, 8, and 9 are unpatentable.

A. Related Proceedings

Petitioner states the ’065 patent was the subject of *inter partes* review No. IPR2014-00161, which was terminated following settlement. Pet. 53; *see General Electric Company v. TAS Energy, Inc.*, No. IPR2014-00161, Paper 20 (PTAB Oct. 3, 2014) (generally cited as “the ’161 IPR”).

Petitioner also states the ’065 patent is the subject of a suit against Petitioner and others filed by Patent Owner, *TAS Energy, Inc. v. Direct Energy, Inc.*, No. 4:15-cv-00512 (S.D. Tex. filed Feb. 24, 2015). Pet. 53.

Patent Owner also lists the *TAS Energy v. Direct Energy* case as a related proceeding. Paper 10, 1. Additionally, Patent Owner identifies *TAS Energy, Inc. v. Stellar Energy Americas, Inc.*, No. 8:14-cv-3145 (M.D. Fla. Dec. 17, 2014). *Id.* This case alleges infringement of U.S. Patent No. RE44,815, issued Mar. 25, 2014 (filed Feb. 26, 2013) (“the ’815 patent”). The ’815 patent claims priority to the ’065 patent.

Numerous patents claim priority to the ’065 patent, directly or indirectly. Many of these offspring patents are involved, or have been involved, in *inter partes* reviews. We identify these cases below.

Patent Owner identifies four *inter partes* review proceedings as related matters (Paper 10, 1):

IPR2015-00882 and IPR2015-00886, each case filed by Petitioner herein, seeking review of selected claims in the ’815 patent (Final Decision determining selected claims are unpatentable entered September 15, 2016);

IPR2015-01214, filed by Petitioner herein, seeking review of all the claims of U.S. Patent No. 6,470,686 (Final Decision determining all claims unpatentable entered concurrently with this decision); and

IPR2015-01665, filed by Petitioner herein, seeking review of selected claims in the ’815 patent (petition denied; case terminated).

We also identify the following three related *inter partes* reviews: IPR2016-00424, 00425, and 00426. Each case was filed by Petitioner herein. Each case seeks review of selected claims of Patent No. RE44,079. Each case is pending.

Patent Owner lists as a related matter U.S. Patent Application Serial No. 13/777,820. *Id.*

B. The ’065 Patent

The invention recited in the challenged claims is a method of cooling inlet

air to a gas turbine. Ex. 1001, col. 1, ll. 7–8. Gas turbines are a well-known and commonly used power source in numerous and diverse applications, such as in airplanes, ships, electricity production, and industrial mechanical drives. Ex. 1004 ¶ 14. It also is well-known that one way of increasing the power output of a gas turbine is to cool the turbine inlet air. Cooling causes the air to have a higher density, thereby creating a higher mass flow rate through the turbine. Ex. 1004 ¶ 15; Ex. 1001, col. 1, ll. 23–25. The higher the mass flow rate through the turbine, the more power the turbine produces. Ex. 1001, col. 1, ll. 25–26. Cooling the inlet air temperature also increases the turbine's efficiency. *Id.* at col. 1, ll. 26–28.

The following annotated Figure 1 from the '065 patent was provided by Patent Owner (PO Resp. 15).

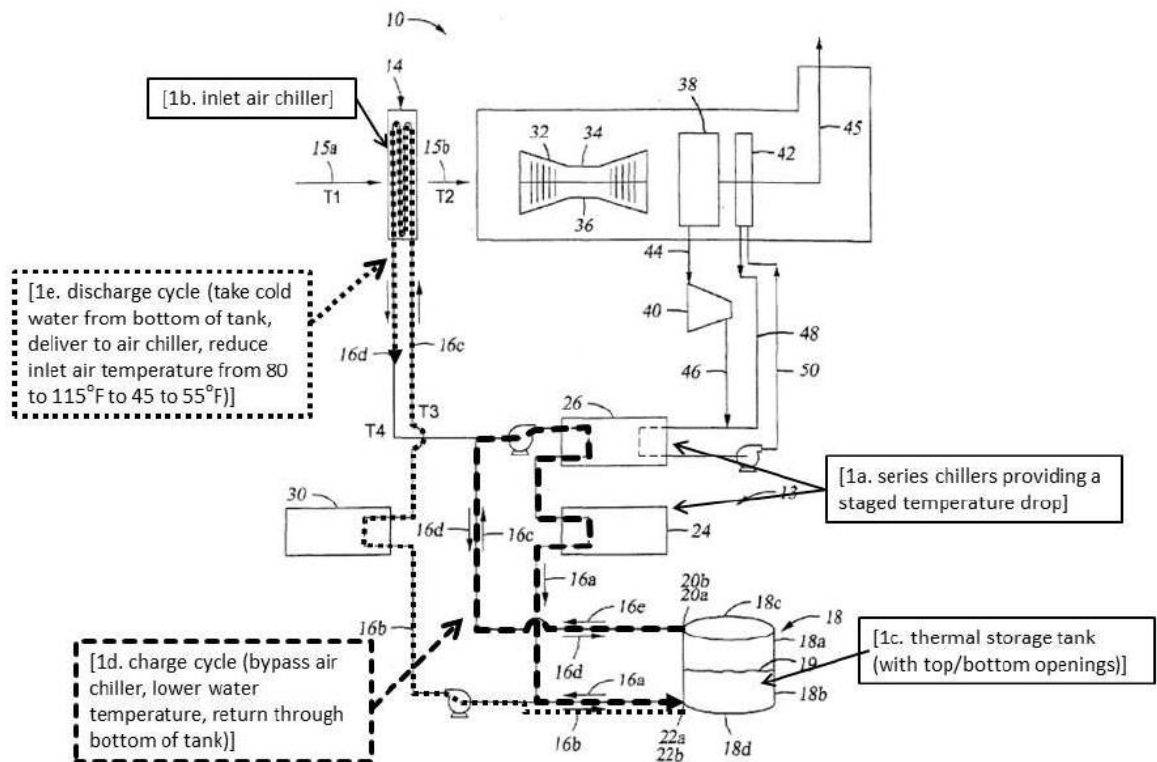


Fig. 1

As shown in annotated Figure 1, and as described in the Specification, the claimed method includes water chillers 24, 26 arranged in series, connected to inlet air chiller 14. Thermal water tank 18 contains water. During a “charge cycle,” water tank 18 fills with chilled water, thus providing for thermal energy storage. Ex. 1001, col. 11, ll. 8–12. During a “discharge cycle,” chilled water from water tank 18 is delivered to inlet air chiller 14 to cool the air entering the turbine. *Id.* at col. 11, l. 49–col. 12, l. 9.

The parties and their respective experts generally refer to turbine inlet cooling (“TIC”) using thermal energy storage (“TES”) by the combined acronym of TIC/TES systems. *E.g.*, Ex. 2009 ¶ 35 (Andrepoint discloses “chilled-water TIC/TES”).

The claimed method includes five basic elements and steps:

1. At least two *water* chillers, arranged in series, providing a staged temperature drop;
2. An inlet *air* chiller for a gas turbine compressor;
3. A thermal water storage tank;
4. A charge cycle, wherein water from the storage tank is cooled by the series *water* chillers, bypasses the inlet *air* chiller, and is returned to the storage tank; and
5. A discharge cycle, wherein chilled water from the storage tank is directed to the inlet *air* chiller to cool the inlet air entering the turbine.

PO Resp. 9–12. In the Summary of the Invention, the ’065 patent refers to these five elements and steps, collectively, as “a method for chilling inlet air to a gas turbine power plant.” Ex. 1001, col. 1, l. 61–col. 2, l. 21.

As discussed more fully below, there is no dispute between the parties that

the five elements and steps are well-known and commonly used in TIC/TES systems. The sole patentability issue before us is whether it would have been obvious to combine these known elements and steps as recited in the challenged claims.

C. Illustrative Claim

Claim 1 is the sole independent claim, and is reproduced below.

1. A method for chilling inlet air to a gas turbine power plant, comprising:

a. providing a system of circulating chilling water including a chilling system that includes at least a first chiller and a second chiller, the first and second chillers being arranged in series, wherein water can pass through the first and second chillers, the water passing through the first chiller being lowered to a first temperature, the water passing through the second chiller being lowered to a second temperature that is lower than the first temperature, thus providing a staged temperature drop;

b. providing an inlet air chiller for lowering the temperature of the inlet air being fed to a gas turbine compressor through heat transfer between the circulating chilling water and the inlet air;

c. providing a thermal water storage tank which is operably connected to the system of circulating chilling water, the thermal water storage tank containing chilling water having a bottom;

d. during a charge cycle, removing chilling water from the thermal water storage tank, passing at least a portion of the removed water through the chilling system without passing that portion of chilling water through the inlet air chiller to lower the temperature of water passing through the chilling system and then introducing at least a portion of that chilled water into the thermal water storage tank at a point proximate the bottom of the tank, wherein the average temperature of the chilling water in the thermal water storage tank is lowered; and

e. during a discharge cycle, chilling the inlet air by removing chilling water from the thermal water storage tank, from a point proximate the bottom of the tank and then passing at least a portion

of that removed chilling water to the inlet air chiller to make heat transfer contact between that portion of chilling water and the inlet air, such that the temperature of the inlet air is lowered from a high temperature of from about 80° F. to about 115° F. to a low temperature of from about 45° F. to about 55° F.

Ex. 1001, col. 13, l. 44–col. 14, l. 17.

D. The Asserted Ground

Petitioner asserts that claims 1, 3–6, 8, and 9 are unpatentable under 35 U.S.C. § 103(a)¹ based on Andrepont² and Mornhed³. Pet. 19.

II. ANALYSIS

A. Claim Construction

Petitioner proposes specific definitions for several claim terms. Pet. 13–18. Patent Owner does not challenge Petitioner’s proposed constructions. PO Resp. 16. Patent Owner asserts, however, there is no need for construction of specific claim terms “because the constructions are immaterial to the Board’s institution decisions.” *Id.*

In an *inter partes* review, claim terms in an unexpired patent are interpreted according to their broadest reasonable construction in light of the specification of the patent in which they appear. 37 C.F.R. § 42.100(b); *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2144–46 (2016). Under that standard, and absent any

¹ The Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112-29, 125 Stat. 284, 296–07 (2011), took effect on September 16, 2012. Because the application for the patent at issue in this proceeding has an effective filing date before that date, we refer to the pre-AIA versions of the statute.

² Andrepont et al., “Summer Peaking Capacity Via Chilled Water Storage Cooling of Combustion Inlet Air,” Proceedings of the Am. Power Conference, Vol. 56-II, 1994. Ex. 1010 (“Andrepont”).

³ Mornhed et al., “Innovations in District Heating and Cooling 1984-1994 and Their Economic Impact,” ASHRAE Transactions: Symposia, asserted by Petitioner as dated 1995 (Pet. iv, 8). Exhibit 1008 (“Mornhed”)

special definitions, we give claim terms their ordinary and customary meaning, as would be understood by one of ordinary skill in the art at the time of the invention. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). Any special definitions for claim terms must be set forth with reasonable clarity, deliberateness, and precision. *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994). Only terms that are in controversy need to be construed, and then only to the extent necessary to resolve the controversy. *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999).

In our Decision to institute this proceeding, we construed several claim terms. Decision 8–10. In general, we agree with Patent Owner that the meaning of specific terms in the claim is not in dispute. PO Resp. 16. It is helpful to our analysis, however, to adopt for purposes of this decision the construction of the phrase “gas turbine power plant,” which we repeat below, from our Decision to institute this proceeding. This phrase is relevant to Patent Owner’s arguments concerning the motivation to combine Andrepont and Mornhed. We give all other claim terms their ordinary and customary meaning, as one of ordinary skill in the art would have understood them at the time of the invention.

1. “*Gas turbine power plant*”

The Specification does not provide any special definition for the term “gas turbine power plant.” The Specification describes a conventional “gas turbine system” as one including a power turbine that is driven by “combustion gas, thereby producing an exhaust gas and useful power.” Ex. 1001, col. 1, ll. 13–18. Accordingly, we determine that the broadest reasonable construction in light of the Specification of the claim term “gas turbine power plant” is a “gas turbine power source driven by combustion gas, thereby producing an exhaust gas and useful power.”

B. Asserted Grounds of Unpatentability

1. Obviousness Based on Andrepont and Mornhed

Petitioner asserts that claims 1, 3–6, 8, and 9 would have been obvious under 35 USC § 103 based on Andrepont and Mornhed. Pet. 19.

Section 103(a) precludes issuance of a patent when “the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.”

35 U.S.C. § 103(a). In *Graham v. John Deere Co.*, 383 U.S. 1 (1966), the Court set out a framework for applying the statutory language of § 103:

Under § 103, the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved. Against this background, the obviousness or nonobviousness of the subject matter is determined. Such secondary considerations as commercial success, long felt but unsolved needs, failure of others, etc., might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented.

Id. at 17–18. When present, we always consider objective evidence of patentability, such as the “secondary considerations,” in a determination of obviousness. *WBIP, LLC v. Kohler Co.*, 829 F.3d 1317, 1328 (Fed. Cir. 2016). “While the sequence of these questions might be reordered in any particular case, the factors continue to define the inquiry that controls.” *KSR Int’l v. Teleflex Inc.*, 550 U.S. 398, 407 (2007).

The Supreme Court made clear that we apply “an expansive and flexible approach” to the question of obviousness. *Id.* at 415. Whether a patent claiming the combination of prior art elements would have been obvious is determined by asking whether the improvement is more than the predictable use of prior art

elements according to their established functions. *Id.* at 417. To answer this question, however, it is not enough to show merely that the prior art includes separate references covering each separate limitation in a challenged claim. *Unigene Labs., Inc. v. Apotex, Inc.*, 655 F.3d 1352, 1360 (Fed. Cir. 2011). Rather, obviousness additionally requires that a person of ordinary skill at the time of the invention would have selected and combined those prior art elements in the normal course of research and development to yield the claimed invention. *Id.*

As a factfinder, we also must be aware “of the distortion caused by hindsight bias and must be cautious of arguments reliant upon *ex post* reasoning.” *KSR*, 550 U.S. at 421. This does not deny us, however, “recourse to common sense” or to that which the prior art teaches. *Id.*

Against this general background, we consider the references, other evidence, and arguments on which the parties rely.

2. *Scope and Content of the Prior Art*

Petitioner asserts, “Andrepoint has everything that’s needed to invalidate except series chilling.” Tr. 9:15–16.⁴ As discussed below, Petitioner relies on Mornhed for the disclosure of series chilling. *E.g.*, Pet. 21–22.

In general, Patent Owner asserts this is “not a simple case about just series chilling. . . . [I]t is not just about swapping out a single chiller for series chilling.” Tr. 26:12–13, 16–17. According to Patent Owner, this case “involves a complex thermomechanical system with numerous interrelated components.” *Id.* at 26:14–16. Patent Owner asserts the case is “about whether someone would have been motivated to combine” the references. *Id.* at 26:17–18; PO Resp. 24 (“failure to

⁴ Transcript citations are to “page:line.”

establish a motivation to combine”). Patent Owner also asserts that “objective indicia . . . strongly support upholding” patentability. PO Resp. 24.

Before addressing these arguments of the parties, we discuss the references and related evidence.

a. Andrepont

Andrepont is a journal article that discusses various turbine inlet air cooling technologies, including several commercially available cool storage technologies. Ex. 1010, 4.⁵ The pros and cons of each cooling option are summarized to illustrate the types of design conditions likely to justify the economic application of each technology. *Id.*

Andrepont discloses the use of chilled water storage for combustion turbine (“CT”) inlet air cooling, including potential applications for “*utility and non-utility* CTs, for new and existing CTs, and for combined cycle as well as simple cycle CTs.” *Id.* (emphasis added). Andrepont notes that various approaches can be employed for the cooling CT inlet air, including evaporative, absorption, mechanical compression, and cool storage cooling. *Id.* Each technology has its pros and cons, which Andrepont summarizes. *Id.*

“Cool storage” cooling, also known as thermal energy storage (“TES”) (*id.*), uses a storage tank to store chilled water. *Id.* at 5 (“cold water is pumped from the bottom of the thermally stratified chilled water storage tank to the air coolers.”).

In the context of discussing a design for a new cool storage installation applied to existing utility simple cycle CTs, Andrepont states that “[t]he technology is of course readily applied to cogeneration or independent power producer (IPP) CTs, as well as to electric power utility CTs.” *Id.* at 5. Andrepont

⁵ We cite to the page number applied by Petitioner to the 9-page exhibit. Exhibit page 4 corresponds to Journal page 1345.

also states that the disclosed CT system has broad applicability and provides benefits “[w]herever there is a value to electricity which varies with the time of day (i.e. *in virtually all situations*).” *Id.* (emphasis added). Andrepont explains: “an inherent flexibility of chilled water storage is that *any water chilling technology*, including absorption chilling, *could be used* to accomplish the recharge [of the storage tank].” *Id.* at 5 (emphases added). Andrepont concludes by stating: “Cool Storage CT Inlet Air Cooling is an economical and technically proven option for CT capacity enhancement. It should not be overlooked by utilities when procuring or planning for summer peaking capacity additions.” *Id.* at 9.

b. Mornhed

Mornhed also is a journal article. Mornhed summarizes innovations in “district heating and cooling” from 1984–1994. Ex. 1008, 1. “District” cooling technology distributes cooling to multiple buildings in a defined district or geographic area rather than using individual building cooling systems. *Id.* In looking at technical innovations during the period studied, Mornhed noted “in many cases technology developed for other fields has been successfully applied” to district cooling. *Id.*

One of the innovations in district cooling summarized by Mornhed is “series chilling,” wherein two chillers “operate in series.” *Id.* at 4. “Series chilling” simply is connecting two chillers in a chain, so the chilled water has only one path to take, from one chiller to the next. Regarding series chilling, Mornhed states series chilling “will almost double the capacity of existing distribution piping” or, alternatively, “reduce pumping power to a fraction”. *Id.* Mornhed also discloses, “[t]he economic benefits of series chilling can be significantly enhanced by the installation of low-temperature chilled-water storage,” i.e., TES. *Id.*

Patent Owner's expert, Gregor P. Henze, Ph.D., P.E., testifies that the problem addressed in Mornhed "was to increase capacity without increasing the number or size of the existing pipes." Ex. 2009 ¶ 55. Dr. Henze also testifies that "Mornhed resolves this dilemma by adding a low temperature chiller in series with the existing chiller." *Id.* There is no evidence to which we have been directed, however, that this problem, to increase system capacity, and solution, to use series chilling, discussed by Dr. Henze, is dependent on the specific number, size, or length of pipes, or to the specific temperatures involved in the system. The quantum of benefits of using series chillers may depend on the details of a specific system, but these details are not recited in the challenged claims.

3. *Level of Skill*

Petitioner asserts the level of ordinary skill in the art of "chilled water-based turbine inlet air cooling systems" at the relevant time "was high." Pet. 18 (citing Ex. 1004 ¶ 12.) According to Petitioner, a person of ordinary skill in this art, or relevant technology, would have been a person having: (1) a Bachelor's degree in Mechanical Engineering or a related discipline along with 4-7 years of related industry experience, or (2) an Associate's degree focusing on HVAC&R or equivalent training with 6 to 10 years of related industry experience. In addition, this person would have had at least two years of practical experience relating to the design and operation of chilled water systems including thermal energy storage. *Id.*

Patent Owner notes that "conspicuously absent" from Petitioner's proposed level of skill "is any mention of the field of the invention, *i.e.*, turbine inlet cooling." PO Resp. 18. Patent Owner overlooks Petitioner's specific reference to "the art of *chilled water-based turbine inlet air cooling systems*" as defining the relevant technology. Pet. 18 (emphasis added). Patent Owner also notes that

Petitioner’s proposed level of skill could theoretically cover a person without “*any experience*” with gas turbines. PO Resp. 18. Patent Owner does not state what significance, if any, there is to this fact. Moreover, we note that experience with the more specific technology of “gas turbine” inlet cooling is subsumed within the broader technology of “turbine” inlet air cooling. Notwithstanding Patent Owner’s comments, Patent Owner accepts Petitioner’s proposed level of skill for this proceeding. *Id.*

The level of skill in the art is “a prism or lens” through which we view the prior art and the claimed invention. *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001). Based on the evidence and arguments, we adopt Petitioner’s proposed level of skill for this proceeding.

4. Claim 1

Petitioner asserts that Andrepont explicitly discloses all the elements of claim 1 except series chillers, which are disclosed in Mornhed. Pet. 21 (citing Ex. 1008 at 4, Fig. 4). Petitioner states that “[a]lthough Andrepont does not specifically disclose the use of series chillers, it was a well-known arrangement for chilled water systems.” *Id.* (citing Ex. 1004 at ¶¶ 19, 31–32); *see also id.* at 22–23 (citing Ex. 1004 at ¶¶ 31–34) (discussing the benefits of modifying the Andrepont system to use series chilling). Petitioner also asserts that Mornhed discloses inlet air cooling for gas turbines used in “district” cooling facilities that uses two chillers in series to provide chilled water to a thermal storage tank. *Id.* at 21–22 (citing Ex. 1008, 2–4, Fig 4).

Petitioner’s expert, Douglas Reindl, Ph.D., P.E., and Patent Owner’s expert, Dr. Henze, agree that a person of ordinary skill, in the relevant period, would have known that series water chillers were a design option for turbine inlet cooling using thermal energy storage. *E.g.*, Ex. 1004 ¶ 30 (“series chillers were well-known”);

Ex. 1013, 73:13–74:8) (in a TIC/TES system, parallel versus series chillers would be “an option that a designer in 1998 could consider”).

Based on the evidence and arguments of the parties, we agree with Petitioner that Andrepont discloses all the elements of claim 1 except series chillers. We also agree that Mornhed discloses series chillers.

Petitioner’s proposed combination of the references is that it would have been obvious to one of ordinary skill in the art “to combine *or replace* the chiller package of Andrepont with the series arrangement of the chillers of Mornhed, in order to achieve the capacity, reduced pumping power, and/or economic benefits explained by Mornhed.” Pet. 22; Reply 9. Petitioner made clear that the proposed modification of Andrepont is to “swap out the C-1 chiller package of Andrepont, take it out, and substitute in series chilling as described in Mornhed, and it is a simple substitution.” Tr. 18:9–13.

Patent Owner asserts that Mornhed focuses on “district” cooling, which, according to Patent Owner, “is a different field of technology from turbine inlet cooling,” which is the technological field of the claimed invention. Patent Owner asserts that turbine inlet cooling (“TIC”) is designed “specifically for cooling a gas turbine “which represents a known load in a single location.” PO Resp. 21 (citing Ex. 2009 ¶ 36). Patent Owner asserts that “district” cooling is intended to cool “a large number of buildings over a large geographic area, with each building having a number of different (and varying) cooling loads.” *Id.* Patent Owner does not cite, however, any limitation in the challenged claims that limits the claims to a known load in a single location. Moreover, Patent Owner acknowledged that the challenged claims “cover district cooling.” Tr. 28:22–24 (“I think the claims, in fairness, as construed by the Board in this case would cover district cooling.”). At the hearing, Patent Owner also stated:

we may take issues in other proceedings with the scope of the claims, but we didn't take issue with the definition of gas turbine that was proposed.^[6] So, I do think, as constituting and construing these IPRs^[7], that they fairly would encompass district cooling.

Tr. 28:24–29:3. Thus, we are not persuaded that a person of ordinary skill would ignore Mornhed's disclosure of series chilling in considering improvements to capacity and pumping power of a TIC/TES system, as disclosed in Andrepont.

Additionally, Patent Owner made clear at the hearing that it was *not* arguing that Mornhed was “nonanalogous art.” *Id.* at 31:16–32:2 (“it’s not a nonanalogous art argument”). Patent Owner also acknowledged that “there’s a lot of same/similar technology being used in these fields.” *Id.* at 31:22–24. Indeed, Mornhed states that the district or distributed cooling systems discussed in his article rely on gas turbine power sources. Mornhed discloses that improvements in gas turbine technology have greatly enhanced their mechanical efficiency and, where natural gas fuel is available, gas turbines are today increasingly replacing steam turbines in cogeneration applications. Ex. 1008, 2.

Patent Owner's primary argument against the proposed combination of references is that Petitioner has “failed to provide a valid motivation to combine the references.” PO Resp. 31. Patent Owner also asserts that “objective indicia” strongly support patentability of the claims. *Id.* at 24. We discuss these two issues below.

a. Rationale

Petitioner's rationale for the proposed modification of Andrepont is that

⁶ The definition of “gas turbine power plant” that was proposed in our Decision to institute this trial has been adopted in this Final Decision. See Section II(A)(1) above.

⁷ The hearing was a consolidated hearing for IPR2015-01212 and IPR2015-01214, which is a related case.

“Mornhed makes clear [the] benefits of series chilling.” Pet. 23 (citing Ex. 1004 ¶¶ 31–34). These benefits are an increase in the capacity of existing distribution piping or, alternatively, reduce pumping power. Ex. 1008, 4. In the cited Declaration of Dr. Reindl (Ex. 1004), Dr. Reindl testifies that the specific benefits of higher operating temperature differentials disclosed in Mornhed for series chilling also can be achieved “by using the series chillers of Mornhed for the ‘Chiller Package C-1’ in Figure 2 of Andrepont.” Ex. 1004 ¶¶ 32–33. Dr. Reindl opines that:

Because of the known advantages of series chillers to provide larger temperature differentials across the chiller system (as specifically discussed in Mornhed), it would have been obvious to one of ordinary skill in the art to modify the Andrepont system shown in Figure 2 to use two chillers in series as disclosed in Mornhed with a reasonable expectation of success.

Id. ¶ 34. Based on this analysis, Petitioner concludes that claim 1 would have been obvious over the combination of Andrepont and Mornhed. *Id.* (citing Ex. 1004 ¶¶ 35–36).

Dr. Henze, Patent Owner’s expert, also testified that in a TIC/TES system series chillers would be “an option that a designer in 1998 could consider.” Ex. 1013, 73:13–74:8. Among the potential benefits of series chillers, Dr. Henze stated series chillers could produce a higher water temperature differential thus providing a higher cooling capacity and lower pumping energy requirements. *Id.* at 74:11–76–21.

Patent Owner asserts that series chilling as disclosed in Mornhed is used to provide more cooling capacity using “existing piping network.” PO Resp. 23. Patent Owner does not direct us to any claim limitation that relates to the “piping network” of the system. Moreover, as admitted by Patent Owner, the claims cover “district cooling,” which is the specific context of the Mornhed disclosure.

Patent Owner also argues that using series chilling in the Andrepont system results in: an impractical and unpredictable thermal energy storage tank; an increase in required chilling power; an increase in required pumping power; and significantly increased cost and complexity of the overall system. *Id.* at 33 (citing Ex. 2009 ¶ 44). Again, however, Patent Owner does not direct us to persuasive evidence why a person of ordinary skill seeking to enhance system capacity of a TIC/TES turbine power plant, as disclosed in Andrepont, would ignore Mornhed's disclosure of series chilling.

We note that claim 1 does *not* recite any specific type of chillers arranged in series, any specific temperature range for the chilled water in the storage tank, a specific temperature differential (ΔT), a or other details of the tank. The only numerical limitations in claim 1 require that, during the discharge cycle, the air temperature entering the turbine through the inlet air chiller is lowered from a high temperature ranging from about 80° F. to about 115° F. to a low temperature ranging from about 45° F. to about 55° F. These are common ranges of ambient air temperatures and reduced-temperature inlet air for enhancing gas turbine operation. Ex. 1004 ¶ 21. As explained in Andrepont, ambient inlet air, at temperatures of 90 to 100°F. or more, is desirably cooled to the 40 to 50°F. range, which is cool enough to achieve substantial CT capacity increases, but not so cool as to initiate potentially damaging icing within the CT inlet. Ex. 1010, 4.

Patent Owner's argument that adding series chilling to the Andrepont system would result in increased pumping power is directly contrary to the disclosure in Mornhed that series chilling can "reduce pumping power" (Ex. 1008, 4). Patent Owner's arguments of increased cost and complexity appear to be based on the assumption that the low temperature chiller in Mornhed will be physically added to the existing Andrepont system. PO Resp. 55 ("if the low temperature

chiller from Mornhed were placed in series with the chiller of Andrepont, it would lead to an impractical thermal energy storage tank”). The obviousness inquiry does not ask “whether the references could be physically combined but whether the claimed inventions are rendered obvious by the teachings of the prior art as a whole.” *In re Etter*, 756 F.2d 852, 859 (Fed. Cir. 1985) (en banc); *see also In re Keller*, 642 F.2d 413, 425 (CCPA 1981) (“The test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art.”). Furthermore, “[a] reference must be considered for everything it teaches by way of technology and is not limited to the particular invention it is describing and attempting to protect.” *EWP Corp. v. Reliance Universal Inc.*, 755 F.2d 898, 907 (Fed. Cir. 1985). Here, we conclude that Mornhed’s detailed disclosure of the known use and benefits of serial chilling in district cooling would have suggested to a skilled artisan that those uses and benefits would have been applicable in the TIC/TES system disclosed in Andrepont. Thus, we are persuaded that the evidence establishes a motivation to combine the references.

b. Objective Indicia

The objective indicia of non-obviousness play an important role as a guard against the statutorily proscribed hindsight reasoning in the obviousness analysis. *WBIP*, 829 F.3d at 1328. “[E]vidence of secondary considerations may often be the most probative and cogent evidence in the record.” *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 1538 (Fed. Cir. 1983). “[E]vidence rising out of the so-called ‘secondary considerations’ must always when present be considered en route to a determination of obviousness.” *Id.* at 1538. “For objective evidence . . . to be accorded substantial weight, its proponent must establish a nexus between the

evidence and the merits of the claimed invention.” *In re Kao*, 639 F.3d 1057, 1068 (Fed.Cir.2011) (quoting *Wyers v. Master Lock Co.*, 616 F.3d 1231, 1246 (Fed.Cir.2010)) (emphasis omitted) (internal quotation marks omitted).

Patent Owner argues generally that “objective indicia” establishes that the claimed invention “would not have been obvious.” PO Resp. 23–31. According to Patent Owner, a database of the Turbine Inlet Cooling Association (“TICA”) (Ex. 2007) establishes patentability of the claimed invention. PO Resp. 24, 27. The version of the TICA database that is reflected in Exhibit 2007, is a “members only” version that contains information that is not available to the general public. Ex. 2008 ¶ 6.⁸ A public version of the TICA database is in the record as Ex. 2014. *Id.* at ¶ 7. According to Patent Owner, the TICA database establishes that “the evidence clearly shows that Mr. Pierson’s chilled-water TIC/TES caused an absolute shift in the TIC/TES market in *standalone* utility gas turbine power plants from a very strong preference for ice storage and ammonia refrigeration to the [Patent Owner’s] patented system.” PO Resp. 27 (citing Ex. 2009, Henze ¶ 76) (emphasis added). We disagree.

There is no persuasive evidence or argument that claim 1 is limited to a “standalone” gas power plant. Also, Patent Owner admitted that there is no nexus between the TICA database and the challenged claims. Tr. 50:3–7 (“I agree that the TICA database doesn’t teach it. It doesn’t speak to series chilling. So, the TICA database, standing alone, doesn’t address the nexus. It addresses part of it

⁸ Mr. Pierson refers in error to the TICA database as “Ex. 2004.” Ex. 2008 ¶ 2. The TICA database is Ex. 2007.

because it has chilled water, but it doesn't address the series chilling.”).⁹ Based on this admission and the evidence discussed above, there is no persuasive nexus between the TICA database and the claimed invention, and thus no persuasive objective indicia of patentability.

c. Conclusion for Claim 1

Andrepoint discloses all the elements of claim 1, except series chilling. Mornhed discloses series chilling. Mornhed also suggests the motivation for using series chilling – series chillers will almost double the capacity of existing distribution piping or, alternatively, reduce pumping power to a fraction. Ex. 1008, 4. Mornhed also discloses that low-temperature chilled-water storage enhances the economic benefits of series chilling. *Id.*

We determine that a preponderance of the evidence supports a determination that one of ordinary skill in the art would have been motivated to modify Andrepoint to use water chillers in series rather than a single water chiller given Mornhed’s disclosure of the benefits of series chillers.

As the Supreme Court made clear, in considering whether an invention would have been obvious, often it will be necessary for a court to look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace. *KSR*, 550 U.S. at 418. When a work is available in one field of endeavor, design incentives and other market

⁹ At the hearing in this case, Patent Owner referred to “paragraph 84 of Dr. Henze's declaration, his original declaration in 2009” as “the only evidence in the record of the nexus.” Tr. 50:8–15. Patent Owner did not cite to a specific exhibit, and we find no declaration by Dr. Henze in the year 2009 as an exhibit in this case. We note that Ex. 2009 in this case is a declaration by Dr. Henze, and paragraph 74 refers to the TICA database. This does not change Patent Owner’s admission that there is no nexus between the database and the challenged claims.

forces can prompt variations of it, either in the same field or a different one.

KSR does not require that a combination only unite old elements without changing their respective functions. *KSR*, 550 U.S. at 416. Instead, *KSR* teaches that “[a] person of ordinary skill is also a person of ordinary creativity, not an automaton.” *Id.* at 421. *KSR* explains that in many cases a person of ordinary skill will be able to fit the teachings of multiple patents together like pieces of a puzzle.” *Id.* at 420. The rationale of *KSR* does not support a theory that a person of ordinary skill can only perform combinations of a puzzle element A with a perfectly fitting puzzle element B. *ClassCo, Inc. v. Apple, Inc.*, No. 2015-1853, 2016 WL 5219886, at *3 (Fed. Cir. Sept. 22, 2016). Regardless of Mornhed’s primary purpose, the assertion that a person of ordinary skill in turbine inlet cooling technology would ignore the benefits of series chillers disclosed in Mornhed because Mornhed may use this technology differently than the claimed invention is not persuasive.

5. *Dependent claims*

a. *Claim 3*

Claim 3, dependent from claim 1, requires the average temperature of the chilling water in the tank “is lowered to about 33° F. to about 40° F. during the charge cycle and raised to about 60° F. to about 70° F. during the discharge cycle.” Ex. 1001, col. 15, ll. 4–7.

Petitioner asserts that Andrepont discloses a chilled water temperature of 39°F during the charge cycle. Pet. 27 (citing Ex. 1010, 5). Petitioner admits that Andrepont does not disclose a return or discharge cycle water temperature, but asserts it would be 60–70°F based on the Andrepont parameters. *Id.* (citing Ex. 1004 ¶ 49). Petitioner also asserts that Mornhed discloses a “25°F temperature differential.” *Id.* at 27–28 (citing Ex. 1004 ¶ 50). We agree with Petitioner’s

analysis.

Patent Owner does not address the challenges against the dependent claims.

Based on the analysis above, we determine that a preponderance of the evidence supports a determination that claim 3 would have been obvious in view of Andrepont and Mornhed.

b. Claim 4

Claim 4, dependent from claim 1, requires the chilling water to be removed from the thermal water storage tank during the charge cycle through a top outlet. Ex. 1001, col. 15, ll. 8–10.

Petitioner asserts that the limitation in claim 4 is disclosed in Andrepont. Pet. 28–29 (citing, in relevant part, Ex. 1010, 5, 6, Fig. 2). We agree that Andrepont discloses this claimed feature. Andrepont discloses “[d]uring off-peak periods, warm water is removed from the top of the tank, pumped to and chilled by the refrigeration system, and returned to the bottom of the tank for use during the next on-peak period.” Ex. 1010, 5.

Based on the analysis above, we determine that a preponderance of the evidence supports a determination that claim 4 would have been obvious in view of Andrepont and Mornhed.

c. Claim 5

Claim 5, dependent from claim 1, requires that the chilling water is removed from the thermal water storage tank during the charge cycle¹⁰ through a bottom inlet. Ex. 1001, col 15, ll. 11–13. Petitioner asserts that Andrepont discloses this

¹⁰ Although claim 5 references the “charge cycle” in connection with the removal of chilled water, we observe that, as set forth in the Specification, chilled water 16b is discharged to air chiller 14 during the *discharge* cycle, rather than during the charge cycle. Ex. 1001, col. 8, ll. 16–19.

claimed feature. Pet. 29–30 (citing Ex. 1010, 5, Fig. 2). We agree. Andrepont discloses that:

[d]uring the on-peak operation of the CTs, cold water is pumped from the bottom of the thermally stratified chilled water storage tank to the air coolers. The cold water cools the hot, humid air approaching the CT; warm water is returned to the top of the tank while cool air enters the CT, increasing CT output and performance.

Ex. 1010, 5.

Based on the analysis above, we determine that a preponderance of the evidence supports a determination that claim 5 would have been obvious in view of Andrepont and Mornhed.

d. Claim 6

Claim 6, dependent from claim 1, requires the chilled water introduced into the thermal water storage tank at a point proximate the bottom of the tank remain substantially at the point proximate the bottom of the tank until used during the discharge cycle. Ex. 1001, col. 15, ll. 14–20. As explained in the Specification, water in the thermal storage tank is “stratified” according to temperature. *Id.* at col. 8, ll. 26–27. The lower temperature water resides at the bottom of the tank. *Id.* at col. 8, ll. 27–30.

Petitioner asserts that this same process is disclosed in Andrepont. Pet. 31 (citing Ex. 1010, 5, Fig. 2). As discussed above with respect to claim 4, we agree that Andrepont discloses a process wherein warm water is removed from the top of the tank, chilled by the refrigeration system, and returned to the bottom of the tank. Ex. 1010, 2.

Based on the analysis above, we determine that a preponderance of the evidence supports a determination that claim 6 would have been obvious in view of Andrepont and Mornhed.

e. Claim 8

Claim 8, dependent from claim 1, requires the second portion of chilling water removed during the discharge cycle to be substantially all of the chilling water in the thermal storage tank. Ex. 1001, col. 16, ll. 6–8.

Petitioner asserts that Andrepont discloses that the cooling system disclosed therein can be designed to operate as daily cycles, which are fully charged and discharged in 24 hours, or as weekly cycles, which are fully charged during off-peak weekend periods and partially discharged and recharged cyclically during Monday through Friday. Pet. 33 (citing Ex. 1010, 5). We agree with this analysis.

Based on the analysis above, we determine that a preponderance of the evidence supports a determination that claim 8 would have been obvious in view of Andrepont and Mornhed.

f. Claim 9

Claim 9, dependent from claim 1, requires the thermal water storage tank to contain a volume of chilling water that is sufficient to lower the temperature of the inlet air to about from 45° F. to about 55° F. for a period of about 4 hours to about 12 hours. Ex. 1001, col. 16, ll. 9–13.

Petitioner asserts the parameters recited in claim 9 are “merely a design choice based on load and cooling requirements and would be obvious to a person of ordinary skill in the art.” Pet. 34 (citing Ex. 1004 ¶¶ 74–75). According to Petitioner, as the period of storage system operation increases, the size of the tank proportionally increases with all other factors remaining equal. *Id.* (citing Ex. 1004 ¶ 75). Petitioner concludes that the length of the discharge period is simply a design choice based on very basic principles well established long before the filing of the ’065 Patent. *Id.* Dr. Reindl’s testimony supports Petitioner’s position. Ex. 1004 ¶ 75. Dr. Reindl’s testimony also is supported by Andrepont,

which discloses that cooling combustion turbine inlet air is desirable typically 4 to 6 hours per day, with the inlet air desirably cooled to the 40 to 50°F range, i.e. cool enough to achieve substantial CT capacity increases, but not so cool as to initiate potentially damaging icing within the CT inlet from the resultant condensation. Ex. 1010, 4.

Based on the analysis above, we determine that a preponderance of the evidence supports a determination that claim 9 would have been obvious in view of Andrepont and Mornhed.

C. Motions to Exclude

Petitioner moves to exclude Exhibit 2013, which is a summary of the TICA Database Summary (Ex. 2007). Paper 33. We do not rely on Ex. 2007. Accordingly, we dismiss Petitioner's motion to exclude as moot.

Patent Owner moves to exclude Exhibit 1019, which is an ASHRAE Design Guide. Paper 28. We do not rely on Ex. 1019. Accordingly, we dismiss Patent Owner's motion to exclude as moot.

Petitioner (Paper 39) and Patent Owner (Paper 41) each move to exclude certain demonstrative slides used at the hearing. As set out in our Order regarding oral argument in this case: “[d]emonstratives are aids in support of oral argument; they are not evidence in the review. They will not become part of the official record of this review other than via the transcript of oral argument.” Paper 36, 3. Because the demonstrative slides are not evidence in this case, and because we do not rely on any of the slides in reaching our decision in this case, the objections and motions to exclude the demonstrative slides are moot. The panel acts as both a gatekeeper of evidence and as an evaluator of evidence. Rather than excluding demonstratives that are allegedly confusing, misleading, and/or irrelevant, we simply do not rely on them or give them no probative weight in our analysis, as

we do here.

III. CONCLUSION

Based on the evidence and arguments in this proceeding, Petitioner has demonstrated, by a preponderance of the evidence, that claims 1, 3–6, 8, and 9 are unpatentable under 35 U.S.C. § 103(a) based on Andrepont and Mornhed.

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that, based on Petitioner's showing by a preponderance of the evidence, claims 1, 3–6, 8, and 9 of Patent No. 6,318,065 B1 are unpatentable.

This is a final decision. Parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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