

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD, DELL TECHNOLOGIES INC.,
and ANKER INNOVATIONS LTD.,¹

Petitioner,

v.

MYPAQ HOLDINGS LTD.,
Patent Owner.

IPR2022-00312
Patent 7,675,759 B2

Before KRISTINA M. KALAN, DANIEL J. GALLIGAN, and
ELIZABETH M. ROESEL, *Administrative Patent Judges*.

GALLIGAN, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable
35 U.S.C. § 318(a)

¹ Anker Innovations Ltd. filed a motion for joinder and a petition in IPR2022-01131 and has been joined as a petitioner in this proceeding.

I. INTRODUCTION

In this *inter partes* review, Samsung Electronics Co., Ltd. (“Samsung”), Dell Technologies Inc. (“Dell”), and Anker Innovations Ltd. (“Anker”) (collectively “Petitioner”) challenge the patentability of claims 1–20 of U.S. Patent No. 7,675,759 B2 (Ex. 1001, “the ’759 patent”), which is assigned to MyPAQ Holdings Ltd. (“Patent Owner”).

We have jurisdiction under 35 U.S.C. § 6. This Final Written Decision, issued pursuant to 35 U.S.C. § 318(a), addresses issues and arguments raised during the trial in this *inter partes* review. For the reasons discussed below, we determine that Petitioner has proven by a preponderance of the evidence that claims 1–20 of the ’759 patent are unpatentable. *See* 35 U.S.C. § 316(e) (2018) (“In an inter partes review instituted under this chapter, the petitioner shall have the burden of proving a proposition of unpatentability by a preponderance of the evidence.”).

A. Procedural History

Samsung and Dell filed a Petition (Paper 3, “Pet.”) challenging claims 1–20 of the ’759 patent on the following grounds:

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1–3, 5–13, 15–20	102(a), (b) ²	Hirst ³
1–3, 5–13, 15–20	103(a)	Hirst
1, 2, 4–6, 11, 14–16, 20	102(a), (b)	Chagny ⁴
1, 2, 4–6, 11, 14–16, 20	103(a)	Chagny

² The Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112-29, 125 Stat. 284, 287–88 (2011) amended 35 U.S.C. §§ 102 and 103, effective March 16, 2013. Because the ’759 patent was filed before this date, we refer to the pre-AIA versions of §§ 102 and 103. Ex. 1001, code (22).

³ US 6,294,904 B1, issued Sept. 25, 2001 (Ex. 1003).

⁴ US 6,873,136 B2, issued Mar. 29, 2005 (Ex. 1004).

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
3, 12, 13, 19	103(a)	Chagny, Clark ⁵
1, 2, 4–6, 11, 14–16, 20	103(a)	Hwang ⁶

Pet. 10. Patent Owner filed a Preliminary Response. Paper 7. With our authorization, Samsung and Dell filed a reply to the Preliminary Response (Paper 9) addressing discretionary denial issues, and Patent Owner filed a sur-reply (Paper 10). We instituted trial on the asserted grounds of unpatentability. Paper 11 (“Inst. Dec.”) at 30.

After institution, Anker filed a motion for joinder and a petition in IPR2022-01131. We joined Anker as a petitioner in this proceeding. Paper 18.

During the trial, Patent Owner filed a Response (Paper 17, “PO Resp.”), Petitioner filed a Reply (Paper 22, “Pet. Reply”), and Patent Owner filed a Sur-reply (Paper 23, “PO Sur-reply”).

An oral hearing was held on February 24, 2023, a transcript of which appears in the record. Paper 28 (“Tr.”).

Petitioner relies on testimony from Dr. Sayfe Kiaei. Exs. 1002 (Declaration), 1026 (Reply Declaration). Patent Owner relies on testimony from Dr. Frank Ferrese. Ex. 2018. The parties have entered in the record transcripts for depositions of these declarants. Exs. 2020, 2021 (Kiaei Deposition), 1027, 1028 (Ferrese Deposition).

B. Real Parties in Interest

Petitioner identifies the following as real parties in interest: Samsung, Dell, Samsung Electronics America, Inc., Samsung Semiconductor, Inc.,

⁵ US 6,664,775 B1, issued Dec. 16, 2003 (Ex. 1005).

⁶ US 2004/0174152 A1, published Sept. 9, 2004 (Ex. 1006).

Samsung Austin Semiconductor, LLC, Dell Inc., and Anker. Pet. 1;
IPR2022-01131, Paper 2 at 1.

Patent Owner identifies itself as the real party in interest and notes that “Transpacific IP Group Limited has an ownership interest in MyPAQ.” Paper 5 at 1; Paper 8 at 1.

C. Related Matters

As required by 37 C.F.R. § 42.8(b)(2), the parties identify various related matters, including *MyPAQ Holdings Ltd. v. Samsung Electronics Co., Ltd.*, 6:21-CV-00398 (W.D. Tex.) (“district court litigation”). Pet. 1; Paper 8 at 1. We are concurrently issuing a final written decision in IPR2022–00311, involving related U.S. Patent 8,477,514 B2.

D. The ’759 Patent and Illustrative Claims

The ’759 patent discloses a power system having a power converter with an adaptive controller that can change an internal operating characteristic (such as switching frequency) of the power converter based on signals about the load to which it provides power. Ex. 1001, code (57), 5:34–55, 7:33–43.

Petitioner challenges all 20 claims of the ’759 patent. Pet. 10. Claims 1, 6, and 16 are independent. Claim 1 is illustrative of the claimed subject matter and is reproduced below with added formatting and bracketed identifiers for claim recitations.

1. [pre] A power converter coupled to a power system controller configured to receive a signal indicating a system operational state of a load coupled thereto, comprising:

[a] a power switch configured to conduct for a duty cycle to provide a regulated output characteristic at an output thereof;
and

[b] a controller configured to receive a command from said power system controller to enter a power converter operational state as a function of said signal indicating said system operational state,

[c] said controller further configured to provide a signal to control said duty cycle of said power switch as a function of said output characteristic and in accordance with said command,

[d] thereby regulating an internal operating characteristic of said power converter to improve an operating efficiency thereof as a function of said system operational state.

II. ANALYSIS

A. *Principles of Law*

To establish anticipation, each and every element in a claim, arranged as recited in the claim, must be found in a single prior art reference. *Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1371 (Fed. Cir. 2008). Although the elements must be arranged or combined in the same way as in the claim, “the reference need not satisfy an *ipsissimis verbis* test,” i.e., identity of terminology is not required. *In re Gleave*, 560 F.3d 1331, 1334 (Fed. Cir. 2009) (citing *In re Bond*, 910 F.2d 831, 832–33 (Fed. Cir. 1990)).

A patent claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the claimed subject matter 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. *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations including (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) any secondary

considerations, if in evidence.⁷ *Graham v. John Deere Co. of Kan. City*, 383 U.S. 1, 17–18 (1966).

B. Level of Ordinary Skill in the Art

Petitioner contends that a person of ordinary skill in the art (“POSITA”) “would have had either (i) a Master of Science in Electrical Engineering, or an equivalent field, or (ii) a Bachelor of Science in Electrical Engineering or an equivalent field as well as at least two years of experience in the design of power electronics.” Pet. 10 (citing Ex. 1002 ¶ 35).

At institution, we found this definition to be consistent with the scope and content of the ’759 patent and the asserted prior art, but we omitted the open-ended phrase “at least” to avoid introducing vagueness as to the amount of experience. Inst. Dec. 10–11.

Patent Owner does not dispute part (ii) of Petitioner’s proposed skill level, but for part (i), Patent Owner argues that “a Master and Bachelor degree in Electrical Engineering alone would not necessarily focus enough on power electronics to qualify as a POSITA.” PO Resp. 17. Relying on Dr. Ferrese’s testimony, Patent Owner argues that,

[t]o qualify as a POSITA based entirely on education, a person would need to demonstrate a significant focus on power electronics while obtaining their Master and/or Bachelor degrees, for example, through taking higher level courses focused on power electronics, publishing on the topic of power electronics, performing lab work or internships in the field of power electronics, or similar.

PO Resp. 17 (citing Ex. 2018 ¶ 45). Patent Owner also argues that “a person with a Master and Bachelor degree in many ‘equivalent fields’ to Electrical

⁷ The parties do not present arguments related to objective evidence of nonobviousness (i.e., secondary considerations) as to any of the challenged claims.

Engineering would not be expected to have any significant exposure to power electronics” and that such a person would need “independent expertise in power electronics (through work or otherwise) to qualify as a POSITA.” PO Resp. 17–18 (citing Ex. 2018 ¶ 46).

We agree with Patent Owner that some degree of familiarity with power electronics would be necessary for a POSITA given the subject matter at issue, and we understood this to be implicit in part (i) of Petitioner’s definition. To address Patent Owner’s concern, we clarify that a person with a Master of Science in Electrical Engineering or an equivalent field would need experience in power electronics to qualify as a POSITA. We are reluctant to use Patent Owner’s formulation of “some independent *expertise* in power electronics” (PO Resp. 17–18 (emphasis added)) because it could be read to include an expert level of skill rather than an ordinary level of skill.

Thus, we determine that a POSITA would have had either (i) a Master of Science in Electrical Engineering, or an equivalent field, and experience in power electronics or (ii) a Bachelor of Science in Electrical Engineering or an equivalent field as well as two years of experience in the design of power electronics.

We would reach the same determinations on Petitioner’s patentability challenges in §§ II.D–G below even if we adopted Patent Owner’s assessment of a person with a Master of Science degree and “some independent *expertise* in power electronics (through work or otherwise),” which is a higher level of skill.

C. Claim Construction

We interpret claim terms using “the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. 282(b).” 37 C.F.R. § 42.100(b).

Both parties state that they interpret the claims according to “their ordinary and customary meaning,” and neither party proposes express constructions in the claim construction sections of their papers. Pet. 10; PO Resp. 16. In its arguments against Petitioner’s unpatentability contentions, however, Patent Owner proposes constructions for “system operational state” and “core state.” PO Resp. 18–22, 54–55. We discuss each of these terms below.

1. “System Operational State”

Independent claims 1, 6, and 16 recite “a signal indicating a system operational state of [a/said] load.”

Petitioner contends that a power consumption signal indicating whether a load is in a normal or standby mode and a signal indicating the activity level of a processor (load) are signals “indicating a system operational state of a load.” Pet. 15, 41–42.

Patent Owner counters that a person of ordinary skill in the art “would understand that the term ‘system operational state’ as it pertains to engineering systems, refers to the way in which the system as a whole is being employed or utilized.” PO Resp. 18–19 (citing Ex. 2018 ¶ 51); *see also* PO Resp. 46 (similar assertion that “the term ‘system operational state’ as it pertains to engineering systems, refers to the way in which the system is being employed or utilized (i.e., operated)” (citing Ex. 2018 ¶ 94)). Patent Owner argues that examples of signals indicating system operational states from the ’759 patent show that such “signal[s] indicate[] the current or

future operational state of the load in a particular context, not simply the current activity level of the processor.” PO Resp. 18–20, 46–47 (citing Ex. 1001, 7:16–28; Ex. 2018 ¶¶ 51, 94). According to Patent Owner, “the system operational state is not merely a measure of power level during a low power state[;] it is a state that is driven by various factors, including external requirements, and is ultimately dependent on the context in which the system is being utilized.” PO Resp. 48 (citing Ex. 2018 ¶ 96); *see also* PO Resp. 21–22 (similar argument (citing Ex. 2018 ¶ 52)).

We do not agree with Patent Owner’s interpretation of the term “system operational state of said load.” As an initial matter, Patent Owner does not direct us to, and we do not find, a definition of “system operational state” of a load in the ’759 patent. As noted above, Patent Owner’s proposed definition is that “the term ‘system operational state’ as it pertains to engineering systems, refers to the way in which the system as a whole is being employed or utilized.” PO Resp. 18–19 (citing Ex. 2018 ¶ 51). Claims 1, 6, and 16, however, recite “a system operational state of *[a/said] load*” (emphasis added), not the system as a whole. Patent Owner’s proposed construction, therefore, is not consistent with the claim language. Patent Owner points to examples disclosed in the ’759 patent in an attempt to narrow the meaning of the claim term and, as further discussed below, to distinguish the prior art. *See* PO Resp. 19–20 (“The ’759 Patent provides examples of signals indicating system operational states including signals” (citing Ex. 1001, 7:17–28)); *see also* PO Resp. 46–47 (similar argument citing Ex. 1001, 7:16–28). But the ’759 patent states that these are non-limiting examples. Ex. 1001, 7:16–17 (“Further examples indicating a system operational state include, without limitation”).

One passage cited by Patent Owner states the following:

It should also be taken into account that there are loads with different operating states. For example, a server configured to process financial data may operate at a higher level of criticality during normal business hours, and revert to a lower processing state at another time of day. The aforementioned system may require a higher level of performance from the power converter during such periods of high criticality, which may compromise operating efficiency, but which may admit higher operating efficiency during substantial periods of time in the lower processing state.

Ex. 1001, 3:55–64, *quoted in* PO Resp. 20–21, 47. Patent Owner argues that this passage “illustrates the difference between operational states and system activity at a particular moment” because, according to Patent Owner, “[i]n this example, the system operational state may be in a critical or non-critical state depending on the given performance constraints at a particular time of day.” PO Resp. 20–21; *see also* PO Resp. 47 (similar argument). We disagree. The ’759 patent passage above effectively correlates processor activity and criticality by saying that, in a period of “high criticality,” the load requires a higher performance level from the power converter than when the load is in a “lower processing state.” Ex. 1001, 3:55–64. Thus, this example shows that a “lower processing state” of a data processing server is a “system operational state” of that server, notwithstanding Patent Owner’s labeling this as a “non-critical state.” *See* PO Resp. 21.

Patent Owner argues that “two processors in two different systems may have the same activity level at some point in time” but may be in different system operational states because, for example, speed is critical with one processor and energy efficiency is critical with the other. PO Resp. 48–49 (citing Ex. 2018 ¶¶ 97–98). Similarly, Dr. Ferrese posits an analogy in which two vehicles are traveling at the same speed but one is carrying a person to a hospital and the other is carrying a family on a road

trip. Ex. 2018 ¶ 97. Dr. Ferrese states that, even though these two vehicles “in a given instant appear to be operating identically,” they “can actually have significantly different system operational states resulting in different preferences in terms of how they are operated and controlled.” Ex. 2018 ¶ 97. These hypotheticals are not persuasive, as they would introduce subjectivity into the claim construction, requiring inquiry into the purpose or intent of a processor’s operation. Furthermore, these hypotheticals are not helpful in resolving the controversy because Petitioner relies on the different activity levels in the prior art as disclosing different system operational states, as discussed below in sections II.D.2.b and II.G.2.a. Thus, we need not opine on whether one activity level of a processor could result in multiple system operational states.

In addition, we decline to define the system operational state of a load to include “external requirements,” as urged by Patent Owner (PO Resp. 21–22, 48), because this ignores the plain language of the independent claims, which recite “a system operational state *of [a/said] load*” (emphasis added), not states external to the load.

For the reasons discussed above, we determine that a signal “indicating a system operational state of said load” encompasses a signal indicating the activity level of a load, including whether the load is in standby or normal mode. *See* Ex. 1001, 3:55–64. We need not further construe this claim term to resolve the patentability issues before us. *See Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1375 (Fed. Cir. 2019) (“The Board is required to construe ‘only those terms . . . that are in controversy,

and only to the extent necessary to resolve the controversy.” (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))).⁸

2. “Core State”

Claims 4 and 14 depend, respectively, from claims 1 and 6 and recite that the “load includes a processor and said system operational state depends on one of a core state and a performance state of said processor.”

Petitioner contends that “[t]he ’759 Patent background explains that a ‘core state’ is ‘under software operating system control’ and relates to ‘various levels of a processor sleep state,’ achieved by ‘halting instruction execution’ among other items.” Pet. 51 (citing Ex. 1001, 4:23–39; Ex. 1002 ¶ 154).

Patent Owner argues that the “core state (C-state) and performance state (P-state) of a processor are defined in the industry standard titled, ‘Advanced Configuration and Power Interface’ which is incorporated by reference into the ’759 Patent.” PO Resp. 55 (citing Ex. 1001, 4:1–6; Ex. 2022 (Advanced Configuration and Power Interface (ACPI) Specification, Revision 3.0, September 2, 2004)). According to Patent Owner, the ’759 patent “defines ‘core state’ as a ‘C-state’ and uses the terms

⁸ Our Rules require us to consider “[a]ny prior claim construction determination concerning a term of the claim in a civil action, or a proceeding before the International Trade Commission, that is timely made of record in the *inter partes* review proceeding.” 37 C.F.R. § 42.100(b). Patent Owner entered into the record an email from a law clerk in the district court litigation laying out in a table “preliminary claim constructions” for some terms of the ’759 patent before a *Markman* hearing. Ex. 2024. That district court case was stayed before the court issued its final claim construction determinations. Tr. 11:4–10. We have considered the preliminary claim constructions in Exhibit 2024, and we determine that they do not impact the analysis in this proceeding.

interchangeably.” PO Sur-reply 19–21 (citing Ex. 1001, 4:1–6, 4:23–25, 7:16–19, 21:6–16, Fig. 12; Ex. 2018 ¶¶ 112–117; Ex. 2020, 66:18–25).

Petitioner counters that the claims recite “a core state,” not “a C-state as defined in ACPI,” and that the ’759 patent provides that “a C-state is merely an *example* of a core state.” Pet. Reply 30–31 (citing Ex. 1001, 7:16–17).

We agree with Petitioner. Claims 4 and 14 recite “core state,” not “C-state.” The specification of the ’759 patent identifies a “C-state” as a type of “core state.” Ex. 1001, 4:23–25 (“Another processor state indicator, the core state (‘C-state’) . . .”). This, however, does not mean that the term “core state” is necessarily limited to C-states as defined in ACPI (“ACPI C-states”). The specification of the ’759 patent elsewhere shows that the ACPI C-states are merely examples within the broader category of core states. For instance, the ’759 patent states that “examples indicating a system operational state include, without limitation, a signal providing a performance state or a core state of a processor *such as a P-state or C-state.*” Ex. 1001, 7:16–28 (emphasis added). Given the ’759 patent’s description of C-states as exemplary core states, we do not agree with Patent Owner’s argument that the recited “core state” should be limited to ACPI C-states.

We need not further construe the term “core state” to resolve the patentability issues before us. *See Realtime Data*, 912 F.3d at 1375.

D. Anticipation by Chagny
(Claims 1, 2, 4–6, 11, 14–16, 20)

Petitioner asserts that Chagny anticipated claims 1, 2, 4–6, 11, 14–16, and 20. Pet. 10, 40–57. Patent Owner opposes. PO Resp. 45–58; PO Sur-reply 7–8, 11–13, 15–16, 19–21.

1. Chagny

Chagny discloses a voltage regulator module (“VRM”) that provides a regulated direct current (“DC”) voltage output to power a processor of an information handling system. Ex. 1004, code (57). An embodiment is shown in Figure 2A, which is reproduced below.

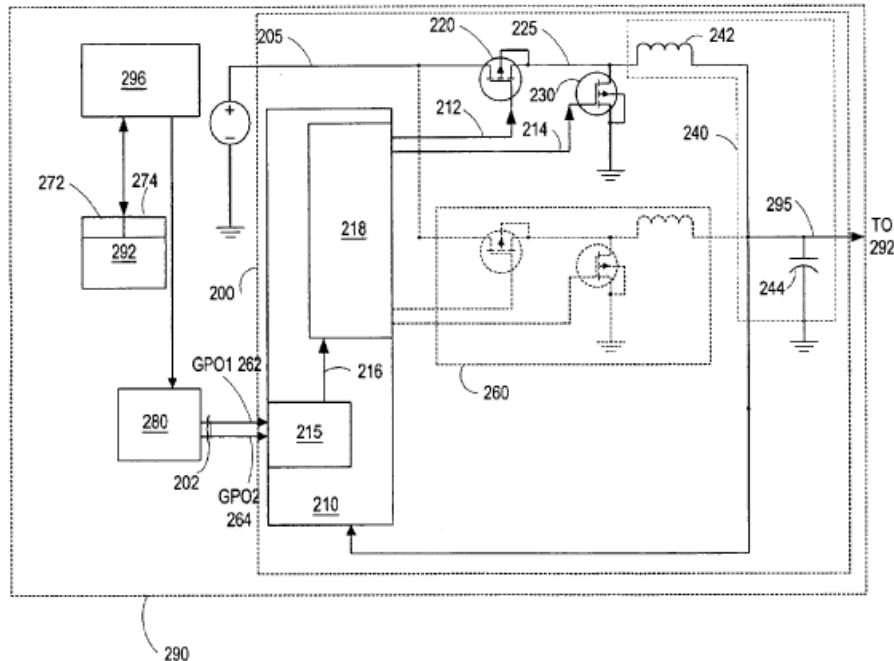


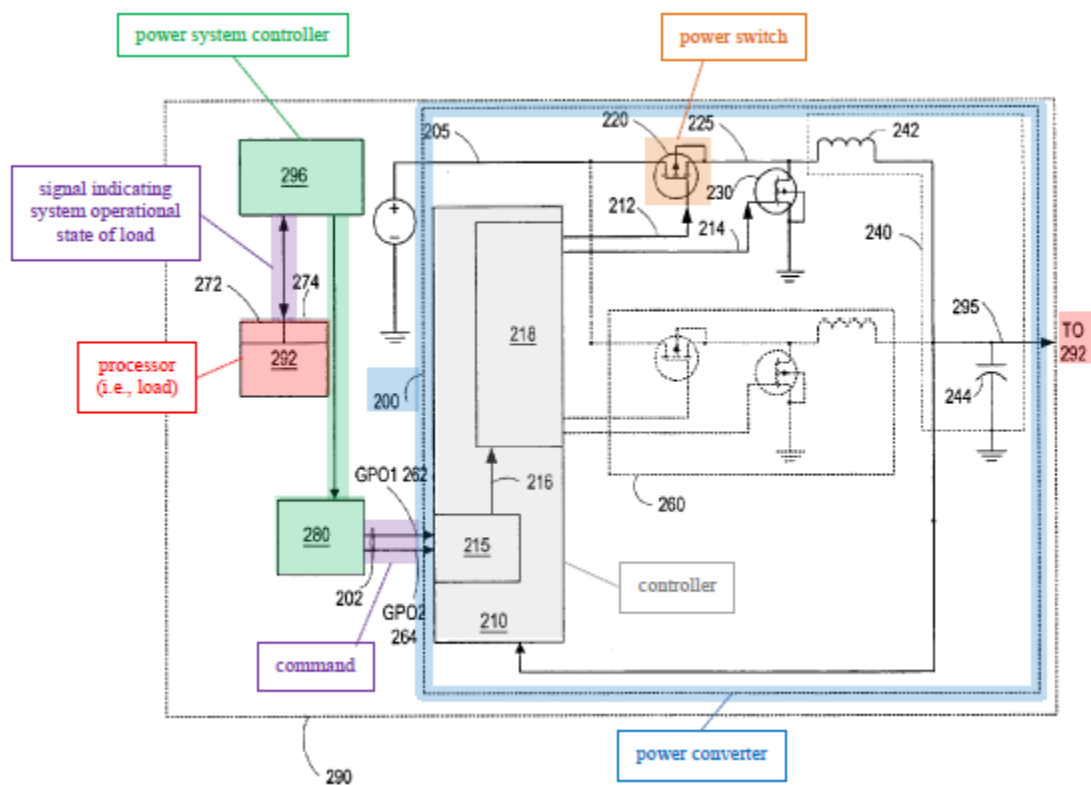
FIG. 2A

Chagny’s Figure 2A shows VRM 200, which receives a DC voltage input 205 and generates a regulated DC voltage output 295, which provides power to processor 292 included in information handling system device 290. Ex. 1004, 3:52–59. VRM 200 includes, among other things, controller module 210 operable to receive activity input 202 indicative of levels of activity of processor 292 and to select a switching frequency of VRM 200 responsive to activity input 202 so that the switching frequency “dynamically matches the level of activity” of processor 292. Ex. 1004, 3:60–65, 4:66–5:3, 5:9–12.

2. Claim 1

a) Overview of Petitioner's Contentions and Findings for Certain Limitations

Claim 1 is directed to a “power converter” that is “coupled to a power system controller” and that comprises “a power switch” and “a controller,” and claim 1 recites functionality for the claimed components. Petitioner provides the annotated version of Chagny’s Figure 2A reproduced below to illustrate its contentions.⁹



Pet. 46. Chagny’s Figure 2A is a diagram of a VRM with a selectable switching frequency. Ex. 1004, 3:17–19. In the annotated version of Chagny’s Figure 2A reproduced above, Petitioner identifies VRM 200 (outlined in blue) as the claimed “power converter,” charge switch 220

⁹ Petitioner and Dr. Kiaei italicize the names of references. We omit this emphasis when quoting Petitioner’s arguments and Dr. Kiaei’s testimony.

(shaded orange) as the claimed “power switch,” and controller module 210 (shaded gray) as the claimed “controller” of the power converter. Pet. 40–41, 43, 45–46. Petitioner identifies processor 292 (shaded pink) as the recited “load” and also identifies software program 296 (shaded green) alone or with I/O controller hub (ICH) 280 (shaded green) as the recited “power system controller.” Pet. 40–42.

(1) Preamble

As to the preamble (“power converter coupled to a power system controller configured to receive a signal indicating a system operational state of a load coupled thereto”), Petitioner argues that Chagny’s VRM 200 is a “power converter” that is coupled to processor 292 (“a load”). Pet. 40–41 (citing Ex. 1004, code (57), 3:54–58, Fig. 2a; Ex. 1002 ¶ 127). Patent Owner does not dispute this assertion. *See* PO Resp. We find that Chagny’s VRM 200 is a power converter because it is “operable to receive a direct current (DC) voltage input 205 and generate a regulated DC voltage output 295.” Ex. 1004, 3:54–56; *see* Pet. 40–41 (discussing this disclosure). This is consistent with the ’759 patent’s description of the operation of power converters. *See, e.g.*, Ex. 1001, 1:46–50 (“In an exemplary application, the power converters have the capability to convert an unregulated dc input voltage such as five volts to a lower, regulated, dc output voltage such as 2.5 volts to power a load.”).

Petitioner contends that Chagny’s software program 296 is a “power system controller” that receives a signal from processor 292 indicating the activity level of processor 292, i.e., the system operational state of the load, and Petitioner annotates this in the figure above with a caption for the arrow (purple) between processor 292 and software program 296. Pet. 41–42 (citing Ex. 1004, 4:18–20, 4:35–37, 4:40–43; Ex. 1002 ¶ 128). Patent

Owner disputes Petitioner's contentions for the "power system controller" as discussed below. *See* PO Resp. 51–54.

(2) Recitation 1a

Claim 1 recites that the power converter has "a power switch configured to conduct for a duty cycle to provide a regulated output characteristic at an output thereof" (recitation 1a). Petitioner argues that Chagny describes this subject matter because charge switch 220 within VRM 200 is a power switch that conducts for a duty cycle to provide regulated DC voltage output 295 at the output of VRM 200. Pet. 43–45 (citing Ex. 1004, 1:51–59, 5:34–42, 5:44–51, 4:63–65, 6:45–49, Fig. 2A; Ex. 1002 ¶¶ 131–137). Patent Owner does not dispute Petitioner's contentions for recitation 1a. *See* PO Resp. 49–51.

Petitioner's contentions for recitation 1a are persuasive. According to the '759 patent, the "duty cycle is a ratio represented by a conduction period of a power switch to a switching period thereof." Ex. 1001, 1:36–38; *see* Tr. 42:1–10 (Patent Owner's counsel agreeing with the definition of duty cycle set forth in the '759 patent); *see also* Ex. 1002 ¶ 38 (Dr. Kiaei's undisputed testimony that the duty cycle is the "ratio of on-time to the total switching period"). We find that Chagny describes a duty cycle because Chagny discloses that charge switch 220 is turned on and off, which results in a conduction period, non-conduction period, and a switching period. *See, e.g.*, Ex. 1004, 5:38–40 ("The opening and closing of the charge and discharge switches 220 and 230 is controlled by the charge and discharge control signals 212 and 214 respectively."). Thus, Chagny discloses that power switch 220, controlled by charge control signal 212, is closed (i.e., conducts) during a charge cycle. Ex. 1004, 5:34–40. Patent Owner agrees that charge switch 220 is turned on and off. *See* Tr. 43:23–44:1 (Q: "Is Patent Owner

disputing that there is a conduction time in Chagny that the FET is turned on and off?"; A: "The FET is turned on and off, yes, so that's correct."); *see also* Tr. 45:11–12 (Patent Owner's counsel stating that "it certainly is turning the FET on and off"). Thus, Chagny discloses that power switch 220 has a duty cycle notwithstanding Patent Owner's argument that "Chagny does not even discuss duty cycles." *See* PO Resp. 50.

Petitioner also shows that Chagny's power switch is configured "to provide a regulated output characteristic at an output thereof," as claimed. Pet. 44–45 (citing Ex. 1002 ¶ 136; Ex. 1004, Fig. 2A, 4:63–65, 5:44–51). Our finding is supported by Chagny's disclosure that "DC voltage input 205 is 'chopped' by the charge switch 220 to generate the switched DC voltage output 225," which is then filtered to generate regulated DC voltage output 295. Ex. 1004, 5:40–42, 5:48–51. Thus, we find that Chagny describes the subject matter of recitation 1a.

(3) Recitation 1b

Claim 1 recites that the power converter has "a controller configured to receive a command from said power system controller to enter a power converter operational state as a function of said signal indicating said system operational state" (recitation 1b). Petitioner contends Chagny describes this subject matter by disclosing controller module 210 receiving activity input 202 from software program 296 and I/O controller hub (ICH) 280 and "select[ing] different switching frequency states (i.e., power converter operational states) based on activity input 202." Pet 46–47 (citing Ex. 1004, 4:46–49, 4:66–5:3, 5:9–12; Ex. 1002 ¶¶ 138–140). Patent Owner agrees that Chagny discloses a controller within VRM 200 (PO Resp. 51), but Patent Owner disputes Petitioner's contentions with respect to "power system

controller” and “system operational state.” *See* PO Resp. 45–49, 51–54. Thus, we further address recitation 1b in section II.D.2.b.3 below.

(4) Recitation 1c

Claim 1 recites that the controller is “further configured to provide a signal to control said duty cycle of said power switch as a function of said output characteristic and in accordance with said command” (recitation 1c). Petitioner argues that Chagny discloses controlling the duty cycle of charge switch 220 as a function of feedback from output 295 and in accordance with activity input 202. Pet. 47–49 (citing Ex. 1004, 3:60–4:7, 4:62–5:2, 5:28–31, 5:34–46, 9:5–7, 10:14–16, Fig. 2A; Ex. 1002 ¶¶ 141–145). We discuss these contentions further below in addressing Patent Owner’s arguments.

(5) Recitation 1d

Claim 1 recites “thereby regulating an internal operating characteristic of said power converter to improve an operating efficiency thereof as a function of said system operational state” (recitation 1d). Petitioner argues that Chagny describes this subject matter by disclosing that controller module 210 changes the switching frequency of VRM 200 based on activity input 202 to save power. Pet. 49–50 (citing Ex. 1004, 2:59–61, 3:9–10, 4:41–43, 5:3–23; Ex. 1002 ¶¶ 146–148). Aside from its arguments regarding the system operational state, which we address below, Patent Owner does not dispute Petitioner’s contentions for recitation 1d. *See* PO Resp. Petitioner’s contentions are persuasive. Chagny discloses that, “[t]o improve efficiency, the VRM advantageously changes the switching frequency of the VRM in accordance with the activity of the processor.” Ex. 1004, 2:59–61; *see also* Ex. 1004, 5:16–18 (“When the activity of the processor 292 is low, the switching frequency 216 is selected to be low 130

to save power.”). Thus, we find that Chagny discloses “regulating an internal operating characteristic of said power converter to improve an operating efficiency thereof as a function of said system operational state.”

b) Patent Owner’s Arguments and Our Analysis

Patent Owner makes the following three arguments regarding claim 1: (1) Chagny does not disclose “a signal indicating a system operational state of a load” as in recitations 1pre and 1b (PO Resp. 45–49); (2) Chagny does not disclose controlling a duty cycle of the power switch “in accordance with said command” to enter a power converter operational state as in recitation 1c (PO Resp. 49–51); and (3) Chagny does not disclose a “power system controller” in recitations 1pre and 1b (PO Resp. 51–54). We address each argument below.

(1) System Operational State

As noted above, Petitioner relies on signals between software program 296 and processor 292 indicating the activity level of processor 292 to teach “a signal indicating a system operational state of a load.” Pet. 41–42 (citing Ex. 1004, 4:18–20, 4:35–37, 4:40–43, Fig. 2A; Ex. 1002 ¶ 128).

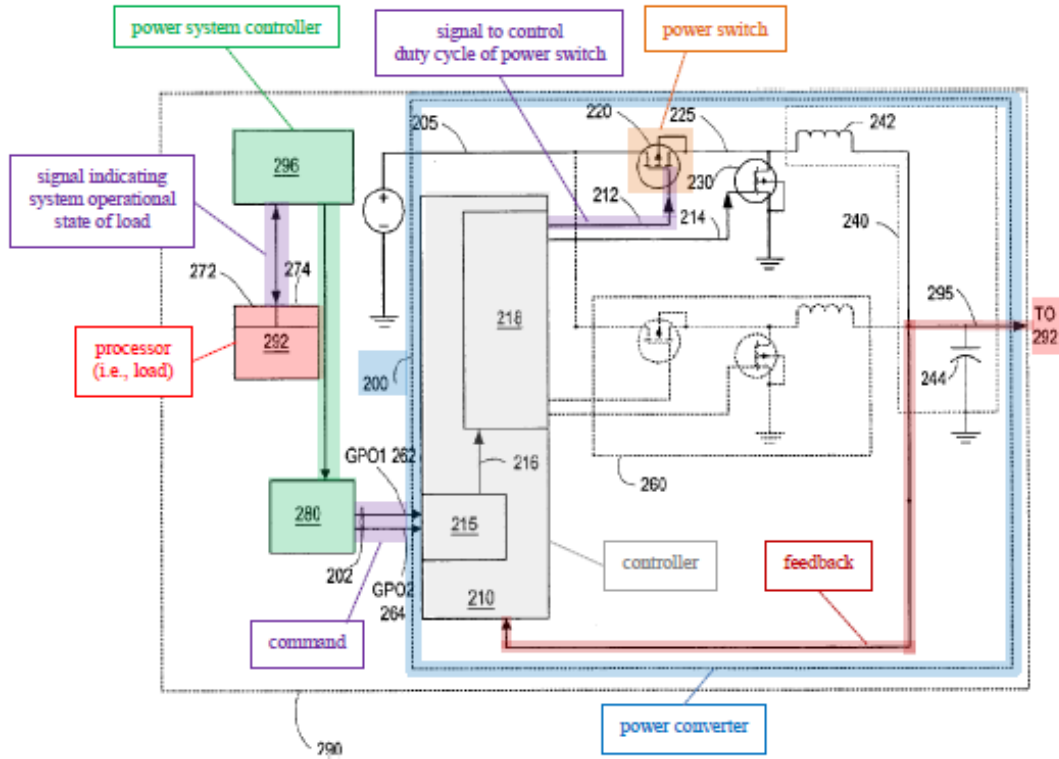
Relying on its proposed construction for “system operational state,” Patent Owner argues that “the activity level of Chagny’s processor does not indicate the system operational state.” PO Resp. 49. For the reasons discussed above in section II.C.1, we do not adopt Patent Owner’s interpretation of “system operational state,” and, thus, we do not agree with Patent Owner’s arguments based on its proposed construction. For the reasons discussed below, we find that Petitioner has shown that Chagny discloses a signal “indicating a system operational state of said load” under our claim construction, which encompasses a signal indicating the activity level of a load. *See* section II.C.1 above.

Chagny discloses that “software program 296 . . . monitors the processor 292 loading.” Ex. 1004, 4:35–37; *see* Pet. 41–42 (discussing this disclosure). Chagny further explains that “processor 292 loading, usage or activity level will vary depending on the number of instructions executed within a predefined time interval.” Ex. 1004, 4:18–20, *cited in* Pet. 41. Thus, we find that software program 296, by monitoring processor 292’s activity, receives a signal indicating the activity level of a processor, which is within the scope of a signal “indicating a system operational state of a load” under our construction.

Based on Petitioner’s persuasive contentions and evidence and for the reasons discussed above, we find that Chagny discloses “a signal indicating a system operational state of a load.”

(2) Controlling the Power Switch’s Duty Cycle

To illustrate its contentions for recitation 1c (“said controller further configured to provide a signal to control said duty cycle of said power switch as a function of said output characteristic and in accordance with said command”), Petitioner provides the annotated version of Chagny’s Figure 2A reproduced below.



Pet. 48. Chagny’s Figure 2A is a diagram of a VRM with a selectable switching frequency. Ex. 1004, 3:17–19. As relevant to recitation 1c, Petitioner’s annotations identify signal 212 (shaded purple) to charge switch 220 (shaded orange) as a signal to control the duty cycle of the power switch and a connection (shaded pink) from output 295 to controller module 210 as “feedback.” Pet. 48.

As to the requirement to control the duty cycle “as a function of said output characteristic,” Petitioner refers to its discussion for recitation 1a explaining how the duty cycle of charge switch 220 determines the voltage level for output 295. Pet. 43–45 (explaining that “for a buck power converter, the output voltage is equal to the input voltage times the duty cycle of the high-side switch”), 48. Petitioner relies on Chagny’s disclosure that “controller module 210 receives the regulated DC voltage output 295 as

a feedback input for regulating the output of the VRM 200.” Ex. 1004, 4:63–65, *cited in* Pet. 48. Petitioner argues that,

[b]ecause it is the duty cycle of charge switch 220 that determines the output voltage, and because Chagny explicitly states that controller module 210 regulates the DC output voltage as a function of the feedback, a [person of ordinary skill in the art] would have understood Chagny to disclose that controller module 210 is configured to control the duty cycle of charge switch 220 as a function of the feedback from the regulated DC voltage output 295 (i.e., as function of said output characteristic).

Pet. 48–49 (citing Ex. 1002 ¶ 143). Thus, Petitioner argues, Chagny discloses controlling the duty cycle “as a function of” output 295 (“said output characteristic”). Pet. 48–49.

As to the requirement to control the duty cycle “in accordance with said command,” Petitioner relies on Chagny’s disclosure that frequency selector module 215 receives activity input 202 and selects switching frequency 216 to match the activity level of processor 292 and that FET driver module 218 receives switching frequency 216 and generates charge control signal 212 having that frequency. Ex. 1004, 4:66–5:2, 5:28–31, *cited in* Pet. 49. In particular, Chagny discloses that “FET driver module 218 is operable to receive the selected value of the switching frequency 216 and generate the charge and discharge control signals 212 and 214, each having the switching frequency 216.” Ex. 1004, 5:28–31. Chagny further discloses that charge control switch 220 responds to charge control signal 212 by generating switched DC voltage output 225 having switching frequency 216. Ex. 1004, 3:66–4:2, 6:46–49, Fig. 3 (step 340). Figure 2A shows that frequency selector module 215 and FET driver module 218 are part of controller module 210. Ex. 1004, 4:62–63. Based on these disclosures, Petitioner argues that Chagny discloses controlling the duty cycle of charge

switch 220 “in accordance with” activity input 202 (“said command”).
Pet. 43–44, 49.

Patent Owner argues that “activity input 202 sets the switching frequency, not the duty cycle,” that switching frequency and duty cycle “are separate concepts,” that “the duty cycle is independent of the frequency,” and that “Chagny does not even discuss duty cycles.” PO Resp. 50 (citing Ex. 2018 ¶ 104; Ex. 1004, 5:28–31, 4:66–5:3; Ex. 2020, 65:6–15, 86:23–87:11).

In its Sur-reply, Patent Owner argues that “[w]hether the limitation would be obvious to a POSITA in light of Chagny is immaterial” because Petitioner contends that Chagny discloses the limitation and anticipated claim 1. PO Sur-reply 12. Patent Owner also argues that “Chagny does not discuss how the conduction period is determined or what the duty cycle is.” PO Sur-reply 13.

As to Patent Owner’s argument that “Chagny does not even discuss duty cycles” (PO Resp. 50), we find that Chagny discloses a duty cycle for power switch 220 for the reasons discussed above in section II.D.2.a.

As to Patent Owner’s argument that “activity input 202 sets the switching frequency, not the duty cycle” (PO Resp. 50), we agree with Petitioner that “[t]here is no requirement that said command must ‘set’ the duty cycle.” *See* Pet. Reply 19. Rather, claim 1 recites “a signal to control said duty cycle of said power switch as a function of said output characteristic and in accordance with said command.” Petitioner contends that, because the duty cycle of charge switch 220 determines the output voltage and because that output voltage is then used as feedback to regulate the output voltage (Ex. 1004, 4:63–65), a person of ordinary skill in the art would have understood that the duty cycle of charge switch 220 is controlled

“as a function of the feedback from the regulated DC voltage output 295 (i.e., as function of said output characteristic).” Pet. 48–49 (citing Ex. 1002 ¶ 143; Ex. 1009, 17–18).

As to Patent Owner’s argument that obviousness to a person of ordinary skill in the art is immaterial because Petitioner’s ground is anticipation (PO Sur-reply 12), we understand that Petitioner is relying on what a person of ordinary skill in the art would have understood from Chagny’s disclosure. *See* Pet. 43–45, 48–49. This is appropriate and indeed necessary because “[a]nticipation is established when ‘one skilled in the art would reasonably understand or infer from the prior art reference’s teaching that every claim [limitation] was disclosed in that single reference.’” *CRFD Research, Inc. v. Matal*, 876 F.3d 1330, 1338 (Fed. Cir. 2017) (quoting *Akamai Techs., Inc. v. Cable & Wireless Internet Servs., Inc.*, 344 F.3d 1186, 1192–93 (Fed. Cir. 2003)). We also credit Dr. Kiaei’s unrebutted testimony that, “for a buck power converter, the output voltage is equal to the input voltage times the duty cycle of the high-side switch (referred to as charge switch [220] in Chagny).” Ex. 1002 ¶ 134. As noted above, Chagny discloses that “controller module 210 receives the regulated DC voltage output 295 as a feedback input for regulating the output of the VRM 200.” Ex. 1004, 4:63–65, *cited in* Pet. 48. Thus, we find that Chagny discloses controlling the duty cycle as a function of the output voltage in order to regulate the output voltage as part of the feedback loop.

As to Patent Owner’s argument that “Chagny does not discuss how the conduction period is determined or what the duty cycle is” (PO Sur-reply 13), claim 1 does not recite any particular value for the duty cycle, and Patent Owner does not dispute Petitioner’s arguments and Dr. Kiaei’s

testimony as to how the duty cycle is controlled to regulate the output voltage, as discussed in the previous paragraph.

As for Patent Owner's argument regarding controlling the duty cycle "in accordance with said command," Petitioner's contention is that charge and discharge control signals 212 and 214 have the switching frequency 216 that is selected based on activity input 202 and, therefore, that Chagny discloses controlling the duty cycle "in accordance with" activity input 202 based on the relationship between frequency and period of the duty cycle. Pet. 49 (citing Ex. 1004, 4:66–5:2, 5:28–31, 5:34–46); Pet. Reply 19–20 (citing Ex. 1026 ¶ 24). The switching frequency is the inverse of the switching period. Ex. 1026 ¶ 24. We credit Dr. Kiaei's unrebutted testimony that, "[a]s a matter of simple math, the duty cycle can therefore also be described as a function of both the conduction period and the *switching frequency*." Ex. 1026 ¶ 24. By disclosing setting the switching frequency and, thus, the switching period, Chagny discloses that the duty cycle is controlled "in accordance with" activity input 202, upon which the switching frequency is based.

Based on Petitioner's contentions and evidence and for the reasons discussed above, we find that Chagny discloses controlling the duty cycle of charge switch 220 as a function of the feedback from the regulated DC voltage output 295 based on Chagny's disclosure that "controller module 210 receives the regulated DC voltage output 295 as a feedback input for regulating the output of the VRM 200." Ex. 1004, 4:63–65. We also find that Chagny discloses controlling the duty cycle of charge switch 220 in accordance with the command to enter a power converter operational state based on Chagny's disclosure that frequency selector module 215 receives activity input 202 and selects switching frequency 216 to match the activity

level of processor 292 and that FET driver module 218 receives switching frequency 216 and generates charge signal 212 having that frequency.

Ex. 1004, 4:66–5:3, 5:28–31.

(3) Power System Controller

As noted above, Petitioner relies on software program 296 alone or with ICH 280 as the recited “power system controller.” Pet. 40–42. Patent Owner disputes this contention for various reasons with which we disagree, as explained below. PO Resp. 51–54.

Patent Owner argues that “the power system controller of the ’759 Patent controls the overall power system,” whereas Chagny’s software program 296 “does not control the power system, and is limited to reporting the activity level of the processor.” PO Resp. 51–53. We disagree. The claimed “power system controller” exerts control over the power system by performing certain functions recited in the claim, specifically “receiv[ing] a signal indicating a system operational state of a load” and providing “a command . . . to enter a power converter operational state as a function of said signal indicating said system operational state.” This is consistent with the ’759 patent’s description that the “power system controller . . . induces the power converter to enter a power converter operational state.” Ex. 1001, 21:39–41. Chagny’s software program 296 exerts control in the same manner by providing activity input 202 to frequency selector module 215 of controller module 210, which changes the switching frequency (“internal operating characteristic”) of VRM 200 in response to activity input 202. Ex. 1004, 5:9–12 (“Thus the controller module 210 dynamically changes the switching frequency 216 of the VRM 200 responsive to the activity input 202 indicative of the activity level of the processor 292.”); *see also* Ex. 1004, 4:35–37, 4:40–43, 4:62–63, 4:66–5:3.

Patent Owner also argues that Chagny’s software program 296 is not a power system controller because it runs on device 290, which the load, not the power system. PO Resp. 52–53. But as Petitioner points out, “[t]he ’759 Patent includes embodiments where ‘the power system controller’ is constructed as an element of a server (i.e., the load).” Pet. 42 n.3 (citing Ex. 1001, 18:24–33, 20:58–61, Fig. 11). We agree with Petitioner because the ’759 patent states that “the power system controller PSC may be constructed as an element of one or more servers SVR,” which are the loads in Figure 11. Ex. 1001, 18:28–33, 20:58–61, Fig. 11; *see also* Inst. Dec. 23–24 (discussing this disclosure).

Based on Petitioner’s contentions and evidence, and for the reasons discussed above, we find that Chagny’s software program 296 is a “power system controller” as recited in claim 1. In particular, we find that Chagny’s disclosure of software program 296 monitoring the activity of processor 292 describes “power system controller configured to receive a signal indicating a system operational state of a load coupled thereto.” *See* Ex. 1004, 4:35–37 (“[S]oftware program 296, which may be included in the operating system (not shown) of the device 290, monitors the processor 292 loading.”); *see* Pet. 41–42 (discussing this disclosure); *see also* PO Resp. 52–53 (noting that software program 296 “report[s] the activity level of the processor”). Based on this finding and the findings in sections II.D.2.a and b.1 above, we find that Chagny describes the subject matter recited in the preamble of claim 1.¹⁰

¹⁰ Because Petitioner has shown that Chagny describes subject matter recited in the preamble, we need not decide whether the preamble is limiting.

As to recitation 1b (“a controller configured to receive a command from said power system controller to enter a power converter operational state as a function of said signal indicating said system operational state”), Chagny discloses that frequency selector module 215 of controller module 210 “is operable to receive the activity input 202 . . . and select a switching frequency 216 from a plurality of switching frequencies as an output, which dynamically matches the level of activity of the processor 292.” Ex. 1004, 4:66–5:3; *see also* Ex. 1004, 5:9–12 (“Thus the controller module 210 dynamically changes the switching frequency 216 of the VRM 200 responsive to the activity input 202 indicative of the activity level of the processor 292.”); *see* Pet. 46–47 (discussing this disclosure). Thus, we find that Chagny’s disclosure of controller module 210 receiving activity input 202 and selecting different power converter switching frequencies based on that input describes “a controller configured to receive a command from said power system controller to enter a power converter operational state as a function of said signal indicating said system operational state.”

c) Conclusion for Claim 1

For the reasons discussed above and based on Petitioner’s contentions and evidence, we find that Chagny describes the subject matter of claim 1 and, therefore, that Chagny anticipated claim 1.

3. Independent Claims 6 and 16

Independent claim 6 is directed to a “power system coupled to a load, comprising” “a power system controller” and “a power converter,” which in turn comprises “a power switch” and “a controller.” Independent claim 16 is directed to a “method of operating a power system coupled to a load” and recites steps that correspond to operations recited in claim 6.

Petitioner contends that the limitations of claims 6 and 16 are similar or the same as limitations of claim 1 and are disclosed by Chagny for the same reasons. Pet. 52–57. Patent Owner does not dispute this characterization and relies on the same arguments for these claims as it makes for claim 1. *See* PO Resp. 45–51.

We find Petitioner’s contentions for claims 6 and 16 persuasive for the reasons discussed for claim 1, and, therefore, we find that Chagny anticipated claims 6 and 16.

4. Claims 2, 5, 11, 15, 20

Claims 2 and 11 depend, respectively, from claim 1 and 6 and recite “wherein said power converter is configured to enter said power converter operational state within a transition time from another power converter operational state.” Petitioner argues that Chagny discloses a predefined time period “within which VRM 200 transitions from one switching-frequency state to another.” Pet. 50–51 (citing Ex. 1004, 4:66–5:18; 5:62–66; Ex. 1002 ¶¶ 150–153); *see* Ex. 1004, 5:62–66 (“The demand for power required by the processor 292 is advantageously controlled by limiting the number of instructions executed for a predefined time period. This control mechanism ensures that the VRM 200 reacts responsively and on time according to the processor 292 demand.”).

Claims 5, 15, and 20 depend, respectively, from claims 1, 6, and 16 and recite “wherein said power converter operational state is selected from the group consisting of: a fully operational power converter, a reduced redundancy power converter, and an idle power converter.” Petitioner argues that “[t]he highest switching-frequency state of Chagny’s VRM 200 represents a power converter state where all power converter components operate at full performance level (i.e., a fully operational power converter).”

Pet. 52 (citing Ex. 1004, 5:5–18, 5:23–26; Ex. 1002 ¶¶ 159–160); *see* Ex. 1004, 5:5–8 (disclosing that, for “low, medium and high activity levels there are 3 corresponding low 130, medium 140 and high 150 switching frequencies”).

Apart from its arguments for the independent claims, Patent Owner does not dispute Petitioner’s contentions that Chagny anticipated claims 2, 5, 11, 15, and 20.

Petitioner’s contentions and evidence, summarized above, are persuasive, and we find that Chagny describes the subject matter of claims 2, 5, 11, 15, and 20 and, therefore, anticipated these claims.

5. *Claims 4, 14*

Claims 4 and 14 depend, respectively, from claims 1 and 6 and recite “wherein said load includes a processor and said system operational state depends on one of a core state and a performance state of said processor.”

Petitioner contends that “[t]he ’759 Patent background explains that a ‘core state’ is ‘under software operating system control’ and relates to ‘various levels of a processor sleep state,’ achieved by ‘halting instruction execution’ among other items.” Pet. 51 (citing Ex. 1001, 4:23–39; Ex. 1002 ¶ 154). Petitioner cites Chagny’s disclosure of different processor activity levels and argues that “the activity level of processor 292 (i.e., system operational state of the load) at any of Chagny’s activity levels (e.g., low, medium, high) is dependent on at least a core state of processor 292.” Pet. 51 (citing Ex. 1004, 4:23–30, 4:43–49, 5:57–61, 6:3–4; Ex. 1002 ¶¶ 155–157).

Patent Owner argues that, as a matter of claim construction, the recited “core state” should be limited to ACPI C-states. *See* PO Resp. 55; PO Sur-reply 20–21. We disagree for the reasons given in section II.C.2.

Patent Owner also argues that Chagny “does not teach using C-states or P-states to define the system operational state” and that “it is not possible for the system of Chagny to ascertain the P-state or C-state based on its signal 202 indicative of processor activity level.” PO Resp. 56. Putting aside whether the recited “core states” are limited to ACPI C-states, Patent Owner’s arguments are not commensurate in scope with claims 4 and 14. Claims 1 and 6 recite “a power system controller configured to receive a signal indicating a system operational state of [a/said] load,” and dependent claims 4 and 14 recite “wherein said load includes a processor and said system operational state depends on one of a core state and a performance state of said processor.” Claims 4 and 14 do not recite that the “core state” itself needs to be reported to the power system controller or that the power system controller or any recited component must be able to “ascertain” the core state of the processor. Rather, there is a signal “indicating a system operational state of [a/said] load,” and the “system operational state depends on . . . a core state.”

Patent Owner characterizes the core states of the ’759 patent as follows:

The core state (or C-state) in the ’759 patent is either a sleep mode (where the activity level of the processor is zero) or (in state C0), “full operational level” (when the activity level of the processor can be anything, including zero). Thus, at best, a core state discloses that the activity level of the processor is zero because the system is in sleep mode.

PO Resp. 57 (citing Ex. 1001, 4:26–34). Thus, according to Patent Owner, an operational processor has a core state different from a processor in sleep mode.

We are persuaded by Petitioner’s contention for claims 4 and 14 that “the activity level of processor 292 (i.e., system operational state of the load) at any of Chagny’s activity levels (e.g., low, medium, high) is dependent on at least a core state of processor 292.” Pet. 51 (citing Ex. 1002 ¶¶ 155–157). We agree because the activity levels (low, medium, and high (Ex. 1004, 4:23–30)) show that Chagny’s processor is in an operational core state “when the activity level of the processor can be anything,” according to Patent Owner. See PO Resp 57. Thus, Chagny’s activity level (“system operational state”) “depends on” the processor being in an operational “core state.”

For the reasons discussed above and based on Petitioner’s contentions and evidence, we find that Chagny describes the subject matter of claims 4 and 14 and, therefore, that Chagny anticipated these claims.

*E. Obviousness Based on Chagny
(Claims 1, 2, 4–6, 11, 14–16, 20)*

Petitioner asserts that claims 1, 2, 4–6, 11, 14–16, and 20 would have been obvious over Chagny. Pet. 10, 57–58. As the Court of Appeals for the Federal Circuit has stated, “a disclosure that anticipates under § 102 also renders the claim invalid under § 103, for ‘anticipation is the epitome of obviousness.’” *Connell v. Sears, Roebuck & Co.*, 722 F.2d 1542, 1548 (Fed. Cir. 1983) (citing *In re Fracalossi*, 681 F.2d 792 (CCPA 1982)). Because we find that Chagny anticipated claims 1, 2, 4–6, 11, 14–16, and 20, we also conclude that the subject matter of claims 1, 2, 4–6, 11, 14–16, and 20 would have been obvious based on the teachings of Chagny.

*F. Obviousness Based on Chagny and Clark
(Claims 3, 12, 13, 19)*

Petitioner asserts that claims 3, 12, 13, and 19 would have been obvious over the combined teachings of Chagny and Clark. Pet. 10, 58–64.

Apart from its arguments for the independent claims, Patent Owner does not dispute Petitioner’s contentions of obviousness for claims 3, 12, 13, and 19 based on the combination of Chagny and Clark. See PO Resp. 58.

Below we summarize Petitioner’s contentions, which we find persuasive.

Claims 3 and 12 depend, respectively, from claims 1 and 6 and recite “wherein said power system controller is configured to receive a signal indicating a power converter status of said power converter, said power converter operational state being a function of said power converter status.” Claim 13 recites, “The power system as recited in claim 12 wherein said power converter status is selected from the group consisting of: a fully operational status, a failure likely status, a failed status, and an overloaded status.”

Claim 19 depends from claim 16 and recites “receiving a signal indicating a power converter status of said power converter and generating said power converter operational state as a function thereof.”

Clark discloses a device including a microprocessor (core logic 50) and a power converter (voltage regulator 40). Ex. 1005, 3:9–20, 3:31–33, Fig. 1. Petitioner relies on Clark’s disclosure of signaling between the core logic 50 and voltage regulator 40. Pet. 61–62 (citing Ex. 1005, 3:44–60, 5:24–36, Fig. 1; Ex. 1002 ¶¶ 189–191). In particular, Clark discloses a signal called Vstable, which is sent from voltage regulator 40 to core logic 50 and indicates whether voltage regulator 40 is in a stable state or is

changing. Ex. 1005, 5:24–36, Figs. 1, 2. Clark also discloses that the core logic 50 can send a control word to voltage regulator 40 “to indicate the voltage potentials to be provided by voltage regulator 40.” Ex. 1005, 3:44–60, Fig. 1.

Petitioner argues that combining “Chagny’s system to further include the control functions of Clark along with the ‘control word’ and ‘Vstable’ signals that Clark uses to communicate between the microprocessor and the power converter” “represents the use of a known technique (i.e., Clark’s dynamic control of the power converter output voltage) to improve a similar device (i.e., Chagny’s information handling system and voltage regulator module) in the same way.” Pet. 61 (citing Ex. 1005, 3:44–60, 5:24–36; Ex. 1002 ¶¶ 189–190). Petitioner argues that a person of ordinary skill in the art would have had a reasonable expectation of success in combining these teachings because “Chagny is already configured to send control signals to its power converter based on the activity level of its processor.” Pet. 61 (citing Ex. 1004, 4:40–43, 5:9–12, Fig. 2A; Ex. 1002 ¶ 190).

For claims 3, 12, and 19, Petitioner argues that Clark’s Vstable signal indicates the power converter status because it informs core logic 50 whether voltage regulator 40 has transitioned from one voltage to another. Pet. 62–63 (citing Ex. 1005, 5:24–36, Fig. 2). For claim 13, Petitioner argues that the Vstable signal indicates that voltage regulator 40 is stable and, therefore, “fully operational.” Pet. 64 (citing Ex. 1005, 5:27–36; Ex. 1002 ¶ 197).

Petitioner’s contentions and evidence, summarized above, are persuasive. Based on those contentions, we find that the combination of Chagny and Clark teaches the subject matter of claims 3, 12, 13, and 19 and that the “combination represents the use of a known technique (i.e., Clark’s dynamic control of the power converter output voltage) to improve a similar

device (i.e., Chagny’s information handling system and voltage regulator module) in the same way.” *See* Pet. 61.

Based on Petitioner’s persuasive contentions and evidence, we conclude that the subject matter of claims 3, 12, 13, and 19 would have been obvious based on the combined teachings of Chagny and Clark.

*G. Anticipation by Hirst
(Claims 1, 6–10, 16–18)*

Petitioner asserts that Hirst anticipated claims 1–3, 5–13, 15–20. Pet. 10, 14–39. Patent Owner opposes. PO Resp. 18–44; PO Sur-reply 6–7, 9–11, 16–19. We address claims 1, 6–10, and 16–18 below. Because we have already determined claims 2, 3, 5, 11–13, 15, 19, and 20 are unpatentable based on the Chagny grounds, we need not address those claims here.

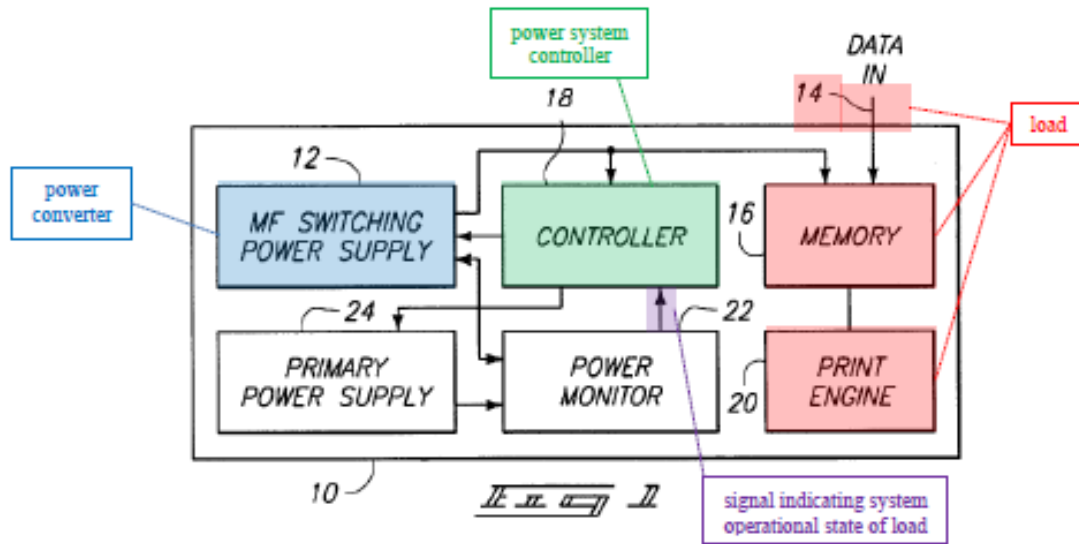
1. Hirst

Hirst discloses a multiple frequency switching power supply that can operate with a first switching frequency when a load is in a normal operating mode and with a second switching frequency when a load is in a standby operating mode. Ex. 1003, code (57), 3:17–23. Additional pertinent details of Hirst are discussed below.

2. Claim 1

a) Preamble

Claim 1 is directed to a “power converter coupled to a power system controller configured to receive a signal indicating a system operational state of a load coupled thereto.” Petitioner provides the following annotated version of Hirst’s Figure 1 to illustrate its contentions:



Pet. 15. Figure 1 of Hirst above shows a block diagram of printer 10. Ex. 1003, 3:51–59 (with added annotations and shading). Referring to the annotated version of Hirst’s Figure 1 above, Petitioner argues that multiple frequency (MF) switching power supply 12 (shaded blue) is “a power converter,” that controller 18 (shaded green) is “a power system controller,” and that memory 16 (shaded red) and print engine 20 (shaded red) are individually or collectively “a load.” Pet. 14–15. Petitioner argues that the normal and standby modes of Hirst’s printer are different system operational states of the load. Pet. 15 (citing Ex. 1003, 3:17–23, 4:32–41). Petitioner argues that Hirst’s power monitor 22 detects whether normal or decreased power consumption is occurring and provides this information to controller 18, as indicated by the arrow (shaded purple) from power monitor 22 to controller 18, which Petitioner identifies as “a signal indicating a system operational state of a load.” Pet. 15–16 (citing Ex. 1003, 4:32–41, 6:65–7:4, 8:27–33, Figs. 1, 3, 6). For the reasons discussed below, Petitioner’s contentions for the preamble are persuasive.

Relying on its proposed construction for “system operational state,” Patent Owner argues that “the system operational state is not merely an

indication of normal or low power state.” PO Resp. 21–22. For the reasons discussed above in section II.C.1, we do not adopt Patent Owner’s interpretation of “system operational state,” and, thus, we do not agree with Patent Owner’s arguments based on its proposed construction.

Patent Owner also argues that “the power draw of two identical systems can be the same while they are in distinctly different system operational states” such that “the power draw of the system at any given time is not indicative of the system operational state of the system.” PO Resp. 23 (citing Ex. 2018 ¶ 56). This argument does not directly address Petitioner’s position because Petitioner relies on Hirst’s disclosure of different power draws as indicating different system operational states. Pet. 15 (citing Ex. 1003, 3:17–23, 4:32–41). Hirst discloses that “power consumption monitor 22 detects normal power consumption and provides control signals to maintain normal power supply functions” and that, “[w]hen the power consumption monitor 22 detects reduced power consumption, signals from the power consumption monitor 22 place the multiple frequency switching power supply 12 in a standby mode.” Ex. 1003, 4:33–41.

Patent Owner also argues that Hirst’s “selection between normal and standby modes is also in response to the output of the power converter, not to a system operational state” and that “the system being in normal or standby mode at a given instant is not indicative of how the system is being utilized and therefore not indicative of the system operational state.” PO Resp. 22. We disagree. Hirst discloses that, when “no input data are present at the data input port 14 and the print engine 20 is not active, power consumption decreases.” Ex. 1003, 4:35–38. Thus, the lower power

consumption that is detected indicates that the printer is not being utilized, i.e., a system operational state.

Based on Petitioner’s persuasive contentions and evidence, we find that Hirst’s MF switching power supply is a power converter because it provides DC-to-DC conversion. Ex. 1003, 3:55–59, *cited in* Pet. 14; *see also* Ex. 1003, 1:18–36 (providing background on buck and boosting DC-to-DC converters). This is consistent with the ’759 patent’s description of the operation of power converters. *See, e.g.*, Ex. 1001, 1:46–50 (“In an exemplary application, the power converters have the capability to convert an unregulated dc input voltage such as five volts to a lower, regulated, dc output voltage such as 2.5 volts to power a load.”). We also find that Hirst’s controller 18 is a power system controller that receives a signal indicating a system operational state from power consumption monitor 22 as discussed above.

Based on Petitioner’s persuasive argument and evidence, we find that Hirst describes the subject matter recited in the preamble of claim 1.¹¹

b) Recitation 1a

Recitation 1a provides that the power converter comprises “a power switch configured to conduct for a duty cycle to provide a regulated output characteristic at an output thereof.” Petitioner argues that Hirst’s switching transistor 34 is the claimed “power switch.” Pet. 18–19 (citing Ex. 1003, code (57), 1:18–28, 2:45–49, 5:18–20, 6:1–20, 6:45–51, Figs. 2–5; Ex. 1002 ¶¶ 64–66).

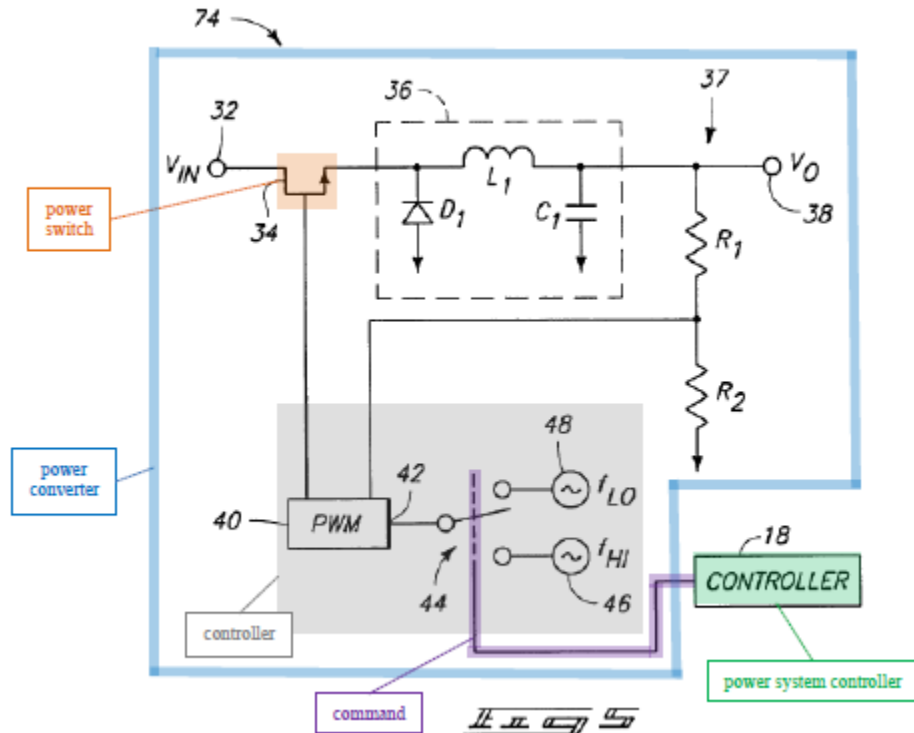
¹¹ Because Petitioner has shown that Hirst describes subject matter recited in the preamble, we need not decide whether the preamble is limiting.

Patent Owner does not dispute Petitioner's contentions for this subject matter.

Petitioner's contentions are persuasive. Hirst discloses that switching transistor 34 is turned ON and OFF and that "[a] pulse width of the ON portion of the duty cycle of the switching transistor 34 is varied in a conventional manner . . . to regulate the amount of charge that is transferred per cycle . . . and thus to maintain the desired output voltage V_{OUT} at the output 38." Ex. 1003, 6:1–3, 6:8–14. Based on Petitioner's persuasive argument and evidence, therefore, we find that Hirst describes "a power switch configured to conduct for a duty cycle to provide a regulated output characteristic at an output thereof."

c) Recitation 1b

Recitation 1b provides that the power converter comprises "a controller configured to receive a command from said power system controller to enter a power converter operational state as a function of said signal indicating said system operational state." Petitioner provides the following annotated version of Hirst's Figure 5 to illustrate its contentions for this subject matter:



Pet. 20. Figure 5 of Hirst is a schematic diagram of an embodiment of a multiple frequency switching power supply, and Petitioner provides annotations for various components, including a gray box encompassing pulse width modulation (PWM) circuit 40, first oscillator 46, second oscillator 48, and switch 44. Ex. 1003, 7:63–65; Pet. 20. As indicated by the blue annotations, Petitioner argues that all components of Hirst Figure 5 except for controller 18 are the “power converter” of claim 1. This is consistent with Hirst’s Figure 1, which shows controller 18 separate from the multiple frequency switching power supply. See Pet. 21 (referring to controller 18 of Hirst’s Figure 1). Petitioner argues that the components within the gray box are collectively the power converter “controller” of recitation 1b. In particular, Petitioner argues that controller 18 (“power system controller”) sends a command to the power converter controller (gray box) to enter normal mode or standby mode (operational states) by switching, respectively, between first oscillator 46 having a high clock

frequency and second oscillator 48 having a low clock frequency. Pet. 21 (citing Ex. 1003, 3:17–23, 7:66–8:8, 8:27–33; Ex. 1002 ¶ 68).

For the reasons discussed below, we find that Petitioner shows persuasively that Hirst discloses recitation 1b. Patent Owner disputes Petitioner’s contentions for recitation 1b, and we address these arguments and provide our analysis below. PO Resp. 24–34; PO Sur-reply 9–11.

(1) Power converter operational state

Patent Owner argues that “[n]othing in Hirst indicates that Hirst’s power converter enters a different power converter operational state as a function of switching between two frequencies.” PO Resp. 24 (citing Ex. 2018 ¶¶ 58–60). We disagree. Hirst states that “MF switching power supply 74 switches from the normal mode of operation using the first oscillator 46 having the first clock frequency f_{HI} to the standby mode of operation using the second clock signal from the second oscillator 48 having the second clock frequency f_{LO} in response to commands from the controller 18.” Ex. 1003, 7:65–8:5. Thus, Hirst expressly discloses that the power supply switches operating modes.

Patent Owner cites various disclosures in the ’759 patent to argue that the “simple binary switching capability of Hirst falls short of the more complex concept of a power converter operating state, which enables sophisticated methods of optimization, such as the use of multidimensional tables, described in the ’759 Patent.” PO Resp. 27 (citing Ex. 1001, 11:19–12:38, 18:66–19:5, 19:15–18, Figs. 5A, 5B; Ex. 2018 ¶ 63). The claims, however, do not recite “sophisticated methods of optimization” or require anything more complex than switching between two states. Hirst’s disclosure is consistent with the ’759 patent’s disclosure of “[a]n exemplary set of power converter operational states” in Table I. Ex. 1001, 18:64–66.

As Petitioner correctly points out, “Table I lists ‘reduced switching frequency’ as the only difference between the second and third power converter operational states.” Pet. Reply 13 (citing Ex. 1001, 18:66–19:3); *see* Ex. 1001, Table I in columns 19 and 20 (describing power converter operational state 3 as having the elements of operational state 2 “plus reduced switching frequency”). Patent Owner responds by arguing that, in the ’759 patent, “[t]he power converter operational state is ‘Fully Operational,’ ‘Reduced load,’ etc.” PO Sur-reply 10 (citing Ex. 1001, Table I). We find that Hirst discloses the same thing by providing “normal power supply” when “normal power consumption” is detected and switching to “standby mode” when “reduced power consumption” is detected. Ex. 1003, 4:33–41. Thus, Patent Owner’s argument supports a finding that Hirst describes power converter operational states.

Patent Owner also argues that the ’759 patent calls the switching frequency an “external characteristic” because the “switching frequency is used to set output voltage,” which is an external characteristic. PO Resp. 26 (citing Ex. 1001, 19:5–7). We disagree because the ’759 patent expressly states that “a switching frequency” is “an internal operating characteristic of a power converter.” Ex. 1001, 18:66–19:5.

Patent Owner additionally argues that Hirst does not describe the subject matter of recitation 1b because “Hirst does not teach or disclose the signal indicating the system operational state.” *See* PO Resp. 24. We disagree for the reasons discussed above for the preamble. *See* section II.G.2.a. above.

(2) Power converter controller

Patent Owner argues that “there is only one controller in Hirst, not a separate power system controller and power converter controller as required

by claims 1 and 6 of the '759 Patent.” PO Resp. 34. Patent Owner argues that Hirst’s controller 18, which Petitioner identifies as the “power system controller,” is the only controller and that “there is no corresponding controller within the power converter.” PO Resp. 32 (citing Ex. 2018 ¶ 70). Patent Owner argues that the components identified by Petitioner as the “controller” within the power converter “simply switch the input frequency for the PWM from a high frequency to a low frequency depending on a command signal from controller 18.” PO Resp. 32 (citing Ex. 2018 ¶ 71). Patent Owner also argues that “Hirst does not refer to this collection of disparate components as a ‘controller’ and there is no logic associated with these components that controls any functionality.” PO Resp. 32.

As an initial matter, anticipation does not require that the prior art reference use identical terminology as the claims. *Gleave*, 560 F.3d at 1334. Thus, Hirst need not use the term “controller” to describe the components Petitioner identifies as disclosing the recited power converter “controller.” Rather, we must determine whether a person of ordinary skill in the art would have reasonably understood or inferred that Hirst describes the claimed controller, and for the reasons discussed below, we find that Hirst describes the controller. *See Akamai Techs., Inc. v. Cable & Wireless Internet Servs., Inc.*, 344 F.3d 1186, 1192–93 (Fed. Cir. 2003) (“[T]he dispositive question regarding anticipation is whether one skilled in the art would reasonably understand or infer from the prior art reference’s teaching that every claim [limitation] was disclosed in that single reference.” (quoting *Dayco Prods., Inc. v. Total Containment, Inc.*, 329 F.3d 1358, 1368 (Fed. Cir. 2003))).

In support of its argument that Hirst does not describe the claimed controller, Patent Owner cites various disclosures in the '759 patent that

describe features and capabilities of the power converter's controller, such as "includ[ing] digital processing capability at least comparable to that of a low-end microprocessor" and "control[ling] the efficiency of a power converter using numerous different inputs." PO Resp. 28–30 (citing Ex. 1001, 6:14–16, 10:32–50, Fig. 3). These features and capabilities, however, are not recited in claim 1, which requires that the controller be "configured to receive a command from said power system controller to enter a power converter operational state as a function of said signal indicating said system operational state" (recitation 1b) and "configured to provide a signal to control said duty cycle of said power switch as a function of said output characteristic and in accordance with said command" (recitation 1c).

We find that Hirst describes the subject matter of recitation 1b. Hirst discloses that "MF switching power supply 74" (power converter) "switches from the normal mode of operation using the first oscillator 46 having the first clock frequency f_{HI} to the standby mode of operation using the second clock signal from the second oscillator 48 having the second clock frequency f_{LO} in response to commands from the controller 18," which "permits the controller 18 to cause more than one MF switching power supply, such as the power supply 74, to enter the standby mode when the laser printer 10 of FIG. 1 enters the standby mode." Ex. 1003, 7:65–8:8 (emphasis added), *cited in* Pet. 21. Thus, we find that the components identified by Petitioner (PWM 40, first oscillator 46, second oscillator 48, and switch 44, as shown in the gray box in annotated Figure 5) collectively are configured to receive a command from controller 18 to switch power converter operational states between normal and standby modes, which is the power converter controller functionality of recitation 1b. Ex. 1003, 7:65–8:8; *see* Ex. 1002 ¶¶ 67–68

(explaining how PWM 40, first oscillator 46, second oscillator 48, and switch 44 operate as the claimed controller).

Patent Owner argues that Petitioner’s allegation that “controller 18 (the power system controller) sends a command to the controller within the power converter to enter one of two power converter operational states” (Pet. 21) “emphasizes that controller 18 is the only element in Hirst performing any control functions.” PO Resp. 33 (citing Ex. 2018 ¶ 73). According to Patent Owner, “the passages from Hirst cited by the Petition make clear that the components of Hirst are simply responding to controller 18’s commands.” PO Resp. 34 (citing Ex. 1003, 7:66–8:7). Claim 1, however, expressly recites that the power converter “controller” is “configured to receive a command from said power system controller to enter a power converter operational state as a function of said signal.” Thus, Petitioner’s contentions directly address the claimed functionality.

(3) Finding for recitation 1b

For the reasons discussed above and based on Petitioner’s contentions and evidence, we find that Hirst describes a power converter that comprises “a controller configured to receive a command from said power system controller to enter a power converter operational state as a function of said signal indicating said system operational state.”

d) Recitation 1c

Recitation 1c provides that “said controller [is] further configured to provide a signal to control said duty cycle of said power switch as a function of said output characteristic and in accordance with said command.”

Petitioner argues that, in Hirst, PWM 40 (a component of the power converter “controller”) “controls the duty cycle of switching transistor 34 (i.e., the power switch) as a function of the feedback from the output voltage

(i.e., as a function of said output characteristic)” and also in accordance with the power system controller command setting the switching frequency.

Pet. 22–23 (citing Ex. 1003, 2:59–65, 5:32–35, 6:8–18, 6:34–37, 7:66–8:9; Ex. 1002 ¶¶ 70–72).

During the trial, Patent Owner did not dispute Petitioner’s contentions for this subject matter. *See* PO Resp. 18–34 (arguments for claim 1).

Petitioner’s contentions are persuasive. Hirst discloses varying the duty cycle based on voltages sensed by voltage divider 37, which we find describes “control[ling] said duty cycle of said power switch as a function of said output characteristic.” Ex. 1003, 6:8–14. Hirst also discloses that “the limits over which the duty cycle may be varied in the PWM circuit 40 are different when the PWM circuit 40 is driven by the first oscillator 46 than when the PWM circuit 40 is driven by the second oscillator 48,” which we find describes “control[ling] said duty cycle of said power switch . . . in accordance with said command.” Ex. 1003, 6:15–18.

e) Recitation 1d

Recitation 1d provides “thereby regulating an internal operating characteristic of said power converter to improve an operating efficiency thereof as a function of said system operational state.” Petitioner argues that Hirst discloses that regulating the switching frequency of the power supply based on the operating mode (high frequency for normal mode and low frequency for standby mode) improves the efficiency of the power converter. Pet. 23–24 (citing Ex. 1003, 1:46–48, 2:2–3, 3:17–24, 4:59–62, 7:66–8:8; Ex. 1002 ¶ 74; Ex. 1010, 2:15–34).

Patent Owner does not dispute Petitioner’s contentions for this subject matter. *See* PO Resp. 18–34 (arguments for claim 1).

As discussed above in section II.G.2.c.1, we find that Hirst's switching frequency is an "internal operating characteristic." Hirst explains that an advantage to reducing a clock frequency is "a sharp increase in switching power supply efficiency because switching losses are dramatically reduced." Ex. 1003, 4:59–62. Therefore, we find that Hirst discloses "regulating an internal operating characteristic of said power converter to improve an operating efficiency thereof as a function of said system operational state."

f) Conclusion for Claim 1

For the reasons discussed above and based on Petitioner's contentions and evidence, we find that Hirst describes the subject matter of claim 1 and, therefore, that Hirst anticipated claim 1.

3. Claim 6

Claim 6 is directed to a "power system coupled to a load, comprising" "a power system controller" and "a power converter," which in turn comprises "a power switch" and "a controller." As Petitioner points out, claim 6 recites essentially the same subject matter as claim 1, and Petitioner, therefore, refers to its claim 1 contentions. Pet. 27. Patent Owner raises the same arguments for claim 6 as for claim 1, which we have addressed above. *See* PO Resp. 18–34.

For the reasons discussed above in section II.G.2 for claim 1 and based on Petitioner's contentions and evidence, we find that Hirst describes the subject matter of claim 6 and, therefore, that Hirst anticipated claim 6.

4. Claim 16

Claim 16 recites a "method of operating a power system coupled to a load, comprising" several steps that correspond to operations recited in claims 1 and 6. Petitioner argues that Hirst discloses methods to operate a

power system. Pet. 35 (citing Ex. 1003, 1:13–15; Ex. 1002 ¶ 110); *see* Ex. 1003, 1:13–15 (“The invention relates to multiple frequency switching power supplies and methods to operate a switching power supply.”).

The first step of claim 16 is “receiving a signal indicating a system operational state of said load.” Petitioner argues that Hirst discloses this step for the reasons explained for the preamble of claim 1, which recites a “power converter coupled to a power system controller configured to *receive a signal indicating a system operational state of a load coupled thereto*” (emphasis added). Pet. 35.

The second and third steps of claim 16 are “generating a power converter operational state as a function of said system operational state” and “inducing a power converter to enter said power converter operational state.” Petitioner refers to its contentions for similar subject matter of claim 1 reciting “a controller configured to receive a command from said power system controller to enter a power converter operational state as a function of said signal indicating said system operational state.” Pet. 36–37 (citing Ex. 1003, 3:17–24, 7:66–8:9; Ex. 1002 ¶¶ 112–114).

For the fourth step of claim 16 reciting “providing a signal to control a duty cycle of a power switch of said power converter as a function of an output characteristic thereof and in accordance with said power converter operational state,” Petitioner refers to its contentions for similar subject matter of claim 1 reciting “said controller further configured to provide a signal to control said duty cycle of said power switch as a function of said output characteristic and in accordance with said command.” Pet. 37 (citing Ex. 1002 ¶ 115).

Petitioner notes that the last clause of claim 16 reciting “thereby regulating an internal operating characteristic of said power converter to

improve an operating efficiency thereof as a function of said system operational state” is identical to recitation 1d. Pet. 38.

Patent Owner raises the same arguments for claim 16 as for claim 1, which we address above. *See* PO Resp. 18–27.

For the reasons discussed above in section II.G.2 for claim 1 and based on Petitioner’s contentions and evidence, we find that Hirst describes the subject matter of claim 16 and, therefore, that Hirst anticipated claim 16.

5. *Dependent Claims 7–10, 17, 18*

Claim 7 depends from claim 6, and as Petitioner notes, claim 7 “repeats each limitation of claim 6, but for ‘*another* load’ and ‘*another* power converter’ (and the associated states, signals, and command) under the control of the same ‘power system controller.’” Pet. 28 (citing Ex. 1007, 1 (comparison of claims 6 and 7)). Claim 17 depends from claim 16 and also “repeats the limitations of claim 16 but for ‘*another* load’ and ‘*another* power converter’ performing the same steps recited in claim 16.” Pet. 38 (citing Ex. 1007, 2 (comparison of claims 16 and 17)).

Petitioner argues that Hirst’s Figure 6 describes multiple power converters providing different voltages to different loads. Pet. 29–30 (citing Ex. 1003, 4:20–31, 5:18–23, 8:9–12, 8:17–23, Fig. 6; Ex. 1002 ¶¶ 92–94). Petitioner contends that Hirst “discloses that the frequency for each of the MF switching power supplies in Figure 6 is under the control of the same ‘controller 18’ (i.e., the power system controller)” and that controller 18 individually selects the frequency for each of the power supplies. Pet. 30–31 (citing Ex. 1003, 7:63–8:8, 8:27–49; Ex. 1002 ¶ 95). Petitioner argues that a person of ordinary skill in the art “would understand that, for *each* of the respective power supplies and loads, controller 18 receives a signal

indicating the system operational state of the load in the same manner described above for claim 1[pre] and 6[a].” Pet. 31 (citing Ex. 1002 ¶ 95).

Claim 8 depends from claim 7 and recites “wherein at least one of said system operational state and said another system operational state, and said power converter operational state and said another power converter operational state, are different.” Petitioner argues that Hirst discloses normal and standby modes of power converter operation and also discloses that each of multiple power converters can be in a different state. Pet. 31–32 (citing Ex. 1003, 7:66–8:8, 8:42–49). Petitioner argues that Hirst also discloses that loads can have different system operational states. Pet. 32 (citing Ex. 1003, 4:27–31, 8:44–49).

Claim 9 depends from claim 7 and recites “wherein said power converter and said another power converter are configured to provide power to said load and said another load, respectively.” Petitioner refers to its contentions for claim 6 and 7, which explain that Hirst’s power converters provide power to different loads. Pet. 28–32.

Claim 10 depends from claim 7 and recites “wherein said power system controller is configured to sequentially operate said power converter and said another power converter.” Claim 18 depends from claim 17 and similarly recites “wherein said power converter and said another power converter are operated sequentially.” Petitioner argues that Hirst’s disclosure of controlling power converters “in a preferred order” describes operating them sequentially. Pet. 33 (quoting Ex. 1003, 8:42–49; citing Ex. 1002 ¶ 102).

Patent Owner does not dispute Petitioner’s contentions for claims 7–10, 17, 18 apart from its independent claim arguments, which we have addressed above in section II.G.2.

Petitioner's contentions are persuasive. Regarding the recitation of multiple power converters and multiple loads, Hirst discloses, with reference to Figure 6, controller 18 controlling multiple power converters (e.g., 96 and 98) that power different loads. *See, e.g.*, Ex. 1003, 8:9–12 (“FIG. 6 is a simplified block diagram of a group of power supplies 80 for the laser printer 10 of FIG. 1. Modern laser printers 10 include a number of power supplies 80, many or all of which may be switching power supplies.”), 8:45–49 (“The controller 18 may switch all of the power supplies 84, 88, 96 and 98 together or may switch them in a preferred order, or may set them individually in response to power levels being drawn from each of them.”). Based on these disclosures, we find that Hirst discloses power converters in different states based on the states of their loads and also discloses sequential operation of the power converters.

For the reasons discussed above and based on Petitioner's contentions and evidence, we find that Hirst describes the subject matter of claims 7–10, 17, and 18 and, therefore, that Hirst anticipated claims 7–10, 17, and 18.

*H. Obviousness Based on Hirst
(Claims 1, 6–10, 16–18)*

Petitioner asserts that claims 1–3, 5–13, and 15–20 would have been obvious over Hirst. Pet. 10, 39–40. Because we find that Hirst anticipated claims 1, 6–10, and 16–18, we also conclude that the subject matter of claims 1, 6–10, and 16–18 would have been obvious based on the teachings of Hirst. Because we have already determined claims 2, 3, 5, 11–13, 15, 19, and 20 are unpatentable based on the Chagny grounds, we need not address those claims here.

I. Remaining Grounds

As noted above in § I.A, Petitioner presents additional challenges to

the claims in this proceeding. Because we determine that all challenged claims are unpatentable as discussed above, we need not separately assess the patentability of these claims based on the remaining grounds in this proceeding. 35 U.S.C. § 318(a) (“If an inter partes review is instituted and not dismissed under this chapter, the Patent Trial and Appeal Board shall issue a final written decision with respect to the patentability of any patent claim challenged by the petitioner and any new claim added under section 316(d).”); *Bos. Sci. Scimed, Inc. v. Cook Grp. Inc.*, 809 F. App’x 984, 990 (Fed. Cir. 2020) (nonprecedential) (“We agree that the Board need not address issues that are not necessary to the resolution of the proceeding.”).

III. CONCLUSION¹²

For the reasons discussed above, we determine that Petitioner has proven, by a preponderance of the evidence, that claims 1–20 of the ’759 patent are unpatentable, as summarized in the following table:

Claim(s)	35 U.S.C. §	Reference(s)/Basis	Claim(s) Shown Unpatentable	Claim(s) Not Shown Unpatentable
1–3, 5–13, 15–20	102(a), (b)	Hirst ¹³	1, 6–10, 16–18	
1–3, 5–13, 15–20	103(a)	Hirst ¹⁴	1, 6–10, 16–18	
1, 2, 4–6, 11, 14–16, 20	102(a), (b)	Chagny	1, 2, 4–6, 11, 14–16, 20	
1, 2, 4–6, 11, 14–16, 20	103(a)	Chagny	1, 2, 4–6, 11, 14–16, 20	
3, 12, 13, 19	103(a)	Chagny, Clark	3, 12, 13, 19	
1, 2, 4–6,	103(a)	Hwang ¹⁵		

¹² Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner’s attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. See 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. See 37 C.F.R. § 42.8(a)(3), (b)(2).

¹³ As explained above, because we determine that claims 2, 3, 5, 11–13, 15, 19, and 20 are unpatentable on other grounds, we do not address them here.

¹⁴ See footnote 13.

¹⁵ As explained above, because we determine these claims are unpatentable on other grounds, we do not address them here.

11, 14– 16, 20				
Overall Outcome			1–20	

IV. ORDER

Accordingly, it is

ORDERED that claims 1–20 of the '759 patent have been shown to be unpatentable; and

FURTHER ORDERED that, because this is a Final Written 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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