

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

PACIFICORP,
Petitioner,

v.

BIRCHTECH CORP.,
Patent Owner.

IPR2025-00717
Patent 10,926,218 B2

Before KRISTINA M. KALAN, ZHENYU YANG, and
DAVID COTTA, *Administrative Patent Judges*.

YANG, *Administrative Patent Judge*.

DECISION

Granting Institution of *Inter Partes* Review on Remand
35 U.S.C. § 314

I. INTRODUCTION

A. *Procedural Background*

PacifiCorp (“Petitioner”)¹ filed a Petition, seeking *inter partes* review of claims 1–4 and 6–26 of U.S. Patent No. 10, 926,218 B2 (Ex. 1001, “the ’218 patent”). Paper 1 (“Pet.”). Petitioner also filed a concurrent petition, seeking *inter partes* review of the same claims challenged in this proceeding. *See* IPR2025-00718, Paper 1.

On March 26, 2025, the Acting Director issued a Memorandum on Interim Processes for PTAB Workload Management (“Bifurcating Memo”), *available at* <https://uspto.gov/sites/default/files/documents/InterimProcesses-PTABWorkloadMgmt-20250326.pdf>. The Acting Director stated that

decisions on whether to institute an IPR or PGR will be bifurcated between (i) discretionary considerations and (ii) merits and other non-discretionary statutory considerations. Under this interim procedure, the Director, in consultation with at least three PTAB judges, will determine whether discretionary denial of institution is appropriate. If it is appropriate, the Director will issue a decision denying institution. If it is not appropriate, the Director will issue a decision regarding that determination and refer the petition to a three-member panel of the PTAB assigned according to Standard Operating Procedure (SOP) 1 (Rev. 16). The three-member panel will then handle the case in the normal

¹ The Petition was filed by PacifiCorp, Interstate Power & Light Company (“IPL”), MidAmerican Energy Company (“MidAmerican”), WEC Energy Group, Inc. (“WEC”), and Wisconsin Power & Light Company (“WPL”). *See* Paper 1. After filing the Petition, IPL, WPL, WEC, and MidAmerican subsequently settled their dispute with Patent Owner, and have been terminated from this proceeding. Papers 26, 31, 34. Accordingly, “Petitioner” as used herein refers only to the remaining Petitioner, namely, PacifiCorp.

course including by issuing a decision on institution addressing the merits and other non-discretionary statutory considerations.

Bifurcating Memo 1.

Pursuant to the Bifurcating Memo, Patent Owner Birchtech Corp. (“Patent Owner”)² filed a Brief regarding Discretionary Denial. Paper 15. On August 22, 2025, the Acting Director determined that discretionary denial was not appropriate and referred the Petition to the Board. Paper 24. The Acting Director instructed the Board to “issu[e] a decision on institution addressing the merits and other non-discretionary considerations.” *Id.* at 2.

Patent Owner filed a Preliminary Response addressing the merits (Paper 17, (“Prelim. Resp.”), Petitioner filed a Reply to the Preliminary Response (Paper 25, “Reply”), and Patent Owner filed a Sur-reply to Petitioner’s Reply (Paper 27, “Sur-reply”).

On November 4, 2025, we instituted *inter partes* review of all challenged claims based on all the grounds raised in the Petition. Paper 35 (“DI”). In the DI, we noted that “Petitioner filed an explanation regarding the necessity of multiple petitions,” and “Patent Owner d[id] not challenge that multiple petitions are necessary” in the Preliminary Response. Paper 23, 3 n.3.

On November 18, 2025, Patent Owner filed a Request for Director Review. Paper 37. Patent Owner did not identify any matter misapprehended or overlooked by the panel in the DI. *See generally id.* Instead, Patent Owner requested “Director Review of the Director’s August 22, 2025 Decision Referring the Petition to the Board (‘Referral Decision’).” *Id.* at 1.

² Birchtech Corp. was formerly known as Midwest Energy Emissions Corp. (“ME2C”) (Paper 9, 2),

According to Patent Owner, “institution of this IPR should be discretionarily denied.” *Id.* at 5.

The Director granted Director Review, finding that the panel “abused its discretion in granting institution of two petitions that each challenge the same claims” of the ’218 patent. Paper 39, 2. The Director vacated the DI and remanded the case “to the Board panel to determine which of the two petitions” to institute. *Id.* at 4.

We have authority under 35 U.S.C. § 314, which provides that an *inter partes* review may not be instituted “unless . . . there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” 35 U.S.C. § 314(a).

For the reasons provided below, we determine Petitioner has satisfied the threshold requirement set forth in 35 U.S.C. § 314(a). Therefore, we institute *inter partes* review of all challenged claims based on all the grounds raised in this Petition.³

B. Real Parties in Interest

The Petition identifies PacifiCorp, IPL, MidAmerican, WEC, and WPL, as well as Alliant Energy Corporation, Alliant Energy Corporate Services, Inc., Berkshire Hathaway Energy Company, MidAmerican Funding, LLC, MHC Inc., PPW Holdings LLC, Madison Gas and Electric Company, and Wisconsin Public Service Corporation as real parties in interest. Pet. 1–2.

³ Pursuant to the Director’s instruction in the Remand Order, we deny institution of *inter partes* review in IPR2025-00718. *See* IPR2025-00718, Paper 40).

Patent Owner identifies “MES, Inc.” as the real party in interest.
Paper 9, 2.

C. Related Matters

Petitioner concurrently filed IPR2025-00718, seeking *inter partes* review of the same claims challenged in this proceeding. Pet. 3. In a concurrently issued decision, we deny institution of *inter partes* review in that case. *See* IPR2025-00718, Paper 40.

The parties identify the following matters as related to this proceeding:

Midwest Energy Emissions Corp. et al. v. Arthur J. Gallagher & Co. et al., No. 1:19-cv-01334 (D. Del.) (“the Delaware Action”);

Midwest Energy Emissions Corp. v. Tucson Electric Power Co. et al., No. 3:24-cv-08145 (D. Ariz.);

Midwest Energy Emissions Corp. v. Berkshire Hathaway Energy Co. et al., No. 4:24-cv-00248 (S.D. Iowa);

Midwest Energy Emissions Corp. v. Ameren Corporation et al., No. 4:24-cv-00980 (E.D. Mo.);

In re Midwest Energy Emissions Corp. Patent Litigation, No. 4:24-md-3132 (S.D. Iowa) (consolidating the Iowa, Arizona, and Missouri cases);

Midwest Energy Emissions Corp. v. Berkshire Hathaway Energy Company et al., No. 2:25-cv-00015 (D. Wy.);

Midwest Energy Emissions Corp. v. Wisconsin Power and Light Company, No. 3:25-cv-00026 (W.D. Wis.);

Midwest Energy Emissions Corp. v. MidAmerican Energy Company et al., Case No. 4:24-cv-00243 (S.D. Iowa);
Birchtech Corp. f/k/a Midwest Energy Emissions Corp. v. Evergy, Inc. et al., Case No. 4:25-cv-00050 (W.D. Mo.);
Midwest Energy Emissions Corp. v. Evergy, Inc. et al., Case No. 4:25-cv-00046 (S.D. Iowa); and
Birchtech Corp. f/k/a Midwest Energy Emissions Corp. v. Evergy, Inc. et al., Case No. 5:25-cv-04033 (D. Kan.).

Pet. 5–6; Paper 9, 2–3.

Petitioner previously filed several petitions for *inter partes* review, challenging other patents owned by Patent Owner. Pet. 3–4. Petitioner also brings to our attention several *inter partes* review proceedings, with petitions filed by other entities. *Id.* at 4–5.

D. The '218 Patent

The '218 patent “relates to methods and materials for the removal of pollutants from flue gas or product gas from a gasification system. In particular, mercury is removed from gas streams generated during the burning or gasification of fossil fuels by highly reactive regenerable sorbents.” Ex. 1001, 1:46–50.

The '218 patent states that

[t]he combustion and gasification of fossil fuel such as coal generates flue gas that contains mercury and other trace elements that originate from the fuel. The release of the mercury (and other pollutants) to the environment must be controlled by use of sorbents, scrubbers, filters, precipitators, and other removal technologies.

Id. at 1:54–59.

The '218 patent acknowledges that “[s]everal types of mercury control methods for flue gas have been investigated, including injection of fine sorbent particles into a flue gas duct and passing the flue gas through a sorbent bed.” *Id.* at 2:10–13. According to the '218 patent, however, because sorbents in the existing carbon injection systems are initially unreactive, they “must be used in large amounts, at high sorbent-to-mercury ratios, to effectively capture the mercury.” *Id.* at 2:31–37. Thus, “there remains a need for more economical and effective mercury removal technology.” *Id.* at 2:43–44.

The '218 patent describes a halogen/halide promoted activated carbon sorbent that is highly effective for the removal of mercury from flue gas streams. *Id.* at 2:56–58. According to the '218 patent, “[t]he sorbent comprises a new halide-modified carbon form containing a reactive compound produced by the reaction of bromine (or halide or other halogen) with the carbon.” *Id.* at 2:58–61.

The '218 patent states that “[o]ptional secondary components and alkali may be added to further increase reactivity and mercury capacity,” and discloses that “the optional secondary component is selected from the group consisting of Group V halides, Group VI halides, HI, HBr, HCl, and combinations thereof.” *Id.* at 2:61–63, 3:40–43.

The '218 patent provides a promoted carbon sorbent “comprising a base activated carbon that has reacted with a promoter selected from the group consisting of halides, halogens, and combinations thereof.” *Id.* at 3:3–6. In one embodiment, “the promoter is selected from the group consisting of Br₂, a Group V bromide, a Group VI bromide, and combinations thereof.” *Id.* at 4:11–13.

The '218 patent states that its invention “provides for cost-effective removal of pollutants including mercury, using sorbent enhancement additives and/or highly reactive sorbents, with contact times of seconds (or less), and that may be regenerated and reused.” *Id.* at 2:44–48.

E. Illustrative Claim

Independent claim 1 is illustrative of the claimed subject matter and is reproduced below, with Petitioner’s designations of the limitations in brackets.

1. [1(Pre)] A method of separating mercury from a mercury-containing gas, the method comprising:

[1(a)] combusting coal in a combustion chamber, to provide the mercury-containing gas, wherein

[1(b)] the coal comprises added HI, an iodide salt, or a combination thereof, added to the coal before the coal enters the combustion chamber, or

the combustion chamber comprises added HI, an iodide salt, or a combination thereof, or

a combination thereof;

[1(c)] injecting a sorbent comprising activated carbon into the mercury-containing gas downstream of the combustion chamber,

[1(d)] wherein a weight ratio of the HI, iodide salt, or the combination thereof added to the coal, added to the combustion chamber, or a combination thereof, to an amount of the sorbent injected into the mercury-containing gas is from about 1:100 to about 30:100;

[1(e)] contacting mercury in the mercury-containing gas with the sorbent; and

[1(f)] separating the sorbent contacted with the mercury from the mercury-containing gas.

Ex. 1001, 35:61–36:14.

F. Asserted Challenges to Patentability

Petitioner asserts the following challenges to patentability:

Claims Challenged	35 U.S.C. §	Reference
1–4, 6–26	103(a)	Vosteen589, ⁴ Starns ⁵
1–4, 6–26	103(a)	Vosteen589, Mass-EPA ⁶
1, 3, 6–18, 20–26	103(a)	Lissianski, ⁷ Starns
1, 3, 6–26	103(a)	Lissianski, Mass-EPA
2, 4, 6, 23–25	103(a)	Lissianski, Starns, Vosteen589
2, 4, 6, 23–25	103(a)	Lissianski, Mass-EPA, Vosteen589

In support of the unpatentability challenges, Petitioner relies on the Declaration of Stephen Niksa, Ph.D. (Ex. 1002).

II. ANALYSIS OF ASSERTED GROUNDS

A. Level of Ordinary Skill in the Art

In determining the level of ordinary skill in the art, various factors may be considered, including the “type of problems encountered in the art; prior art solutions to those problems; rapidity with which innovations are

⁴ US 2004/0013589 A1, published Jan. 22, 2004. Ex. 1005 (“Vosteen589”).

⁵ Starns, Travis, et al., *Full-Scale Test of Mercury Control with Sorbent Injection and an ESP at Wisconsin Electric’s Pleasant Prairie Power Plant*, Session AE1-C, Paper No. 43249, AIR & WASTE MANAGEMENT’S ASSOCIATION’S 95TH ANNUAL CONFERENCE, June 23–27, 2002. Ex. 1008 (“Starns”).

⁶ Massachusetts Dept. of Environmental Protection, Bureau of Waste Prevention, *Evaluation of the Technological and Economic Feasibility of Controlling and Eliminating Mercury Emissions from the Combustion of Solid Fossil Fuel*, Dec. 2002, available at <https://web.archive.org/web/20030411074158/http://www.state.ma.us/dep/bwp/daqc/files/mercfeas.pdf> and at <https://www.mass.gov/doc/evaluation-of-technologicaleconomic-feasibility-of-controlling-eliminating-mercuryemissions/download>. Ex. 1009 (“Mass-EPA”).

⁷ US 7,514,052 B2, issued April 7, 2009. Ex. 1014 (“Lissianski”).

made; sophistication of the technology; and educational level of active workers in the field.” *In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995). Furthermore, the prior art itself can reflect the appropriate level of ordinary skill in the art. *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001).

Petitioner asserts that “[a] person of ordinary skill in the art [“POSITA”] would have at least a bachelor’s degree in chemical engineering, mechanical engineering, or a related field of study with at least two years of experience implementing pollution control in power generation plants for natural gas, coal, and/or industrial waste incineration.” Pet. 11 (citing Ex. 1002 ¶¶ 48–51). Patent Owner does not dispute the level of ordinary skill in the art. *See generally* Prelim Resp.

For purposes of this Decision, we adopt Petitioner’s proposed definition of a POSITA because it is consistent with the skill level reflected in the disclosures of the ’218 patent and prior art. *See Okajima*, 261 F.3d at 1355 (the prior art may reflect an appropriate level of skill in the art).

B. Claim Construction

In an *inter partes* review, we construe a claim term “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). Under that standard, the words of a claim “are generally given their ordinary and customary meaning,” which is “the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention, i.e., as of the effective filing date of the patent application.” *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–13 (Fed. Cir. 2005) (en banc).

Claim terms need only be construed to the extent necessary to resolve the controversy. *Wellman, Inc. v. Eastman Chem. Co.*, 642 F.3d 1355, 1361

(Fed. Cir. 2011). On this record and for purposes of this Decision, we see no need to construe any claim term expressly.

C. Alleged Obviousness over Vosteen589 and Starns or Mass-EPA

Petitioner asserts that claims 1–4 and 6–26 would have been obvious over Vosteen589 and Starns (Ground 1), and over Vosteen589 and Mass-EPA (Ground 2). Pet. 18–62. Based on this record, and for at least the following reasons, we determine Petitioner has established a reasonable likelihood that it would prevail in these assertions.

1. Asserted Prior Art

a. Vosteen589

Vosteen589 “relates to a process for removing mercury from flue gases of high-temperature plants, in particular power stations and waste incineration plants.” Ex. 1005 ¶ 1. Specifically, Vosteen589 states:

The invention relates to a process for removing mercury from flue gases of high-temperature plants, in particular from power stations and waste incineration plants, in which bromine and/or a bromine compound and/or a mixture of various bromine compounds is fed to the if appropriate multistage furnace and/or to the flue gas in a plant section downstream of the furnace, the temperature during the contact of the bromine compound with the flue gas being at least 500° C., preferably at least 800° C., the combustion taking place in the presence of a sulphur compound, in particular sulphur dioxide, with or without the addition of sulphur and/or a sulphur compound and/or of a mixture of various sulphur compounds, and then the flue gas being subjected to an if appropriate multistage cleanup for removing mercury from the flue gas, which cleanup comprises a wet scrubber and/or a dry cleanup.

Id. ¶ 6.

Vosteen589 discloses that the bromine compound may be sodium bromide and can be in the form of a salt that can be added to waste mixture,

coal, or the like to be burnt. *Id.* ¶ 13. Vosteen589 describes a flue gas emission control system including a dry emission control system that may use, for example, “cloth filters which are impinged with a blown-in finely pulverulent slaked lime/activated carbon or slaked lime/oven coal coke mixture.” *Id.* ¶ 19. Vosteen589 further describes continuously measuring the mercury content of the flue gas and controlling the amount and/or mixture of bromine and/or bromine compound fed by Vosteen589’s emission control system. *Id.* ¶ 22.

b. Starns

Starns describes a project that “determine[s] the capabilities of injecting activated carbon ahead of particle control devices (PCD) to remove mercury” and “determine[s] the cost and impacts of this technology.” Ex. 1008, 2.

Starns discloses that “[t]he most mature, retrofit technology available today is the injection of sorbents such as powdered activated carbon (PAC) into the flue gas upstream of the particle control equipment” in which “[t]he gas-phase mercury in the flue gas contacts the sorbent and attaches to its surface.” *Id.* A PLC (programmable logic controller) system “is used to control system operation and adjust injection rates” of the sorbent. *Id.* at 7. Primary variables of the optimum operating conditions include “injection concentration” and “carbon type.” *Id.* at 10. Accordingly, Starns provides a “full-scale evaluation of mercury control using activated carbon injection upstream of an ESP” (electrostatic precipitator, a particle control equipment). *Id.* at 3, 20.

c. Mass-EPA

Mass-EPA provides a report relative to “Massachusetts’ regulation 310 CMR 7.29” that “establishes emissions standards for sulfur dioxide (SO₂), oxides of nitrogen (NO_x) and carbon dioxide (CO₂) from the six affected power plants and caps emissions of CO₂ from the facilities.” Ex. 1009, 1.

Mass-EPA notes that “[m]ass transfer refers to the ability of the sorbent particles to contact the Hg in the flue gas.” *Id.* at 21, n.25. Mass-EPA explains that “[m]ercury can be captured and removed from gas by injection of a sorbent into the exhaust system and subsequent collection of the particulates” thereby providing a “low-cost and efficient sorbents and effective particulate collection” methodology. *Id.* at 32. Activated carbon is used as a “sorbent for mercury adsorption.” *Id.* Mass-EPA states that “[r]esearch in understanding and improving mercury adsorption efficiency of activated carbons has been ongoing with the goal of improving carbon to mercury injection rates and reducing control costs.” *Id.* at 35.

2. Analysis

We focus our analysis on independent claim 1. Petitioner argues that (1) Vosteen589 discloses limitations 1(Pre) and 1(a); (2) Vosteen589 discloses or suggests 1(b); and (3) Vosteen589 in combination with Starns or Mass-EPA teaches 1(c), 1(d), 1(e), and 1(f). Pet. 30–42. Petitioner asserts that “[a] POSITA would have been motivated to combine Vosteen589 with Starns (Ground 1) and with Mass-EPA (Ground 2), with reasonable expectation of success.” Pet. 26.

Patent Owner disagrees. Prelim. Resp. 8–20. According to Patent Owner, Petitioner has not shown a motivation to combine the prior-art

teachings. *Id.* at 8–19. In addition, Patent Owner asserts that Petitioner fails to show that the proposed combinations would employ the claimed use of iodine. *Id.* at 19–20.

Based on the current record, we find Petitioner’s arguments more persuasive. We address the parties’ arguments below.

a. Reason to Combine

Petitioner argues that “Vosteen589 uses a dry-emission control system for the flue gas, which works based on the adsorption of ionic mercury compounds.” Pet. 26 (citing Ex. 1005 ¶¶ 7, 18, 19) (quotation marks omitted). Petitioner asserts that Vosteen589 discloses “finely pulverulent slaked lime/activated carbon” sorbent. *Id.* (citing Ex. 1005 ¶ 19). Petitioner acknowledges that “[t]hough Vosteen589 discloses activated-carbon sorbent and particulate-control devices (ESPs), Vosteen589 does not fully disclose certain implementational details, such as how sorbent is introduced.” *Id.* at 26–27. Petitioner, however, argues that “Starns and Mass-EPA supply these details, including hardware and control processes.” *Id.* at 27.

Petitioner contends that “activated-carbon injection was well-known.” *Id.* Petitioner asserts that each proposed combination represents “combining prior art elements (activated-carbon sorbent) according to known methods (injection into flue gas) to yield predictable results (mercury removal).” *Id.* (citing Ex. 1002 ¶ 283).

Patent Owner asserts that “Petitioners fail to provide evidence of a motivation to combine and instead just rely on the fact that various mercury control techniques were known in the art.” Prelim. Resp. 9. Patent Owner contends that “Petitioners offer no evidence to support their conclusion other than the fact that the references qualify as prior art.” *Id.* at 11. According to

Patent Owner, “Petitioners identify no problem to be solved in Vosteen or other reason as to why a POSITA would be motivated to modify Vosteen.” *Id.* at 12.

Patent Owner also argues that the testimony of Dr. Niksa, Petitioner’s declarant, “does not fill this gap.” *Id.* According to Patent Owner, Dr. Niksa’s testimony should be afforded little weight because it is inconsistent with his testimony in IPR2020-00834. *Id.* at 12–13. Lastly, Patent Owner asserts that during prosecution of a related patent, the examiner found that a POSITA would not have modified the prior art in the manner suggested by Petitioner. *Id.* at 13–14.

On this record, and for purposes of institution, we find Petitioner has sufficiently shown that a POSITA would have had a reason to modify the teachings of Vosteen589 with either of Starns or Mass-EPA.

With respect to the combination of Vosteen589 and Starns, Petitioner relies on Starns for teaching hardware and control processes for “injecting activated carbon ahead of particle control devices (PCD) to remove mercury.” Pet. 35 (citing Ex. 1008, 2). Specifically, Starns teaches “injection of sorbents such as powdered activated carbon (PAC) into the flue gas upstream of the particle control equipment.” *Id.* (citing Ex. 1008, 2; Ex. 1002 ¶ 313).

Petitioner asserts that activated-carbon injection was well-known in the art. *Id.* at 27 (citing Ex. 1001, 2:10–15, 30:36–40; Ex. 1095, 114:21–25; Ex. 1096, 41:5–9; Ex. 1097, 210:4–18). Petitioner points to Starns for stating that the “most mature, retrofit technology available today is the injection of sorbents such as powdered activated carbon (PAC) into the flue gas

upstream of the particle control equipment.” *Id.* at 28 (citing Ex. 1008, 2) (emphasis omitted).

According to Petitioner, a POSITA would have modified Vosteen589’s system to include Starns’s activated charcoal injection, because activated charcoal injection was “a ‘mature’ technology [and] the combination of Vosteen589 and Starns represents [nothing more than] combining prior art elements according to known methods to yield predictable results of removing mercury.” *Id.* at 29 (citing Ex. 1002 ¶¶ 285–288). Petitioner further explains that this combination results in “improved mercury removal (compared to activated carbon alone) with lowered sorbent costs.” *Id.* at 27–28 (citing Ex. 1002 ¶¶ 287).

Similarly, Petitioner asserts that “the combination of Vosteen589 and Mass-EPA represents [nothing more than] combining prior-art elements according to known methods to yield predictable results of removing mercury,” because activated carbon injection “was ready for commercialization by 2002, years before the ’218 Patent’s earliest possible priority date.” *Id.* at 30 (citing Ex. 1002 ¶¶ 289–293). As support, Petitioner points to Mass-EPA’s teaching that activated carbon, as “the most extensively studied sorbent for mercury adsorption,” was “the most likely candidate to reach commercialization for mercury removal in the near future.” *Id.* at 29 (citing Ex. 1009, 32); *see also* Ex. 1009, 32 (“Increased removal of mercury from gas has been demonstrated by co-injection of activated carbon and calcium-based sorbents in spray dryer adsorber systems in full-scale coal-fired power plants.”).

Petitioner also alleges that Mass-EPA provides an express motivation to combine the teachings of these references, that is, to “improv[e] mercury

adsorption efficiency of activated carbons . . . with the goal of improving carbon to mercury injection rates and reducing control costs.” Pet. 30 (citing Ex. 1009, 39); *see also id.* at 29 (“Availability of low-cost and efficient sorbents and effective particulate collection are key in implementation of this type of mercury control.”) (citing Ex. 1009, 32); *id.* at 29–30 (“[E]stimated costs for powdered activated carbon injection-based technology, which most likely will reach commercialization for mercury control before other technologies, is within the current control costs for NOx.”) (citing Ex. 1009, 58). Petitioner contends that using Mass-EPA’s activated carbon injection in Vosteen589’s method would result in “improved mercury-adsorption efficiency, achieving the Mass-EPA’s stated goal of ‘reducing control costs.’” *Id.* at 30 (citing Ex. 1002 ¶ 294).

The current record supports that Petitioner’s combination of Vosteen589 with Starns and with Mass-EPA would have been “the mere application of a known technique to a piece of prior art ready for the improvement.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 401 (2007). Indeed, “if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond that person’s skill.” *Id.* Patent Owner does not allege that the combination was beyond the skill level of a POSITA at the time of the alleged invention. *See generally* Prelim. Resp. Thus, for purposes of this Decision, Petitioner has provided sufficient reasoning with rational underpinnings to explain why a POSITA would have modified the teachings of the applied references, with a reasonable expectation of success. *See KSR*, 550 U.S. at 418.

We acknowledge Patent Owner’s arguments to the contrary, but are persuaded by Petitioner’s arguments on this record. The Supreme Court has explained that “the [obviousness] analysis need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ.” *Id.* at 418. And further, “[t]he combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results.” *Id.* at 416. “If a person of ordinary skill can implement a predictable variation, § 103 likely bars its patentability.” *Id.* at 417. Here, as detailed above, it appears that activated carbon injection was a known substitute that may be implemented as an alternative to activated carbon in a fixed form, *i.e.*, coated on a fabric filter.

To the extent that any portions of Dr. Niksa’s testimony may be contradictory, Patent Owner will have the opportunity to test the veracity of Dr. Niksa’s opinions over the course of trial. *Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579, 596 (1993) (“Vigorous cross-examination [and] presentation of contrary evidence . . . are the traditional and appropriate means of attacking shaky but admissible evidence.”).

We also find unpersuasive Patent Owner’s argument that the Examiner ultimately allowed the claims of a related patent after initially rejecting the claims on a similar basis. Prelim. Resp. 13–14. That issue is best raised and resolved through the process involving a bifurcated procedure for considering discretionary issues, such as 35 U.S.C. § 325. *See Bifurcating Memo.*

In sum, based on the current record and for purposes of institution, we find Petitioner has shown adequately a motivation to combine the teachings of Vosteen589 with those of Starns or Mass-EPA.

b. Adding Iodide Salt to Coal and/or Combustion Chamber

Limitation 1(b) recites

“the coal comprises added HI, an iodide salt, or a combination thereof, added to the coal before the coal enters the combustion chamber, or
the combustion chamber comprises added HI, an iodide salt, or a combination thereof, or
a combination thereof.”

Ex. 1001, 35:65–36:3.

Petitioner argues that “Vosteen589 mixes halide additives with coal in the combustion chamber and/or upstream of combustion chamber.” Pet. 31 (citing Ex. 1005 ¶¶ 6, 9, 13). According to Petitioner, Vosteen589 discloses three preferred bromide compounds: “aqueous hydrogen bromide (HBr, hydrobromic acid), solid sodium bromide (NaBr, salt), and aqueous sodium bromide (NaBr, salt water),” and “then teaches using iodide in a similar manner as the bromide compounds.” *Id.* at 32 (citing Ex. 1005 ¶ 16).

Petitioner further points out that Vosteen589 discloses the use of iodine-containing compounds in its claims. *Id.* (Ex. 1005, claims 1, 2, 6). Petitioner concludes that “Vosteen589 discloses, or at least renders obvious, applying iodide compounds in the same locations (i.e., to the coal or to the combustion chamber) as the bromide compounds, so the two can be mixed together.” *Id.* at 33 (citing Ex. 1002 ¶¶ 302–304).

Petitioner argues that, in Vosteen589, because iodide compounds are “a supplement to, or partial replacement of, the added bromine compound,”

they are in “a mixture” with the preferred bromide compounds (e.g., HBr and NaBr). *Id.* (citing Ex. 1005 ¶ 16). According to Petitioner,

a POSITA would have mixed like materials, such as using: aqueous hydroiodic acid (HI) to mix with aqueous hydrobromic acid (HBr); solid NaBr powder to mix with solid NaI powder; or aqueous iodide salt solutions (e.g., NaI) to mix with aqueous bromide salt solutions (e.g., NaBr or “alkali metal bromide”). A POSITA would have been further motivated to use an iodide salt and/or HI, because each are readily dissolvable in water, which facilitates their ability to be “sprayed” onto the coal or “into one of the combustion chambers.”

Id. at 33–34 (citing Ex. 1005 ¶ 13; Ex. 1002 ¶ 307) (footnote omitted).

As for the choice of which “iodine compound” to use, Petitioner continues, that simply would be a matter of routine experimentation. *Id.* at 34 (citing Ex. 1002 ¶ 308). Petitioner asserts that “[a] POSITA would have found it obvious that ‘iodine compound and/or a mixture of various iodine compounds’ would include hydrogen iodide (HI) and/or an iodine salt (each are examples of an iodine compound) in order to facilitate mixing with homologous bromide compounds.” *Id.* at 33 (citing Ex. 1002 ¶ 305).

Patent Owner contends that the description in Vosteen 589’s paragraph 16 “indicates that a POSITA should not employ iodine additives.” Prelim. Resp. 20 (emphasis removed). According to Patent Owner,

[a]t most, Vosteen teaches that a waste incinerator may be able to reduce the amount of bromine additive employed when combusting high iodine waste. But this is simply not a teaching that a POSITA should add high iodine waste to a coal combustion chamber. Indeed, such a result would likely cause a catastrophic failure as waste incinerators are not interchangeable with coal combustors.

Id.; see also Sur-reply 3 (arguing the same).

Patent Owner’s argument, however, is merely attorney argument without evidentiary support. *See Icon Health & Fitness, Inc. v. Strava, Inc.*, 849 F.3d 1034, 1043 (Fed. Cir. 2017) (“Attorney argument is not evidence.”). It does not, on this record and at this stage of the proceeding, undermine Petitioner’s position, which is supported by uncontested testimony of Dr. Niksa.

Moreover, Patent Owner’s reading of Vosteen589’s paragraph 16 appears too narrow. Vosteen589 states that “[i]odine compounds oxidize mercury more effectively compared with bromine compounds.” Ex. 1005 ¶ 16. It is “from economic aspects” that Vosteen589 prefers bromine compounds, because they are less expensive. *Id.* Vosteen589, however, discloses using iodine compounds “as a supplement to, or partial replacement of,” the bromine compounds. *Id.*

Vosteen589 states that the iodine compounds “can be fed” in the form of high-iodine wastes. *Id.* This disclosure, however, does not limit application of Vosteen589’s process to “waste incinerators,” as Patent Owner contends. *See* Prelim. Resp. 20. Indeed, Vosteen589 states that its process “is to find the broadest possible application,” including “in coal-fired power stations.” Ex. 1005 ¶ 5.

In sum, based on the current record and for purposes of institution, we find Petitioner has shown sufficiently that Vosteen589 teaches the use of iodine compounds, including HI and/or an iodine salt.

3. Summary

Based on the current record and for purposes of institution, we find Petitioner has shown sufficiently that (1) a POSITA would have had a motivation to combine the teachings of Vosteen589 with those of Starns or

Mass-EPA; and (2) each asserted combination teaches the limitations of claim 1. In other words, Petitioner has established a reasonable likelihood of prevailing on their assertion that the combination of Vosteen589 with either of Starns or Mass-EPA renders claim 1 obvious. We, thus, institute trial to review the challenged claims of the '218 patent.

Petitioner also asserts that the combination of Vosteen589 with either of Starns or Mass-EPA renders claims 2–4 and 6–26 obvious. Pet. 42–62. Patent Owner does not argue these claims separately. *See* Prelim. Resp. 8–20. In any event, we institute an *inter partes* review as to all challenges raised in the Petition. *See SAS Institute, Inc. v. Iancu*, 138 S. Ct. 1348, 1356 (2018); *see also* 37 C.F.R. § 42.108(a) (“When instituting *inter partes* review, the Board will authorize the review to proceed on all of the challenged claims and on all grounds of unpatentability asserted for each claim.”).

D. Alleged Obviousness over Lissianski and Starns or Mass-EPA

Petitioner asserts that claims 1, 3, 6–18, and 20–26 would have been obvious over Lissianski and Starns (Ground 3); and that claims 1, 3, and 6–26 would have been obvious over Lissianski and Mass EPA (Ground 4). Pet. 62–92. Based on this record, and for at least the following reasons, we determine Petitioner has established a reasonable likelihood that it would prevail in these assertions.

1. Lissianski

Lissianski relates to a method for removing mercury emissions from coal combustion flue gas by injecting NH_4Cl , NH_4Br , or NH_4I into the flue gas; oxidizing elemental mercury with a halogen (chlorine, bromine, or iodine) from the injected additive; absorbing the oxidized mercury with an

adsorbent in the flue gas; and collecting the adsorbent with the oxidized mercury in a combustion waste treatment system. Ex. 1014, 2:3–13.

Lissianski discloses that “[t]he hot flue gas causes the additive to thermally decompose to form HCl, HBr or HI which results in more significant mercury oxidation. The increase in mercury oxidation allows for improved efficiency of mercury removal by activated carbon (AC) injection.” *Id.* at 3:45–49. Lissianski discloses that “[t]he halogen additive can be co-injected with air, recycled flue gas, nitrogen or another carrier gas to increase the penetration of the additive aqueous solution across the flue gas path and to improve mixing of the additive aqueous solution and flue gas.” *Id.* at 4:20–23.

Lissianski illustrates the method for removing mercury emissions in a coal plant with a halogen-containing additive in Figure 1, reproduced below:

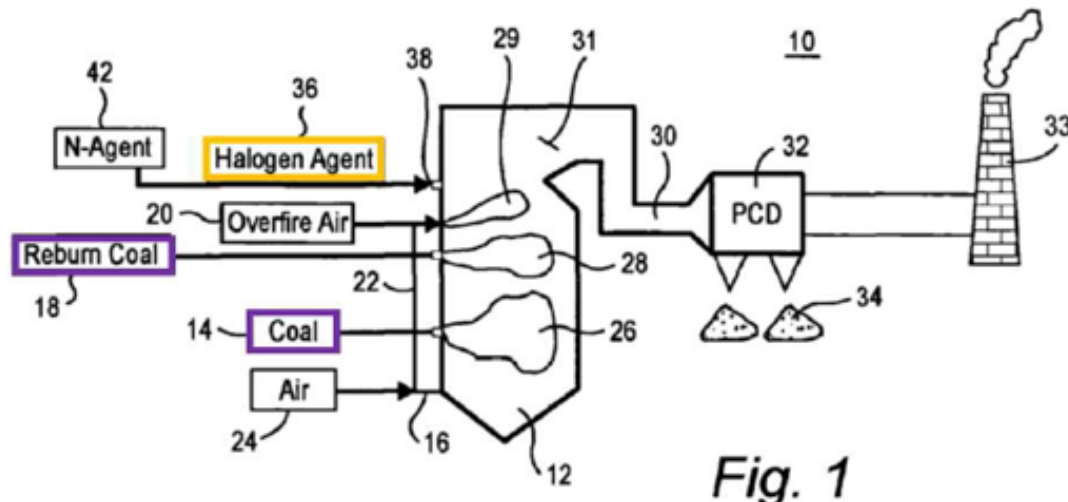
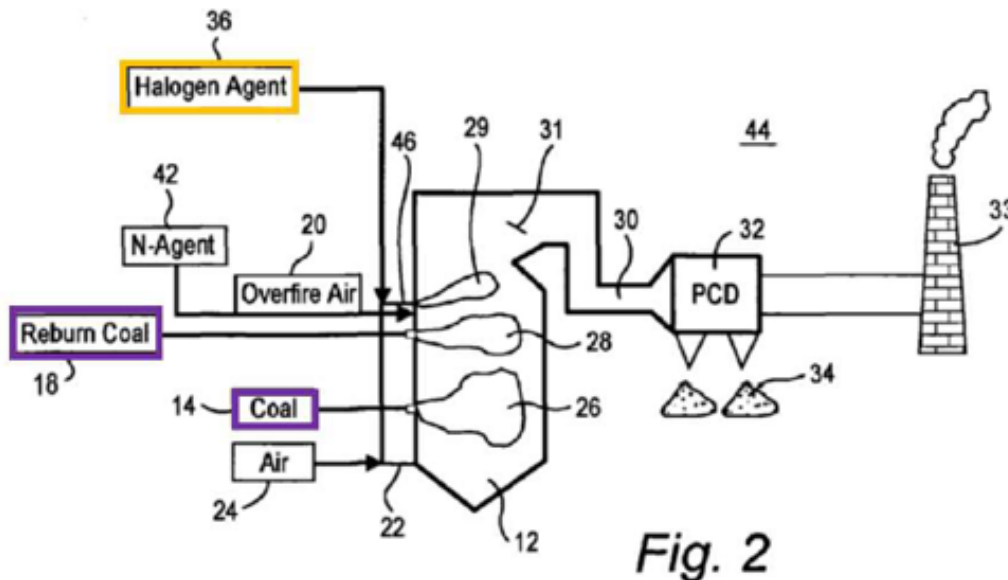


Figure 1 of Lissianski, as annotated by Petitioner, is “a schematic diagram of a coal fired power plant having a primary combustion zone with an additive injection system downstream of the primary combustion zone.” *Id.* at 2:53–56. It shows halogen-containing additive 36 (annotated in

yellow) injected via nozzles 38 into the flue gas and downstream of combustion zone 26. *Id.* at 4:14–19.

Figure 2 of Lissianski is reproduced below:



The schematic diagram of a coal fired power plant in Figure 2 is similar to that in Figure 1, except “the additive injection is performed in cooperation with an overfire air (OFA) system.” *Id.* at 2:57–60. Annotated Figure 2 shows halogen-containing additive 36 (annotated in yellow) injected through nozzles 46 into the boiler with overfire air and into the burnout zone 29. *Id.* at 4:30–36.

Lissianski discloses that “[m]odeling predicts that injection of chlorine or bromine in the amount of 3 ppm results in mercury oxidation at higher temperatures. Modeling also predicts that bromine is a more effective oxidizing agent than is chlorine.” *Id.* at 6:53–65, Fig. 9.

2. Analysis

We again focus our analysis on independent claim 1. Petitioner argues that (1) Lissianski discloses limitations 1(Pre), 1(a), 1(b), and 1(f);

and (2) Lissianski in combination with Starns or Mass-EPA teaches 1(c), 1(d), and 1(e). Pet. 65–74. Patent Owner asserts that Petitioner fails to show that the proposed combinations teach adding iodine additives to coal or to a combustion chamber. Prelim. Resp. 21–24.

Based on the current record, we find Petitioner’s arguments more persuasive. We address the parties’ arguments below.

a. NH₄I

Relying on Lissianski’s Figure 2, Petitioner contends that Lissianski describes injecting NH₄Cl, NH₄Br, or NH₄I, referred to as a “halogen agent” or a “halogen additive,” into a combustion chamber to help oxidize mercury. Pet. 66 (citing Ex. 1014, Abstract, 4:14–36, 42–47). Petitioner asserts, and Patent Owner does not dispute, that NH₄I is an iodide salt. *Id.* (citing Ex. 1002 ¶ 427).

Patent Owner counters that the description of Figure 2 “refers to NH₄Cl, which is neither HI nor an iodide salt.” Prelim. Resp. 22 (citing Ex. 1014, 4:30–42). Although Patent Owner is correct in this observation, Lissianski repeatedly employs the phrase “NH₄Cl, NH₄Br or NH₄I,” which describes NH₄I, side by side with NH₄Cl, as an exemplary halogen agent. *See, e.g.*, Ex. 1014, code (57), 2:8, 2:26–2:27, 2:44–2:45, 3:19–20, 3:42–43, 4:14–15; *see also id.*, claims 1, 25, 32 (reciting NH₄I as a halogen-containing additive”). Thus, we are not persuaded that the “halogen agent” in Figure 2 is limited to NH₄Cl.⁸

⁸ Lissianski describes Figure 2 as “a schematic diagram of [a] coal fired power plant similar to the plant shown in FIG. 1 wherein the additive injection is performed in cooperation with an overfire air (OFA) system.” Ex. 1014, 2:61–64. Lissianski does not specify the halogen additive in its description of Figure 2.

b. Adding Iodide Salt to Coal and/or Combustion Chamber

Petitioner argues that in Lissianski, NH_4I is injected into the combustion chamber because “the halogen agent is ‘injected . . . into the boiler along with the OFA 20 into the burnout zone 29,’ and the ‘[o]verfire air (OFA) is injected into the OFA burnout zone 29 **to complete combustion.**’” Pet. 67 (citing Ex. 1014, 4:9–10, 4:30–36; Ex. 1002 ¶ 428) (Petitioner’s emphasis).

Petitioner also asserts that “Lissianski illustrates that the halogen agent is mixed with coal upstream of the combustion chamber,” because “the arrow from [the] halogen agent in Figure 2 extends vertically to the bottom of the figure, indicating junctions between the halogen agent and overfire air 20, reburn coal 18, primary coal 14, and primary air 24.” *Id.* (citing Ex. 1002 ¶ 429).

Patent Owner contends that “Lissianski consistently touts the benefits of adding additives to flue gas, not the combustion chamber.” Prelim. Resp. 21. Patent Owner argues that Dr. Niksa testified that “the term ‘flue gas’ refers to gas that is outside the combustion chamber.” *Id.* at 21 n.17 (citing Ex. 1002 ¶ 74). According to Patent Owner, “Lissianski asserts that the only benefit of halogen additives is mercury oxidation, which cannot occur in the combustion chamber.” *Id.* at 21 (citing Ex. 1014, 6:57–59). Therefore, Patent Owner concludes that Petitioner has failed to show Lissianski teaches “add[ing] an iodine-based additive to coal or a combustion chamber as opposed to the flue.” *Id.* at 24.

On this record, we find Petitioner’s arguments more persuasive. Each of Lissianski’s Figures 1 and 2 shows “a coal combustion furnace 12, e.g., a boiler, having a coal fuel injection system 14, primary air injectors 16,

reburn coal injectors 18 and overfire air (OFA) injectors 20.” Ex. 1014, 3:59–62 (number bolding removed). In Lissianski, “[t]he hot gas path **through the furnace** 12 includes a primary combustion zone 26, a reburn zone 28, an overfire air zone 29, and a convective pass 30.” *Id.* at 4:1–3 (number bolding removed, emphasis added).

Lissianski states that

[m]ost of the coal is burned in a primary combustion zone 26 of the boiler 12. The remaining coal (or fuel) is injected downstream into the reburn zone 28 through the reburn injectors 18 to provide fuel-rich combustion in the reburn zone 28. Overfire air (OFA) is injected into the OFA burnout zone 29 to complete combustion.

Id. at 5:1–10 (number bolding removed). This disclosure supports Petitioner’s argument that “coal combustion occurs at each of these three zones within the combustion chamber.” Reply 7 (citing Ex. 1002 ¶¶ 427–429).

The disclosure of Lissianski also supports Petitioner’s argument that “[t]he ‘flue gas’ referenced in Lissianski is simply an area within the combustion chamber (item 12), but ‘downstream from the primary combustion zone 26’ (i.e., towards the upper elevations of the boiler, as shown in Fig. 2).” *Id.* (citing Ex. 1014, 4:17–20, number bolding removed). Indeed, Lissianski discloses that “[t]he hot flue gases flow through the post-combustion zone 31 **of the boiler** and to a convective pass 30.” *Id.* at 4:10–12 (number bolding removed, emphasis added).

Dr. Niksa’s testimony is not inconsistent with Lissianski’s disclosure. Dr. Niksa testified that

[i]t was known that the point **within the furnace** after the last bank of the superheater section, and before the entrance to the economizer, was commonly referred to as the “furnace exit”

and was understood as the transition point after which the combustion gases were referred to as flue gases from there forward.

Ex. 1002 ¶ 74 (emphasis added). In other words, the “flue gas” discussed in Dr. Niksa’s testimony starts in the combustion chamber. *See id.* ¶ 72 (combustion in “combustion chamber or furnace”).

Thus, the current record supports Petitioner’s conclusion that, in Lissianski’s Figure 2, “the halogen agent is injected into the combustion chamber, at a point in which combustion has not yet been completed.”⁹ *See* Reply 8.

3. Summary

Based on the current record and for purposes of institution, we find Petitioner has shown sufficiently that the combination of Lissianski with Starns or Mass-EPA teaches the limitations of claim 1.

Petitioner asserts that “[a] POSITA would have been motivated to combine Lissianski with Starns (Ground 3) and Lissianski with Mass-EPA (Ground 4), with reasonable expectation of success.” Pet. 63. Patent Owner argues that “[f]or the same reasons that Petitioners failed to support the proposed combinations with Vosteen, Petitioners fail to show that a POSITA would combine the secondary references with Lissianski.” Prelim. Resp. 21.

As explained above, on the current record and for purposes of institution, we determine Petitioner has shown sufficiently that a POSITA would have had a motivation to combine the teachings of Vosteen⁵⁸⁹ with

⁹ The parties also dispute what Lissianski’s Figure 9 shows. *See* Prelim. Resp. 23–24; Reply 8. At this stage of the proceeding, we do not resolve this issue because both parties present attorney arguments without sufficient evidentiary support.

those of Starns or Mass-EPA. *See supra* Section II.C.2.a. For the same reasons, we find Petitioner has shown sufficiently that a POSITA would have had a motivation to combine the teachings of Lissianski with those of Starns or Mass-EPA.

In other words, Petitioner has established a reasonable likelihood of prevailing on their assertion that the combination of Lissianski with either of Starns or Mass-EPA renders claim 1 obvious.

Petitioner also asserts that the combination of Lissianski with either of Starns or Mass-EPA renders obvious claims 3, 6–18, and 20–26. Pet. 74–92. Patent Owner does not argue these claims separately. *See* Prelim. Resp. 21–24. We institute trial as to all challenges raised in the Petition. *See SAS*, 138 S. Ct. at 1356.

*E. Alleged Obviousness over Lissianski, Vosteen589,
and Starns or Mass-EPA*

Petitioner asserts that claims 2, 4, 6, and 23–25 would have been obvious over Lissianski, Vosteen589, and Starns (Ground 5) or over Lissianski, Vosteen589, and Mass EPA (Ground 6). Pet. 92–97. Patent Owner argues that these challenges “rely in grounds 1–4 to support their challenges as to the independent claims, these grounds fail for the same reasons described above with respect to grounds 1–4.” Prelim. Resp. 24.

As explained above, on this record, we determine Petitioner has shown a reasonable likelihood to prevail in their challenges under Grounds 1–4. *See supra* Sections II.C., II.D. Thus, based on this record, we determine Petitioner has established a reasonable likelihood that it would prevail in showing obviousness of claims 2, 4, 6, and 23–25 over Lissianski, Vosteen589, and Starns or over Lissianski, Vosteen589, and Mass-EPA.

III. CONCLUSION

Based on the current record, and for the reasons explained above, we find Petitioner has demonstrated a reasonable likelihood that it would prevail with respect to at least one claim challenged in the Petition. We, therefore, institute an *inter partes* review of all challenged claims on all asserted grounds.

This Decision is not a final determination on the patentability of any challenged claim. Our view with regard to any conclusion reached in the foregoing could change upon further development of the record during trial. We remind the parties that any argument not raised in a Patent Owner Response to the Petition, or permitted in another manner during trial, shall be deemed forfeited and/or waived even if asserted in the Preliminary Response. *In re Google Tech. Holdings LLC*, 980 F.3d 858, 862–64 (Fed. Cir. 2020) (holding an argument forfeited when not timely raised before the Board); *In re NuVasive, Inc.*, 842 F.3d 1376, 1380–81 (Fed. Cir. 2016) (holding Patent Owner waived an argument addressed in the Preliminary Response by not raising the same argument in the Patent Owner Response).

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that, pursuant to 35 U.S.C. § 314(a), *inter partes* review is hereby instituted on all challenged claims of the '218 patent based on all the asserted grounds set forth in the Petition; and

FURTHER ORDERED, pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4(b), notice is hereby given of the institution of a trial commencing on the entry date of this decision.

FOR PETITIONER:

David Tobin
Brian Oaks
Syed Fareed
Christian Tatum
MCDERMOTT WILL & SCHULTE LLP
dtobin@mwe.com
boaks@mwe.com
sfareed@mwe.com
ctatum@mwe.com

R. Scott Johnson
Thomas Patton
FREDRIKSON & BYRON, P.A.
rsjohnson@fredlaw.com
tpatton@fredlaw.com

Michelle Kemp
PERKINS COIE LLP
kemp-ptab@perkinscoie.com

Michael Piery
Lauren Bolcar
QUARLES & BRADY LLP
michael.piery@quarles.com
lauren.bolcar@quarles.com

FOR PATENT OWNER:

Hamad Hamad
CALDWELL, CASSADY & CURRY P.C.
hhamad@caldwellcc.com