

UNITED STATES PATENT AND TRADEMARK OFFICE

PATENT TRIAL AND APPEAL BOARD

Berkshire Hathaway Energy Company, and
PacifiCorp

Petitioners

v.

Birchtech Corp.

Patent Owner

IPR2025-00280
Patent No. 10,596,517

PETITIONERS' REPLY TO PATENT OWNER'S RESPONSE

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UPDATED EXHIBIT LIST

(Adding Exhibits 1147-1160)

Exhibit	Description of Exhibits
1001	U.S. Patent No. 10,596,517 to Olson et al. (filed June 4, 2018) (“ 517 Patent ” or “ Challenged Patent ”)
1002	Declaration of Dr. Stephen Niksa in Support of Petition for <i>Inter Partes</i> Review of U.S. Patent No. 10,596,517 (“ 517 Niksa Decl. ”)
1003	Curriculum Vitae of Dr. Stephen Niksa
1004	Family Tree of ME2C Patents
1005	U.S. Patent Publication No. 2004/0013589 to Vosteen et al. (filed July 24, 2002) (“ Vosteen589 ”)
1006	U.S. Patent Pub. No. 2008/0107579 to Downs et al. (published May 8, 2008) (“ Downs-Boiler ”)
1007	U.S. Patent Prov. App. No. 60/555,353 (filed Mar. 22, 2004) (“ Downs-Boiler-Provisional ”)
1008	Travis Starns, “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 95 TH ANNUAL CONFERENCE (Baltimore, MD: June 23-27, 2002) (“ Starns ”)

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1009	Massachusetts Dep. 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) (“Mass-EPA”), 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-technological-economic-feasibility-of-controlling-eliminating-mercury-emissions/download
1010	Sharon Sjostrom, “Full Scale Evaluations of Mercury Control Technologies with PRB Coals,” Track A, Session A3 (Mercury – Control), Presentation A3b, EUEC: 8TH ELECTRIC UTILITIES ENVIRONMENTAL CONFERENCE (Tucson, Arizona: January 25, 2005) (“Sjostrom”)
1011	Craig Eckberg et al., “Mercury Control Evaluation of Halogen Injection into a Texas Lignite-Fired Boiler,” Track A, Session A3 (Mercury – Control), Presentation A3c, EUEC: 8TH ELECTRIC UTILITIES ENVIRONMENTAL CONFERENCE (Tucson, Arizona: January 25, 2005) (“Eckberg”)
1012	U.S. Patent Pub. No. 2006/0048646 to Olson et al. (published Mar. 9, 2006) (“Olson-646”)
1013	U.S. Patent No. 6,953,494 to Nelson (filed May 6, 2003) (“Nelson”)
1014	U.S. Patent No. 7,514,052 to Lissianski et al. (filed Apr. 7, 2009) (“Lissianski”)

Exhibit	Description of Exhibits
1015	RESERVED
1016	RESERVED
1017	RESERVED
1018	U.S. Patent No. 8,652,235 to Olson et al. (issued February 18, 2014) (“Olson-235”)
1019	RESERVED
1020	File History of U.S. Patent Prov. App. No. 60/605640 (“Provisional”)
1021	File History of U.S. Patent Application No. 11/209,163, which ultimately issued as U.S. Patent No. 7,435,286 (“163 Application File History”)
1022	File History of U.S. Patent Application No. 12/201,595, which ultimately published as 2009/0062119 and was abandoned (“595 Application File History”)
1023	Excerpts of File History of U.S. Patent Application No. 15/951,970, which ultimately issued as U.S. Patent No. 10,933,370 (“370 Patent File History”).
1024	File History of U.S. Patent Application No. 15/997,091, which ultimately issued as U.S. Patent No. 10,596,517 (“517 Patent File History”).

Exhibit	Description of Exhibits
1025	File History of U.S. Patent Application No. 12/419,219, which ultimately issued as U.S. Patent No. 8,168,147 (“ 147 Patent File History ”).
1026	File History of U.S. Patent Application No. 15/978,760 (issued as U.S. Patent No. 10,343,114) (“ 114 Patent File History ”)
1027	Babcock & Wilcox, STEAM: ITS GENERATION AND USE, 40th ed. (The Babcock & Wilcox Company: 1992) (“ B&W: Steam ”)
1028	J. Bustard, S. Sjostrom, et al., “Full Scale Evaluation of Sorbent Injection for Mercury Control on Coal-Fired Power Plants,” International Conference on Air Quality III, Paper No. A5-4 (Sept. 9-12, 2002: Arlington, VA) (“ Bustard ”)
1029	U.S. Patent No. 1,984,164 to Stock et al. (issued Dec. 11, 1934) (“ Stock ”)
1030	Electric Utilities Environment Conference 2005 Handout (“ EUEC Handout ”)
1031	Scan of jacket/cover of CD mailed to conference attendees from EUEC: 8th Electric Utilities Environmental Conference (Tucson, Arizona: January 23-26, 2005) (“ EUEC CD Scan ”)
1032	Redline comparison between U.S. Patent Pub. No. 2008/0107579 (Downs-Boiler, EX1006) and U.S. Patent Prov. Appl. No. 60/555,353 (Downs-Boiler-Provisional, EX1007), using Downs-Boiler-Provisional as the original version (“ Downs-Boiler-Redline ”)

Exhibit	Description of Exhibits
1033	U.S. Patent No. 8,512,655
1034	U.S. Patent No. 8,821,819
1035	U.S. Patent No. 9,757,689
1036	CRC Handbook of Chemistry and Physics, 86th Ed.; Lide, D.R., ed. (“CRC Press: March 2005”)
1037	Paul Chu, “Power Plant Evaluation of the Effect of SCR Technology on Mercury,” Paper No. 106, COMBINED POWER PLANT AIR POLLUTANT CONTROL MEGA SYMPOSIUM (MEGA) (Washington, DC: May 19-22, 2003) (“Power Plant Evaluation”)
1038	Evan J. Granite et al., “Sorbents for Mercury Removal from Flue Gas,” DOE/FETC/TR-98-01, U.S. Department of Energy (Jan. 1998) (“Granite”)
1039	Thomas J. Feeley, et al., “A Review of DOE/NETL’s Mercury Control Technology R&D Program for Coal-Fired Power Plants,” <i>DOE/NETL Hg R&D Program Review</i> (April 2003) (“Feeley”)
1040	Oxtoby et al., PRINCIPLES OF MODERN CHEMISTRY, 4 th ed (Saunders College Publishing: 1999) (“Oxtoby”)
1041	N.N. Greenwood and A. Earnshaw, CHEMISTRY OF THE ELEMENTS, 2nd ed. (Butterworth-Heinemann: 1997) (“Greenwood”)

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1042	B.R. Puri, <i>Surface Complexes on Carbons</i> , in CHEMISTRY AND PHYSICS OF CARBON 191 (Philip L. Walker, ed.) (Marcel Dekker: 1970) (“Puri”)
1043	Frank E. Huggins et al., “XAFS Examination of Mercury Sorption on Three Activated Carbons,” <i>Energy & Fuels</i> 1999(13), p. 114-121 (1999) (“XAFS”)
1044	S. Niksa et al., <i>Predicting Complete Hg Speciation Along Coal-Fired Utility Exhaust Systems</i> , MEGA SYMPOSIUM, Paper # 45 (Washington, DC: Aug. 2004) (“Hg Speciation”)
1045	D.L. Laudal et al., <i>Evaluation of Mercury Speciation at Power Plants Using SCR and SNCR NOx Control Technologies</i> , Paper No. A5-01, INT’L CONF. ON AIR QUALITY III (Arlington, VA: Sept. 9-12, 2002) (“Laudal”)
1046	U.S. Patent No. 4,196,173 to DeJong (“DeJong”)
1047	U.S. Patent No. 5,695,726 to Lerner (“Lerner”)
1048	Carey, T. R., Jr., O. W. H., Richardson, C. F., Chang, R., & Meserole, F. B. (1998). Factors Affecting Mercury Control in Utility Flue Gas Using Activated Carbon. <i>Journal of the Air & Waste Management Association</i> , 48(12), 1166–1174. https://doi.org/10.1080/10473289.1998.10463753 (“Carey”)
1049	NETL - Mercury Emissions Control , February, 2003, available at: https://web.archive.org/web/20030315093905fw_/http://www.netl.do

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	e.gov/coalpower/environment/mercury/control-tech/inactive.html (“U.S. DOE, Completed Mercury Projects, February, 2003”)
1050	Proposed National Emission Standards for Hazardous Air Pollutants; and, in the Alternative, Proposed Standards of Performance for New and Existing Stationary Sources: Electric Utility Steam Generating Units, 69 Fed. Reg. 4652-4752 [Volume 69, No. 20] (Jan. 30, 2004) (“EPA-Proposal”)
1051	U.S. EPA, “Study of Hazardous Air Pollutant Emissions from Electric Utility Steam Generation Units -- Final Report to Congress,” (Vol. 1 1998), available at https://www3.epa.gov/ttn/utox/eurtc1.pdf (“U.S. EPA – Vol. 1 1998”)
1052	U.S. EPA, “Mercury Study Report to Congress Volume 1: Executive Summary,” EPA-452/R-97-003 (Dec. 1997), available at https://www.epa.gov/sites/production/files/2015-09/documents/volume1.pdf (“U.S. EPA – Exec. Summary Vol. 1 Dec. 1997”)
1053	U.S. EPA, AP-42: External Combustion Sources, Chapter 1: Fifth Edition, Volume I (Sep. 1998), available at https://www3.epa.gov/ttn/chief/ap42/ch01/index.html (last visited Nov. 20, 2024) (“Chapter 1 of AP-42”)
1054	U.S. DOE, Mercury Emissions Control - Regulatory Drivers (Jan. 24, 2003), available at https://web.archive.org/web/20030416142937/http://www.netl.doe.gov/coalpower/environment/mercury/regs.html (“Mercury Emissions Control”)

Exhibit	Description of Exhibits
1055	Clean Air Mercury Rule: Basic Information, available at https://web.archive.org/web/20050920005951/http://www.epa.gov/mercuryrule/basic.htm (“Clean Air Mercury Rule”)
1056	EPA Newsroom, “EPA Announces First-Ever Rule to Reduce Mercury Emissions from Power Plants” (Mar. 15, 2005), available at: https://archive.epa.gov/epapages/newsroom_archive/newsreleases/91ab7266e65751b985256fc50067d9b0.html (“3/15/2005 EPA Press Release”)
1057	EPA Newsroom, “Public Comment Period Begins for Proposed Power Plant Regulations” (Jan. 29, 2004), available at: https://archive.epa.gov/epapages/newsroom_archive/newsreleases/4daf1d46e8dd755c85257036005511f9.html (“1/29/2004 EPA Press Release”)
1058	EPA Newsroom, “EPA Supplements Proposal to Reduce Power Plant Mercury Emissions,” (Feb. 24, 2004), available at: https://archive.epa.gov/epapages/newsroom_archive/newsreleases/5810096dabfc9eba85256e440078905f.html (“2/24/2004 EPA Press Release”)
1059	Sharon Sjostrom et al., “Field Studies of Mercury Control Using Injected Sorbents,” AWMA ANNUAL MEETING, Session Ae-1b (2002) (“Field Studies of Mercury Control”)
1060	EPA, “Mercury Study Report to Congress Volume VIII: An Evaluation of Mercury Control Technologies and Costs,” EPA Report No. EPA-452/R-97-010 (Dec. 1997), available at https://www3.epa.gov/airtoxics/112nmerc/volume8.pdf (“EPA 1997 Mercury Study Report Vol. VIII”)

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1061	EUEC 2005 home page, available at: https://web.archive.org/web/20050303090129/http://www.euec.com/
1062	Charlene R. Crocker et al., “Mercury Control with the Advanced Hybrid Particulate Collector Technical Progress Report,” U.S. DOE-NETL (Nov. 2003) (“ Crocker ”)
1063	Redline Comparison, showing changes from ’163 Application (as published at 2006/0048646) to ’970 Application (as published at 2018/0229182)
1064	Redline Comparison, showing changes from ’558 Application (as published at 2015/0246315) to ’970 Application (as published at 2018/0229182)
1065	U.S. Patent No. 8,168,147
1066	U.S. Patent No. 10,933,370
1067	U.S. Patent No. 10,589,225
1068	File History of U.S. Patent Application No. 14/712,558, which ultimately issued as U.S. Patent No. 10,589,225 (“ ’225 Patent File History ”)
1069	RESERVED
1070	Roop Chand Bansal, et al., ACTIVE CARBON (Marcel Dekker:1988). (“ Bansal ”)

Exhibit	Description of Exhibits
1071	<i>Midwest Energy Emissions Corp., et al. v. Arthur J. Gallagher & Co., et al.</i> , No. 1:19-cv-01334-CJB, Dkt. No. 440 (D. Del. June 24, 2022). (“ Dkt No. 440 ”)
1072	<i>Midwest Energy Emissions Corp., et al. v. Arthur J. Gallagher & Co., et al.</i> , No. 1:19-cv-01334-CJB, Dkt. No. 447 (D. Del. July 12, 2022). (“ Dkt No. 447 ”)
1073	Welcome Page of CD mailed to conference attendees of the 2002 Air & Waste Management’s Association’s 95 th Annual Conference & Exhibition (Baltimore, Maryland: June 23-27, 2002) (“ AWMA CD Scan ”)
1074	Main Menu of CD mailed to conference attendees of the 2002 Air & Waste Management’s Association’s 95 th Annual Conference & Exhibition (Baltimore, Maryland: June 23-27, 2002) (“ AWMA CD Scan, Main Menu ”)
1075	Author Index of CD mailed to conference attendees of the 2002 Air & Waste Management’s Association’s 95 th Annual Conference & Exhibition (Baltimore, Maryland: June 23-27, 2002) (“ AWMA CD Scan, Author Index ”)
1076	Papers by Session of CD mailed to conference attendees of the 2002 Air & Waste Management’s Association’s 95 th Annual Conference & Exhibition (Baltimore, Maryland: June 23-27, 2002) (“ AWMA CD Scan, Papers by Session ”)
1077	Scan of jacket/cover of CD mailed to conference attendees of the 2002 Air & Waste Management’s Association’s 95 th Annual

Exhibit	Description of Exhibits
	Conference & Exhibition (Baltimore, Maryland: June 23-27, 2002) (“AWMA CD Photo”)
1078	AWMA Website (Internet Archive), available at https://web.archive.org/web/20020613041559/http://www.awma.org/about/overview.htm (AWMA Overview)
1079	AWMA Website (Internet Archive), available at https://web.archive.org/web/20020527005933/http://www.awma.org/ (AWMA Homepage, advertising AWMA 2002 Conference)
1080	AWMA Website (Internet Archive), available at https://web.archive.org/web/20020604012426/http://www.awma.org:80/about/ (AWMA About Page)
1081	AWMA Website (Internet Archive), available at https://web.archive.org/web/20020601173851/http://www.awma.org/ACE2002/tech-program/MondayPM.asp#AE-1c (AWMA Technical Program Schedule for Monday 24, 2002 for Session AE-1C)
1082	AWMA Website (Internet Archive), available at https://web.archive.org/web/20020616091740/http://www.awma.org/ACE2002/exhibition/list.asp (AWMA 2002 Conference list of exhibitors)
1083	AWMA Website (Internet Archive), available at https://web.archive.org/web/20020601121532/http://www.awma.org/ACE2002/top10list.asp (AWMA 2002 Conference Top Ten Reasons)
1084	AWMA Website (Internet Archive), available at https://web.archive.org/web/20020610093515/http://www.awma.org/

Exhibit	Description of Exhibits
	ACE2002/welcome.asp (AWMA 95th Annual Conference and Exhibition Welcome Page)
1085	AWMA Website (Internet Archive), available at https://web.archive.org/web/20020806044928/http://www.awma.org:80/pubs/bookstore/ItemInfo.asp?OrderCode_s=VIP-110-CD (AWMA Bookstore Page, Order form for 2002 AWMA Conference CD)
1086	AWMA Website (Internet Archive), available at https://web.archive.org/web/20020806041256/http://www.awma.org:80/pubs/bookstore/ (AWMA Bookstore Homepage)
1087	State of Massachusetts Mass-EPA (Internet Archive) (dated Jan. 6, 2003), available at https://web.archive.org/web/20030106044457/http://www.state.ma.us/dep/bwp/about.htm (describing mission of Mass Department of Environmental Protection, Bureau of Waste Prevention)
1088	State of Massachusetts Mass-EPA (Internet Archive) (dated Dec. 21, 2002), available at https://web.archive.org/web/20021221040816/http://www.state.ma.us/dep/bwp/bwpprogs.htm (describing the divisions and programs of the Mass Bureau of Waste Prevention)
1089	State of Massachusetts Mass-EPA (Internet Archive) (dated Jan. 6, 2003), available at https://web.archive.org/web/20030106024342/http://www.state.ma.us/dep/bwp/bwppubs.htm (describing the publications by program of the Mass Bureau of Waste Prevention)
1090	State of Massachusetts Mass-EPA (Internet Archive) (dated Dec. 20, 2002), available at

Exhibit	Description of Exhibits
	https://web.archive.org/web/20021220143210/http://www.state.ma.us/dep/bwp/daqc/daqcpubs.htm#ecp (describing the Air Program Planning Unit Publications of the Mass Bureau of Waste Prevention)
1091	Internet Archive Standard Affidavit, explaining how to interpret hyperlinks, available at: https://archive.org/legal/affidavit.php
1092	Expert Report of Philip J. O’Keefe, PE Regarding Infringement (Oct. 25, 2022) (excerpted), submitted by Patent Owner in <i>Midwest Energy Emissions Corp., et al. v. Arthur J. Gallagher & Co., et al.</i> , No. 1:19-cv-01334-CJB
1093	Deposition Transcript of Phillip O’Keefe Vol. 1 (Mar. 2, 2023), taken in <i>Midwest Energy Emissions Corp., et al. v. Arthur J. Gallagher & Co., et al.</i> , No. 1:19-cv-01334-CJB.
1094	Deposition Transcript of Phillip O’Keefe Vol. 2 (Mar. 3, 2023), taken in <i>Midwest Energy Emissions Corp., et al. v. Arthur J. Gallagher & Co., et al.</i> , No. 1:19-cv-01334-CJB.
1095	Deposition Transcript of Edwin Olson (Aug. 26, 2022) (excerpted), taken in <i>Midwest Energy Emissions Corp., et al. v. Arthur J. Gallagher & Co., et al.</i> , No. 1:19-cv-01334-CJB.
1096	Deposition Transcript of Michael Holmes (Aug. 24, 2022) (excerpted), taken in <i>Midwest Energy Emissions Corp., et al. v. Arthur J. Gallagher & Co., et al.</i> , No. 1:19-cv-01334-CJB.

Exhibit	Description of Exhibits
1097	Deposition Transcript of John Pavlish (Aug. 25, 2022) (excerpted), taken in <i>Midwest Energy Emissions Corp., et al. v. Arthur J. Gallagher & Co., et al.</i> , No. 1:19-cv-01334-CJB.
1098	Affidavit of Tanya Zeif, Custodian of Records for Internet Archive (1/10/2025), sponsoring Exhibits 1078-1086
1099	Affidavit of Tanya Zeif, Custodian of Records for Internet Archive (1/13/2025), sponsoring Exhibits 1009, 1061, 1087-1090
1100	RESERVED
1101	RESERVED
1102	RESERVED
1103	RESERVED
1104	RESERVED
1105	RESERVED
1106	RESERVED
1107	RESERVED
1108	RESERVED

Exhibit	Description of Exhibits
1109	RESERVED
1110	Petitioner PacifiCorp’s Stipulation Regarding District Court Proceedings
1111	Petitioner MEC’s Stipulation Regarding District Court Proceedings
1112	Petitioners WPL and IPL’s Stipulation Regarding District Court Proceedings
1113	Puget Sound Energy, <i>Colstrip Facts</i> , available at: https://www.colstripfacts.com/faqs#:~:text=Talen%20Energy%20owns%2030%25%20interest,operator%20of%20all%20four%20plants.&text=PacifiCorp%20owns%20a%2010%25%20interest%20in%20units%203%20%26%204
1114	Plaintiff’s Initial Infringement Contentions (March 18, 2025) served in <i>In re: Midwest Energy Emissions Corp. Patent Litig.</i> , No. 4:24-md-03132-SHL-WPK (S.D. Iowa) and filed publicly at ECF 106-3
1115	Exhibit A to Plaintiff’s Initial Infringement Contentions (March 18, 2025) served in <i>In re: Midwest Energy Emissions Corp. Patent Litig.</i> , No. 4:24-md-03132-SHL-WPK (S.D. Iowa) and filed publicly at ECF 106-3
1116	<i>Coal Explained: Use of Coal</i> , U.S. Energy Information Administration (last updated Sept. 14, 2023), available at: https://www.eia.gov/energyexplained/coal/use-of-coal.php#:~:text=In%202022%2C%20coal%20accounted%20for,19.5%25%20of%20U.S

Exhibit	Description of Exhibits
1117	<i>What EPA is Doing to Reduce Mercury Pollution, and Exposures to Mercury</i> , U.S. Env’t Protection Agency (last updated July 11, 2024), available at https://www.epa.gov/mercury/what-epa-doing-reduce-mercurypollution-and-exposures-mercury
1118	Birchtech, <i>Technology Overview</i> , available at https://www.birchtech.com/tech-overview
1119	Exec. Order No. 14261, 90 Fed. Reg. 15517 (April 8, 2025)
1120	Patent Owner’s Response to Petitioners’ Motion to Stay Pending <i>Inter Partes</i> Review <i>In re: Midwest Energy Emissions Corp. Patent Litig.</i> , No. 4:24-md-03132-SHL-WPK, ECF 128 (S.D. Iowa)
1121	Docket Navigator, <i>Time to Trial in the Southern District of Iowa</i> , https://search.docketnavigator.com/patent/binder/0/0 (last accessed June 2, 2025)
1122	<i>Deere & Co. et. al v. Kinze Mfg., Inc. et. al</i> , 4:20-CV-00389 (S.D. Iowa) (Docket Sheet)
1123	<i>Piatz v. State Farm Mut. Auto. Ins. Co.</i> , 3:21-CV-00007 (S.D. Iowa) (Judge Locher) (Docket Sheet and ECF 8)
1124	<i>Probasco et al v. MFA Inc.</i> , 4:22-CV-00117 (S.D. Iowa) (Judge Locher) (Docket Sheet and ECF 7, 9)
1125	<i>Shin v. Winnebago Indus., Inc. et. al</i> , 3:23-CV-00077 (S.D. Iowa) (Judge Locher) (Docket Sheet)

Exhibit	Description of Exhibits
1126	<i>Nuhn Industries Ltd v. Bazooka Farmstar LLC</i> , 3:22-cv-00015 (S.D. Iowa) (Docket Sheet and ECF 286)
1127	<i>G.W. Lisk Company, Inc. v. Gits Manufacturing Company</i> , 4:17-cv-00273 (S.D. Iowa) (Docket Sheet)
1128	<i>In re: Midwest Energy Emissions Corp. Patent Litig.</i> , No. 4:24-md-03132-SHL-WPK, ECF 131 (S.D. Iowa May 22, 2025) (Order Denying Without Prejudice Pre-Institution Stay)
1129	<i>In re: Midwest Energy Emissions Corp. Patent Litig.</i> , No. 4:24-md-03132-SHL-WPK, ECF 111 (S.D. Iowa Apr. 18, 2025) (Order re: Petitioners' Deadline to File Surreply)
1130	<i>In re: Midwest Energy Emissions Corp. Patent Litig.</i> , No. 4:24-md-03132-SHL-WPK, ECF 19 (S.D. Iowa Jan 10, 2025) (Order on Motions to Dismiss and Motion to Sever)
1131	<i>In re: Midwest Energy Emissions Corp. Patent Litig.</i> , No. 4:24-md-03132-SHL-WPK, ECF 1 (S.D. Iowa December 17, 2024) (MDL Transfer Order)
1132	<i>In re: Midwest Energy Emissions Corp. Patent Litig.</i> , No. 4:24-md-03132-SHL-WPK, ECF 129 (S.D. Iowa May 21, 2025) (Petitioners' Reply Brief In Support of Motion to Stay Pending <i>Inter Partes</i> Review)
1133	Email from Justin Nemunaitis to Joe Jacobi (Jan. 16, 2024, 11:01 AM)

Exhibit	Description of Exhibits
1134	<i>In re Midwest Energy Emissions Corp. Patent Litig.</i> , MDL No. 3132 ECF 35 (J.P.M.L. Nov. 14, 2024) (Patent Owner’s Reply Brief in Support of Consolidation)
1135	<i>Midwest Energy Emissions Corp. v. Arthur J. Gallagher & Co.</i> , No. 19-1334-RGACJB ECF 1 (D. Del. July 17, 2019) (Complaint for Patent Infringement)
1136	<i>Midwest Energy Emissions Corp. v. Arthur J. Gallagher & Co.</i> , No. 19-1334-RGACJB ECF 130 (D. Del. July 15, 2020) (First Amended Complaint for Patent Infringement)
1137	Exhibit 1137- Confidential Business Information
1138	Exhibit 1138- Confidential Business Information
1139	Exhibit 1139- Confidential Business Information
1140	RESERVED
1141	<i>In re: Midwest Energy Emissions Corp. Patent Litig.</i> , No. 4:24-MD-03132-SHL-WPK, (S.D. Iowa Oct. 3, 2025) (Joint Motion to Stay Proceedings Pending Director Review of Inter Partes Review)
1142	<i>In re: Midwest Energy Emissions Corp. Patent Litig.</i> , No. 4:24-MD-03132-SHL-WPK, (S.D. Iowa Oct. 13, 2025) (Order Granting Motions to Stay and Denying Without Prejudice or as Moot All Other Pending Motions)

Exhibit	Description of Exhibits
1143	Exhibit 1143 - Confidential Business Information
1144	Declaration of Jennifer A. McIvor
1145	Declaration of Brad Richards
1146	Puget Sound Energy, Colstrip Facts
1147	Redacted Deposition Transcript of Edwin Olson (including pg. 100) [corresponding to previously filed EX1095]
1148	U.S. Patent Publication 2009/0062119A1 to Olson et al.
1149	Comparison of Figures from 60/605,640 and 2009/0062119
1150	Deposition Transcript of John Pavlish (Feb. 26, 2026)
1151	Deposition Transcript of Jim Trettel (Mar. 6, 2026)
1152	Deposition Transcript of J. Edward Cichanowicz, Ph.D. (Mar. 5, 2026)
1153	PacifiCorp Letter to ME2C re ME2C Complaint, Sept. 30, 2024
1154	ME2C Letter to PacifiCorp, Oct. 14, 2024

Exhibit	Description of Exhibits
1155	2025-04-02 email between counsel for ME2C and counsel for MidAmerican
1156	<i>In re: Midwest Energy Emissions Corp. Patent Litig.</i> , No. 4:24-MD-03132-SHL-WPK, ECF 190 (S.D. Iowa Sept. 10, 2025) (SEALED PacifiCorp Motion for Judgment on the Pleadings)
1157	<i>In re: Midwest Energy Emissions Corp. Patent Litig.</i> , No. 4:24-MD-03132-SHL-WPK, ECF 84 (S.D. Iowa Mar. 21, 2025) (SEALED MidAmerican Energy Company Amended Answer) [corresponding to previously filed EX2009]
1158	<i>In re: Midwest Energy Emissions Corp. Patent Litig.</i> , No. 4:24-MD-03132-SHL-WPK, ECF 85 (S.D. Iowa Mar. 21, 2025) (SEALED Wisconsin Power and Light Company Amended Answer) [corresponding to previously filed EX2010]
1159	<i>In re: Midwest Energy Emissions Corp. Patent Litig.</i> , No. 4:24-MD-03132-SHL-WPK, ECF 195 (S.D. Iowa Sept. 11, 2025) (SEALED MidAmerican Motion for Partial Judgment on the Pleadings)
1160	Declaration of Dr. Stephen Niksa (Mar. 13, 2026)

I. INTRODUCTION

In its Patent Owner Response (“POR,” Paper 58), PO does not dispute that Vosteen589 combined with Starns (Ground 1) and Mass-EPA (Ground 2) discloses every challenged claim, and PO only addresses motivation to combine. PO does not dispute that Grounds 3-5 disclose or render obvious every challenged claim and pre-dates PO’s patent filings, so PO argues that for earlier reduction to practice. Last, PO argues the petition was time-barred.

The POR rehashes arguments the Board rejected in its institution decision, and should do so again.

II. GROUNDS 1-2: OBVIOUSNESS OVER VOSTEEN589/ STARNs/MASS-EPA

PO cannot overcome the strong motivations to combine Vosteen589 with Starns and Mass-EPA.

A. PO Ignores Motivations for “Injecting” Activated Carbon

Vosteen589 discloses the claimed two-part process. Vosteen589 applies aqueous solutions of NaBr and HBr (and other bromides), directly to coal upstream of the combustion chamber to remove mercury. Pet at 43, 51; EX1005 ¶¶[0006], [0009], [0013]-[0014], cls. 1-2; EX1002 ¶¶229-230, EX1160 ¶17. Downstream, Vosteen589 uses a “dry emission control system” with activated carbon that works “based on the adsorption” of mercury. EX1005 ¶¶[0018]-[0019]; *see* ¶[0007]; EX1002 ¶¶298-300; EX1160 ¶¶19-23.

Starns and Mass-EPA describe how to implement a dry-emission control system in Vosteen589. Starns and Mass-EPA describe hardware and control processes for activated carbon injection (ACI) ahead of particle control devices, such as electrostatic precipitators (ESPs) common to all three references. Pet. at 50-55.

Grounds 1-2 represent combining prior-art elements (activated-carbon sorbent) according to known methods (injection into flue gas) to yield predictable results (mercury removal). EX1002 ¶300. “There is a motivation to combine when a known technique ‘has been used to improve one device, and a [POSITA] would recognize that it would improve similar devices in the same way,’ using the ‘prior art elements according to their established functions.’” *Intel Corp. v. PACT XPP Schweiz AG*, 61 F.4th 1373, 1380-81 (Fed. Cir. 2023).

Starns discloses that by 2002, years before PO’s earliest asserted priority/invention date, 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.” EX1008, 2; EX1002 ¶¶301-303. Likewise, Mass-EPA characterizes ACI as the “most extensively studied sorbent” and “most likely will reach commercialization for mercury control.” EX1009, 32, 58. Adding the ACI of Starns and Mass-EPA to Vosteen589 represents the “mere application of a known technique to a piece of prior art ready for the improvement.”

See KSR Int’l Co. v. Teleflex Inc., 550 U.S. 398 (2007); EX1002 ¶¶289-292.¹

As further support, Pavlish informed the DOE in 2004 that ACI was the “most mature technology available for Hg control.” EX2012 at 9. Pavlish and Cichanowicz knew of ACI since 1997. EX1150, 159:15-160:11, 178:10-179:15; EX1152, 93:21-94:20, 97:20-99:6 (ACI was “conventional” and “routine” by 2003).

Against this straightforward combination, PO asserts non-obviousness based on: (a) ignoring Vosteen589’s disclosure of applying Br-containing chemicals to coal and downstream activated carbon impingement; (b) citing Br-based corrosion problems that did not exist in 2004; (c) citing scrubber concerns that did not exist; and (d) presenting unsupported “teaching away” arguments.

B. PO Ignores the Disclosure of Vosteen589

PO argues Petitioners “failed to show that a POSITA would be motivated to combine pre-combustion bromine additives with activated carbon injection as

¹ Dr. Niksa provides a detailed technical understanding of ACI and the interoperability of Starns/Mass-EPA with Vosteen589. EX1002 ¶¶97-115, 129-151. This contrasts with *Virtek*, where the expert “stated eleven times that he did not provide any reason to combine the references in his expert declaration.” *Virtek Vision Int’l ULC v. Assembly Guidance Sys., Inc.*, 97 F. 4th 882, 887 (Fed. Cir. 2024).

opposed to injecting pre-brominated carbon.” POR at 10.

First, Vosteen589 expressly discloses applying NaBr(aq) and other bromine-containing chemicals to coal. EX1005 ¶¶[0009], [0013]; EX1160 ¶17.

Second, though Vosteen589 does not use the word “injection,” Vosteen589 discloses a “dry emission control system,” also referred to as “dry cleanup,” that is “downstream of the combustion” and has a “mercury sorption stage” that removes “metallic mercury” and “ionic mercury.” EX1005 ¶¶[0007], [0017]-[0019], [0022]; EX1160 ¶¶18-23.

Vosteen589 refers to binding mercury to “adsorbents” or “sorbents,” and provides as an exemplary sorbent “finely pulverulent slaked lime/activated carbon.” EX1005 ¶¶[0003], [0007], [0019].² An ESP then removes the mercury-sorbent composition. EX1005 ¶[0034]. Thus, Vosteen589 already discloses “activated carbon,” and Starns/Mass-EPA provide the hardware and control mechanisms for how to add that activated carbon to the system of Vosteen589.

² PO asserts without support that Vosteen589 is “pre-coating fabric filters ... to protect the fabric filters.” POR at 9. As Dr. Niksa explains, fabric filters and ESPs are alternative options in Vosteen589. At least for the ESP (also present in Starns and Mass-EPA), the activated carbon is continuously injected. EX1160 ¶¶41-46.

C. PO's Corrosion Argument Does Not Apply

PO argues that “Petitioners fail to address the risk of corrosion that can occur when power plants add bromine additives to coal.” POR at 1. PO suggests a POSITA would instead use pre-brominated activated carbon (“B-PAC”) downstream of the combustion chamber. POR at 1, 18-19. This argument is irrelevant, because as described above, Vosteen589 itself says to apply bromine additives to coal.

PO's argument is also technically wrong and rife with its own hindsight. Relying on Vosteen589's disclosed Br concentrations in the flue gas (43 and 75 mg/M³ S.T.P. d.b.), Dr. Niksa calculated the amount of Br added to the coal to achieve these flue-gas concentrations. The Br concentration in coal (265~450 ppm) was not excessive, compared to native (and well-studied) chlorine levels in coal, and would have not presented corrosion concerns. EX1002 ¶¶376-387; EX1160 ¶¶25-28.

As both experts agree, POSITAs were not studying Br-based corrosion until years after 2004. EX1160 ¶¶28-31; EX1052 at 108:8-109:3. Pavlish testified that “the concern with bromine [about corrosion] was quite diminished,” because they were using much less bromine than chlorine. EX2004 at 253:11-15. So too with the disclosed concentrations in Vosteen589. Notably, the Challenged Claims recite adding halogens to coal, and Cichanowicz agreed “that either corrosion caused by

Br would not have been a significant concern or it was a significant concern and the '114 Patent tells us nothing about how to fix that.” EX1052 at 114:18-116:7, 118:24-119:14.

In any event, concerns (if any) with corrosion would have been weighed against other cost savings, ease of implementation, and mercury-removal effectiveness for the combination of Vosteen589 with Starns and Mass-EPA. EX1160 ¶¶32-33; EX1150, 197:20-198:11 (comparing the cost to “spend hundreds of millions of dollars” in new equipment “against using a two-part process” that may cause some corrosion).

D. Scrubber Did Not Teach Against ACI

PO argues that because certain embodiments in Vosteen589 had a scrubber, a POSITA would not be “motivated to employ activated carbon injection as well.” POR at 1.

As Dr. Niksa explains, most power plants in 2004 did not have scrubbers, because operators did not need them to meet SOx regulations. EX1160 ¶¶33-37. Vosteen589 teaches using conventional particle collection devices—e.g., electrostatic precipitators (ESPs) and fabric filters (FFs)—to remove mercury-sorbent compositions. EX1005 ¶¶[0019], [0033], [0037], [0042], [0047]-[0049], claim 8. Likewise, Starns and Mass-EPA use ESPs. EX1002 ¶302-306; EX1160 ¶46. Vosteen589 recognizes that some plants already had scrubbers, but they too

could benefit from activated-carbon sorbent. *See* EX1005 cl. 1 (using “wet scrubber and/or a dry cleanup”).

Figure 2 in the Provisional employs ACI and a scrubber. EX1020. Even Claim 25 of the ’517 Patent contemplates using activated-carbon injection together with a scrubber. Cichanowicz could not explain the inconsistency in PO’s position. EX1152, 120:23-121:22.

E. The Prior Art Does Not “Teach Away” from the Claims

PO asserts the prior art “taught away” from the two-part process, purportedly in favor of B-PAC. POR at 1, 9. But PO does not cite to any actual “teaching away” in Vosteen589, Starns, Mass-EPA, or any other prior art. Prior art “does not teach away, however, if it merely expresses a general preference for an alternative invention but does not criticize, discredit, or otherwise discourage investigation into the invention claimed.” *DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 567 F.3d 1314, 1327 (Fed. Cir. 2009).

PO provides an unsupported and legally insufficient assertion that “that the required reaction between bromine and carbon that can improve mercury capture requires several minutes of residence time in a controlled environment,” which B-PAC purportedly provides. POR at 1. However, B-PAC was a commercial product and a POSITA would not know, or even care, how it was manufactured. EX1160 ¶49. Also, B-PAC was more expensive than the regular activated carbon of

Vosteen589, Starns, and Mass-EPA, so a POSITA would have selected regular ACI for applications that did not require the enhanced removal properties of B-PAC. EX1002 ¶¶396-401; EX1160 ¶51; EX1150, 186:22-188:15; EX1152, 110:8-18.

F. Secondary Considerations

PO cites self-serving prosecution declarations from Pavlish, but does not present actual evidence of secondary considerations. POR at 25.³ “[W]eak secondary considerations generally do not overcome a strong prima facie case of obviousness.” *Ohio Willow Wood Co. v. Alps S., LLC*, 735 F.3d 1333, 1344 (Fed. Cir. 2013). Indeed, the considerations identified by PO “equally apply to the prior art,” Downs-Boiler and Vosteen589, and PO “has not shown the requisite nexus between the secondary indicia and the patented inventions.” *See id.*

III. GROUNDS 3-5: DOWNS-BOILER

Because PO does not dispute that Downs-Boiler (EX1006) has a prior-art date of March 22, 2004, which precedes the filing dates of the ’517 Patent (6/4/2018) and ’640 Provisional (8/30/2004), PO’s only argument against Grounds 3-5 is that it does not qualify as prior art because actual reduction to practice (RTP) occurred “[d]uring

³ PO mischaracterizes Dr. Niksa’s transcript. POR at 24. He testified he could not recall the *first* time he saw data from the two-part process, but did recall the Sjostrom report in 2005. EX2049 at 94:4-96:4.

tests conducted in September 2003, December 2003, and February 2004.” POR at 35.

First, the '517 Patent is a post-AIA patent, because PO it is entitled to the benefit of an earlier priority date.⁴ It is “no longer possible to antedate or ‘swear behind’” prior art. M.P.E.P §2152.01. The “swear behind” inquiry should end here.

Second, to swear behind, PO must establish either “(1) a conception and reduction to practice before the filing date of the [reference] or (2) a conception before the filing date of the [reference] combined with diligence and reduction to practice after that date.” *Taurus IP, LLC v. DaimlerChrysler Corp.*, 726 F.3d 1306, 1323 (Fed. Cir. 2013).

PO suggests conception by August 2002, but its only support is uncorroborated declarations from its CTO, John Pavlish (EX2018, EX2046), discussing a hodgepodge of “research ideas” (EX2015) from others that he “maintained.” POR at 34. As he admits, EX2015 fails to disclose adding Br or any halogens to coal. EX1150, 147:7-24. EX2015 does not describe the “specific, settled idea, [the] particular solution to the problem at hand” required for conception, and is “just a general goal or research plan he hopes to pursue.” *Burroughs Wellcome Co. v. Barr Labs., Inc.*, 40 F.3d 1223, 1228 (Fed. Cir. 1994). PO does not

⁴ Petitioner addresses PO’s priority date arguments at the end of this brief.

address *conception* of “every feature of [the] claimed invention.” *See id.*

PO also does not address diligence until RTP, and the logbooks have numerous gaps: 8/15/2002-9/29/2002; 3/21/2003-7/28/2003; 7/31/2003-9/8/2003; 9/19/2003-12/8/2003; 12/11/2003-2/1/2004; 2/5/2024-2/17/2024; and 3/12/2024-3/28/2024. *See* EX2017 at 126-127, 137-139, 204-207, 223-226, 319-320, 335-336, 349-350, 262-263. Absent diligence, PO tries to show actual RTP before Downs-Boiler, but it cannot

“To demonstrate an actual reduction to practice, the [patentee] must have: (1) constructed an embodiment or performed a process that met all the limitations of the claim and (2) determined that the invention would work for its intended purpose.” *In re Steed*, 802 F.3d 1311, 1318 (Fed. Cir. 2015). Both elements require independent corroboration. *E.I. DuPont De Nemours & Co. v. Unifrax I LLC*, 921 F.3d 1060, 1075 (Fed. Cir. 2019).

A. No Evidence PO Appreciated the Invention Would Work for Its Intended Purpose

The intended purpose of the '517 Patent was effective removal of mercury. The preamble of *every* independent claim of the '517 Patent recites, “a method of [reducing or separating] mercury in a mercury-containing gas.” “[T]he '517 technology was developed by the inventors as part of a research project into mercury capture.” POR at 32; *see* EX1152, 88:21-87:7.

The inventors did not always appreciate that the two-part process—NaBr on

coal and ACI downstream—would successfully remove mercury. Such processes were among the “speculative approaches.” EX1045, 252:12-25.

It was not until *after* the March 2004 date of Downs-Boiler that the inventors appreciated the two-part process was effective to control mercury. As discussed below, the first documented mercury measurement with the two-part process was in February 2005. EX2013. “When testing is needed to establish that an invention worked for its intended purpose, the inventor must have recognized that the tests were successful.” *Streck, Inc. v. Research & Diagnostic Sys., Inc.*, 659 F.3d 1186, 1193-1195 (Fed. Cir. 2011). “[R]eduction to practice does not occur until an inventor, or perhaps his agent, knows that the invention will work for its intended purpose. [RTP] cannot be established nunc pro tunc. There must be contemporaneous recognition and appreciation of the invention represented by the counts.” *Estee Lauder Inc. v. L’Oreal, S.A.*, 129 F.3d 588, 593-594 (Fed. Cir. 1997).

1. October 2003 Report (EX2032)

Pavlish provided a October 2003 report to DOE that summarizes test results through 3/31/2003. EX2032; EX1150, 192:17-193:5. The tests used NaCl on coal or HCl in flue gas. The report lacks any bromine-containing ingredients or SEA2. EX1150, 193:6-195:23.

2. February 2004 Report (EX2012)

The February 2004 DOE report summarizes test results from 10/1/2003-

12/31/2003. EX2012; EX1150, 214:13-215:17, 226:10-20. PO contends “SEA2” in this report is another name for NaBr. Yet, it does not mention “bromine” or “Br” in any form—or state what is in SEA2—nor do the logbooks refer to “SEA 2.” EX1150, 232:24-235:20. The only tether between “SEA 2” (DOE reports) and “NaBr” (logbooks) is Pavlish’s uncorroborated testimony. EX1150, 235:3-20; *see Apator Miitors APS v. Kamstrup A/S*, 887 F.3d 1293, 1296 (Fed. Cir. 2018) (evidence “is stuck in a catch-22 of corroboration”).

Even ignoring lack of corroboration, the February 2004 report does not demonstrate inventor appreciation that adding NaBr to coal and downstream ACI would work for its intended purposes. They conducted 14 tests (labeled T1-1 through T1-14), including the following additives: None, NaCl, SEA2, Zn, Zn and NaCl, and CaCl₂. Some tests had sorbent and some did not. EX2012 at 17; EX1150, 228:7-10, 238:4-239:10. The inventors were still “trying to ... narrow the list down to what would be more practical.” EX1150, 227:13-229:22. Only baseline mercury measurements of raw coal were made (i.e., no additive and no ACI), but “mercury measurements for [the] two-part process are not provided in Exhibit 2012.” EX1150, 240:19-242:20.

PO has also not identified any mercury measurements in the logbooks (EX2017), and Pavlish “would not expect any mercury measurements to be found” there. EX1150, 243:23-244:6. When technicians performed mercury

measurements, they output them to data files, and Pavlish is not sure he “ever got them.” The technicians transferred data files to researchers, who summarized the data to give Pavlish “a bigger view of it.” EX1150 at 82:13-83:2, 99:15-101:16, 105:18-25. The span of this process “could take anywhere from a few weeks to a few months” before Pavlish would see the summaries. EX1150 at 106:18-107:16.

Thus, by the February 2004 report (one month before Downs-Boiler’s date), PO has not demonstrated the inventors were aware of the two-part process succeeding in mercury removal.

3. August 2004 Provisional (EX1020) and Later

PO filed the Provisional in August 2004, *after* Downs-Boiler. EX1020. The Provisional has no “specific numbers” for mercury removal using the two-part process. EX1150, 244:16-245:24. Thus, in all documents before Downs-Boiler, and for months afterward, there are no mercury measurements for testing Br on coal.

The *only* documents cited by PO providing specific mercury-removal percentages from SEA2 on coal are from February 2005 and October 2005, both long after Downs-Boiler. *See, e.g.*, POR at 47-54 (citing EX2013-EX2014). There was no contemporaneous recognition of success.

B. No Actual RTP of All Independent Claims

Setting aside the inadmissibility of the supporting materials, discussed below, and assuming *arguendo* that “SEA 2” in the DOE reports contains NaBr, PO still

cannot corroborate RTP of “all the limitations of the claim.” *Steed*, 802 F.3d at 1318.

These limitations include:

- “the coal comprising an additive comprising Br₂, HBr, a bromide compound, or a combination thereof” (claim 1);
- “the coal comprises added Br₂, HBr, bromide compound, or a combination thereof, added to the coal before the coal enters the combustion chamber, or the combustion chamber comprises added Br₂, HBr, bromide compound, or a combination thereof, or a combination thereof” (claims 29 and 30).
- “mercury-containing gas comprises a halogen or halide promoter comprising HBr, Br⁻, or a combination thereof” (Claim 30)

PO’s evidence, at best, discloses adding only one species in one phase (solid NaBr) to coal.

1. No RTP of adding HBr or Br₂ to coal or combustion chamber

Pavlish testified the inventors never tested adding hydrogen bromide (HBr) or molecular bromine (Br₂) to coal or combustion chamber. EX1150, 61:20-21, 64:10-66:9, 136:5-140:5, 201:18-202:21, 254:9-12. PO’s expert also has not seen such evidence. EX1152, 73:11-22. Lead inventor Dr. Olson testified it would be “absolutely stupid” to add “Br₂ in the combustion chamber or upstream of the combustion chamber.” EX1147 at 100:4-25. Several reasons explain Dr. Olson’s testimony. At room temperature, Br₂ is a fuming liquid, and HBr is a gas. EX1152, 34:6-19, 37:23-39:5. Br₂ and gaseous HBr are incredibly toxic and difficult to handle. EX1150, 61:2-18, 140:6-13, 231:7-232:23, 249:18-250:23. The test setup

was designed to accommodate only solid materials and was open to the environment.

EX1150, 222:16-224:5.

Where there is not “a physical embodiment which includes all limitations of the claim,” there “cannot be a reduction to practice of the invention.” *UMC Elecs. Co. v. U.S.*, 816 F.2d 647, 652 (Fed. Cir. 1987); *see Tronzo v. Biomet, Inc.*, 156 F.3d 1154, 1158-60 (Fed. Cir. 1998) (denying priority where earlier application did not provide written-description support for the full scope of claimed alternatives).

2. No RTP of HBr, Br₂ or Br- added in the “combustion chamber” or HBr, Br- in “mercury-containing gas”

PO focuses its brief on what was added to coal, but neglects components in the combustion chamber and mercury-containing gas. There is no evidence that PO added Br₂, HBr or bromide ions (Br-) to the combustion chamber. That defeats RTP. Even if PO argues incorrectly those are “added” to the chamber by combusting bromine on the coal, Pavlish is unaware of any technique that could measure the presence of Br₂ in the “combustion chamber,” and the inventors also did not test for the presence of Br₂ or Br- in the “mercury-containing gas.” EX1150, 51:25-52:2, 255:16-256:11, 257:21-261:12; *see* EX1152, 157:20-159:9. Pavlish is unaware of any technique that could differentiate between HBr, Br₂, and other bromine-containing species in the gas-phase, and he did not even try to measure such species in the gas phase (regardless of form) until 2007. EX1050 at 47:1-5, 49:14-51:17, 255:16-256:11; *see* EX1152, 159:18-160:19.

Pavlish submitted a declaration during prosecution of the '517 Patent, asserting that Br⁻ and Br₂ would *not* form in the combustion chamber or mercury-containing gas. He simulated what happens when NaBr(s) is heated to combustion temperatures and beyond.

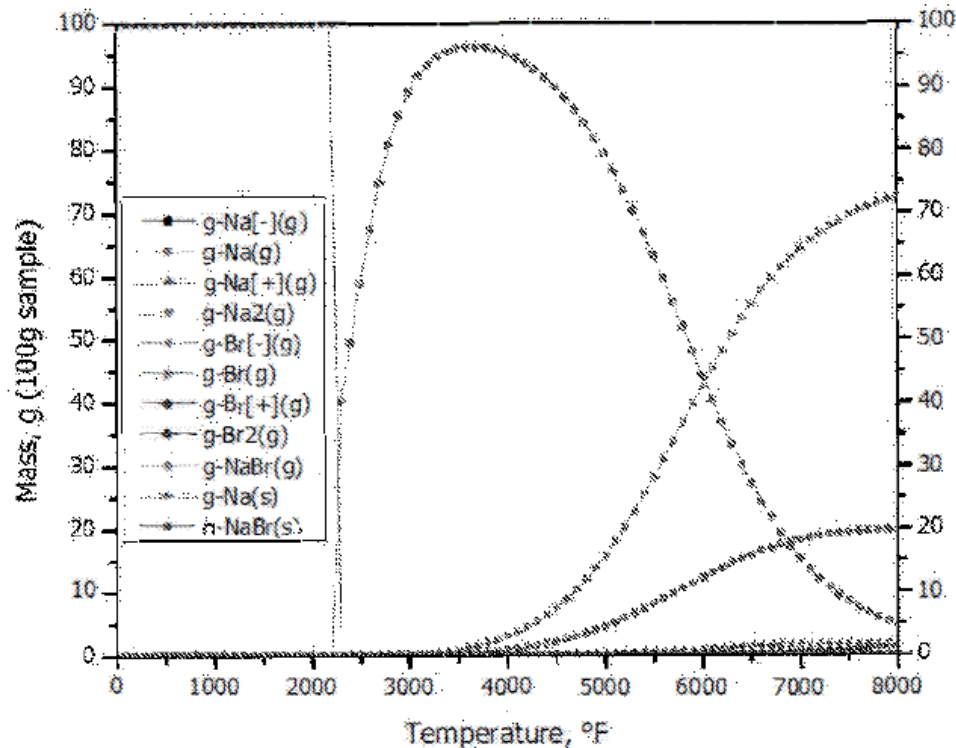


Figure 1. NaBr FactSage equilibrium calculation.

EX1024 at 329. Around 2000°F, NaBr(s) evaporated to form NaBr(g). Around 3,500°F, NaBr(g) dissociated to form Na(g) and Br(g) atoms (not ions). The combustion chamber operated by Pavlish during testing was at 3,000-4,000°F. EX1150, 200:5-19, 256:17-257:2.

compounds, elemental forms of chemical elements, and the like. FactSage was used to calculate equilibrium concentrations of materials present for a 100 g solid NaBr sample in a coal-combustion furnace as a function of temperature, shown in Figure 1. Figure 1 clearly shows the rapid emergence of gaseous NaBr molecules once the NaBr boiling point of 2,530 °F is reached. At temperatures of around 3,000 °F, nearly all the solid NaBr has been converted to gas phase NaBr molecules. As the gas phase NaBr molecules are brought to temperatures beyond 3,000 °F, dissociation into gaseous sodium atoms and bromine atoms occurs.

EX1026 at 325 ¶23. As shown in the figure, gas-phase concentrations of ions (Na⁺, Br⁻) and molecular bromine (Br₂) remained at 0. Mr. Pavlish explained that when tests were conducted by others of this process, “Br₂ was not detected.” EX1026 at 323 ¶19. Thus, even in 2019, the inventors did not believe that all claim limitations, such as Br₂ or Br⁻ in the “combustion chamber” or “mercury-containing gas,” would be met. *See* EX1150, 34:18-35:3.

It is insufficient to establish “prior to the reference date, a part, some parts, or even a combination of parts” of the claim, but instead must establish “possession of either the whole invention claimed, or something falling within the claim, in the sense that the claim as a whole reads on it.” *In re Tanczyn*, 347 F.2d 830, 833 (C.C.P.A. 1965). “Nothing in *In re Clarke* discharges Patent Owner’s burden of showing prior possession of ‘something falling within the claim,’ or indicates the sufficiency of showing merely a possession of ‘some parts’ of the invention ...” *Nespresso USA, Inc. v. K-Fee System GmbH*, IPR2023-00502, Paper 26 at 22 (P.T.A.B. Sept. 10, 2024).

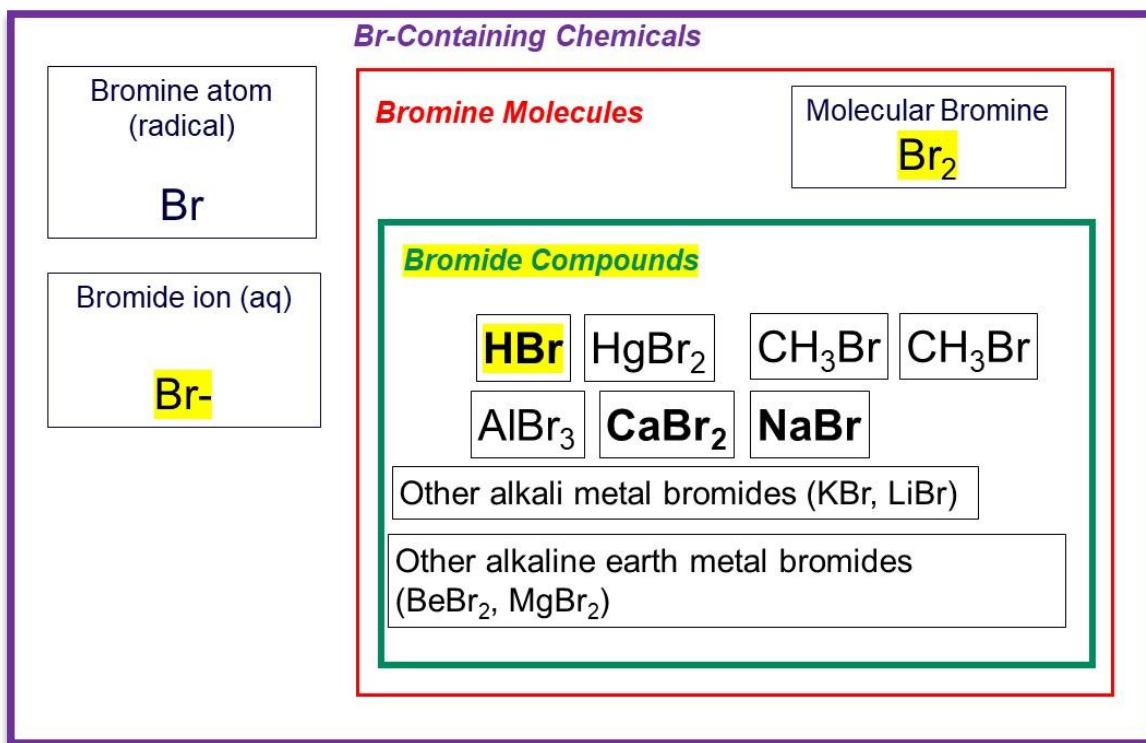
3. No RTP of Untested Elements

As described above, the inventors at most tested adding solid NaBr to coal (though did not appreciate if the testing was successful until after Downs-Boiler). PO contends that it does not need to demonstrate possession: of other Br-containing ingredients added to coal (e.g., HBr, Br₂), Br₂ in combustion chamber, (or Br₂ or Br- in mercury-containing gas), suggesting these would be an obvious variant. POR at 27 (citing *Application of Clarke*, 356 F.2d 987, 991 (C.C.P.A. 1966)). According to PO, “regardless of the form of bromine added to coal or a combustion chamber, the high heat of the chamber breaks those bonds and forms bromine atoms.” POR at 29.

a. PO Misreads the CCPA Cases

Clarke held that “antedating affidavits must contain facts showing a completion of ‘the invention’ commensurate with the extent the invention is shown in the reference.” *Clarke*, 356 F.2d at 992. Further, “how much the reference shows of the claimed invention ... is crucial to the requirement of what the [swear behind] affidavit must show.” *Clarke*, 356 F.2d at 991 (explaining that “a single species can rarely, if ever, afford sufficient support for a generic claim”).

The disclosure of Downs-Boiler is more extensive than the inventors’ testing. To help explain this, Dr. Niksa prepared the figure below:



EX1160 ¶12. Downs-Boiler discloses “bromine-containing reagents” added to coal and combustion chamber, which include: alkali-metal bromides, alkaline-earth metal bromides (particularly CaBr_2), HBr , and Br_2 . EX1006 ¶¶[0015], [0018]-[0019], [0021]. Unlike PO’s solid NaBr , the bromine-containing reagent in Downs-Boiler “may be fed to the boiler combustion zone 14 in gaseous, liquid, or solid form.” EX1006 ¶[0022].

PO provided no support for possession of Br_2 , $\text{HBr}(\text{aq})$, or $\text{CaBr}_2(\text{aq})$, any genus (“alkali metal” or “alkaline metal” bromides), or other phases (aqueous, liquid, or gas) disclosed by Downs-Boiler. The inventors tried just one species, $\text{NaBr}(\text{s})$, and thought it would be “absolutely stupid” to add HBr and Br_2 to the coal or combustion chamber, especially since the hardware at EERC was designed to

accommodate only solid materials. EX1147 at 100:4-25.

Ignoring the inventor testimony, PO asserts the testing has general applicability, but “[that is] backwards: To antedate a reference, the patentee needs to show that the inventors possessed knowledge of the species contained in both the reference and the patent, not to show that the invention is broader than the reference. *Pernix Ireland Pain DAC v. Alvogen Malta Operations Ltd.*, No. 16-139-WCB, 2018 WL 2225113, at *16 (D. Del. May 15, 2018) (summarizing *Clarke*, 356 F.2d at 991); *see In re Mantell*, 454 F.2d 1398, 1401 (CCPA 1972) (insufficient when “affidavit evidence shows reduction to practice of much less than the reference shows”).

More recent cases discuss swearing behind when claims have multiple alternatives. *See Fidelity Information Servs., LLC v. Groove Digital, Inc.*, IPR2019-00193, Paper 58 at 6 (P.T.A.B. Apr. 30, 2020). The claim recited an applet to deploy “at least one of independent or in conjunction with an internet browser window.” The prior art taught “both alternatives covered by this claim element,” but the swear-behind disclosed only the “independent of” alternative. *Id.* at 32. This was insufficient, because the patentee could not show “prior to the date of the reference or activity, all of the species shown in the reference.” *Id.* Here, the claims recite several alternatives—e.g., HBr or Br₂ added to coal or the combustion chamber, and Br₂ in mercury-containing gas—that are disclosed by Downs-Boiler, but not the RTP documents.

b. PO Applies Hindsight

PO argues that the other bromine-containing materials recited in the claims are obvious variations, because they dissociate in the combustion chamber to form Br atoms, which further react to form HBr, and the HBr then reacts to capture mercury. PO provided no evidence that this was known *to the inventors before March 2004*, “prior to the effective date of the reference(s) or the activity.” MPEP 715.03 (perspective is “at the time” of the inventors’ testing). PO’s expert confirms that this process may also not have been known in 2004. EX1152, 130:20-131:13; *see* EX1152, 129:22-131:3, 136:10-14, 155:1-12. In such cases where the mechanism is unknown or predictability is in question, showing prior completion of one species within the disclosed genus is generally not sufficient to overcome the reference or activity. MPEP 715.03 (citing *In re Shokal*, 242 F.2d 771 (CCPA 1957)).

PO cites Fig. 2 of the ’517 Patent to show that the inventors appreciated the combustion chemistry. POR at 29. The patent figures were not filed until August 2004—after Downs-Boiler—so they are irrelevant. Moreover, as described below, after August 2004, the inventors substantively modified the figure.

C. No Actual RTP of Other Claims

Claims 4, 7-10, 13-30: The only discussion in the POR is effectively a see-above cite. POR at 60 (citing EX2046). This is an improper bulk citation, and

EX2046 should be disregarded. 37 C.F.R. §42.6(a)(3). And even within EX2046, much of the analysis simply cites back to various elements of the '114 or '225 Patents, without applying to the '517 (or even introducing the '225 Patent claim chart into evidence). *See, e.g.*, EX2046 at 105-108.

Claims that cite documents after Downs-Boiler: The only corroborating documents cited for Claims 2-3, 5-6, and 11 are all February 2005 or later.

D. PO's Cited Documents Should Not Be Given Weight

The Board should give little to no weight to PO's cited documents.

1. Logbooks (EX2017)

The logbooks raise evidentiary concerns.

a. Logbooks are unwitnessed

Each page has a place labeled "Witnessed & Understood by me," which is blank.

554	zeroed and spanned Panel analyzers	R
556	purged water from Sample Conditioner	R
100	blew out FURNACE AND STATIL #2 LINES	J.H.
To Page No. _____		
Witnessed & Understood by me, _____		Date _____
Date 9/10/03		Invented by _____
Page 134 of 347		Date IPR2020-00834
Recorded by _____		Ex. 2016 Part 2 of 2
RESTRICTED-ATTORNEYS' EYES ONLY		
ME2C-RC-00053295 PTX-069.0282		
Exhibit 2017 Page 282		

See, e.g., EX2017 at 282; EX1150, 218:4-14. “[U]nwitnessed laboratory notebooks [are] insufficient on [their] own to support a claim of reduction to practice.” *Medichem, S.A. v. Rolabo, S.L.*, 437 F.3d 1157, 1169 (Fed. Cir. 2006).

b. Pavlish’s testimony is needed to correlate logbooks with the inventors’ activities

The only evidence connecting the logbook entries to the activities of the inventors is Pavlish’s own testimony, and this is insufficient. *See Apator*, 887 F.3d at 1296 (“Apator attempts to corroborate [inventor’s] testimony with the emails and the drawings, but the emails and drawings can only provide that corroboration with help from [inventor’s] testimony.”). The logbook entries were created by technicians, who were directed by a cost center manager, who was directed by Pavlish and other research groups—multiple layers of management. EX1150, 72:16-76:20. The logbook data was entered serially and, as a result, can contain the work of researchers who are not the inventors. EX1150, 86:23-90:6. Pavlish did not himself “enter any data into the PTC logbooks” and did not know whether any of the other inventors did either; it “would have been the technicians or operators who were the people that entered data into the PTC logbooks.” EX1150, 90:23-92:1. The only tether between specific logbook entries and the RTP activities is Pavlish’s testimony.

Pavlish also did not typically review the logbook entries. Technicians would create and initial the logbook entries, mid-level (unnamed) researchers would

summarize the data, and Pavlish would eventually review the summaries. EX1150, 86:23-92:1, 94:6-95:7, 216:9-217:17. With one exception, Pavlish was unable to recall the names of the technicians and unable to recognize the initials in the logbooks. EX1150, 78:22-79:5, 217:11-222:9. He cannot speak to the maintenance or collection of the logbooks, as he was not involved. EX1150, 285:23-286:2.

2. Conclusory expert testimony

The Panel should give no weight to the Cichanowicz declaration on conception/RTP issues. The totality of his report on these issues is two pages. EX2047 ¶¶57-62. He bulk-cites numerous exhibits (including Pavlish's declaration, EX2046), with no pin cites. The superficiality of his report is unsurprising, as he was first retained on December 5-6, 2025 and signed his declaration on December 14. EX1152, 6:14-17, 14:17-23, 18:3-5.

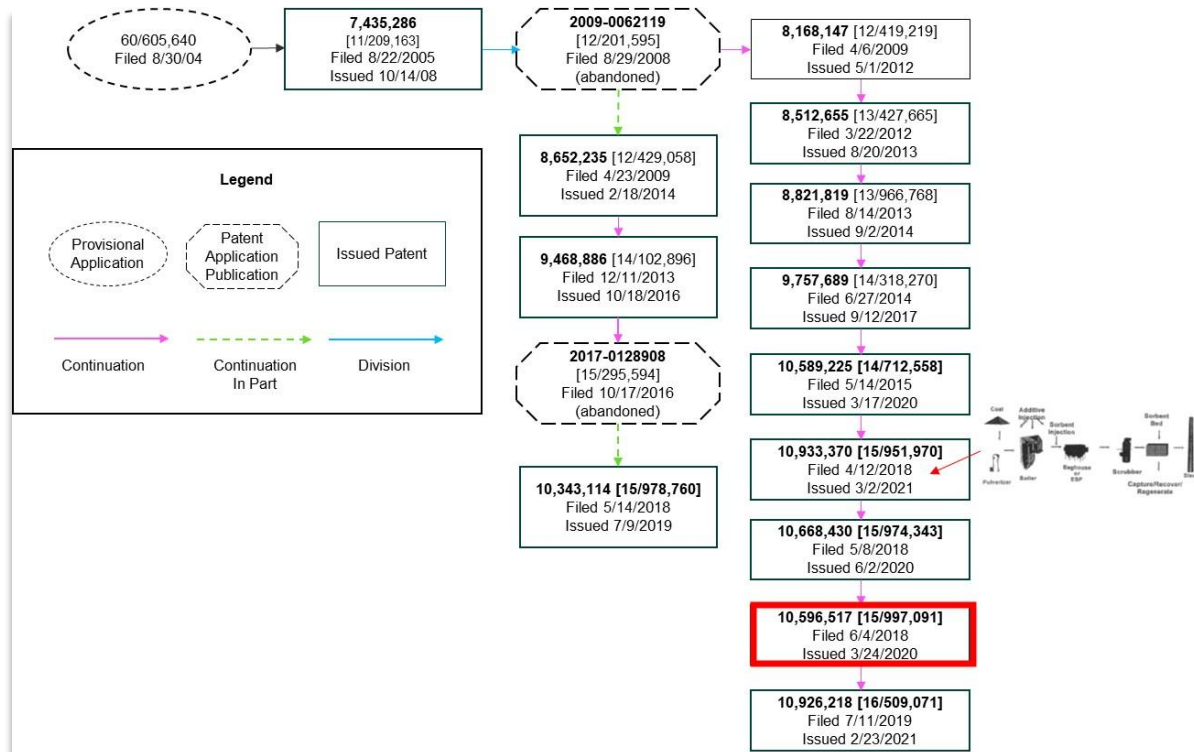
Cichanowicz has no personal knowledge of the conception/RTP activities, because he first learned about adding Br to coal when "Vosteen brought this to the party" in Summer 2004. EX1152, 101:18-22, 106:9-12; *see* EX1150, 131:15-136:7. Cichanowicz never prepared a claim chart or checked whether the evidence cited for RTP met all claim limitations. EX1152, 71:9-13, 72:23-73:9, 74:5-75:14, 78:19-79:3. "[T]he cited declaration testimony is conclusory and unsupported, adds little to the conclusory assertion for which it is offered to support, and is entitled to little weight." *See Xerox Corp. v. Bytemark, Inc.*, IPR2022-00624, Paper 9 at 15

(P.T.A.B. Aug. 24, 2022) (precedential).

IV. THE '517 PATENT IS NOT ENTITLED TO EARLIER PRIORITY

Petitioners assert prior art dated before the actual filing date of the '517 Patent. Accordingly, the burden of production shifts to PO to argue or produce evidence that the challenged patent is entitled to an earlier filing date. *See Mueller Sys., LLC v. Rein Tech, Inc.*, IPR2020-00100, 2020 WL 2478524, at *10 (P.T.A.B. May 12, 2020).

PO asserts priority to the '640 Provisional (EX1020). But, the specification was amended on April 12, 2018 upon filing the '970 Application.



EX1004 (annotated). The changes to the specification in the '970 Application added a figure and were extensive. EX1064 (redlines, '558 published application vs '970

published application).⁵ Prior to April 2018, a POSITA would not conclude that applicants possessed the subject matter of the issued claims of the '517 Patent.

First, even assuming that the Provisional could be incorporated by reference and its contents considered, the Provisional itself does not fully support the challenged claims. Second, the Provisional itself was not properly incorporated into the downstream non-provisional applications. Third, the downstream applications do not support the challenged claims.

A. Requirements to Demonstrate Priority

Without support in earlier-filed applications for the challenged claims, PO cannot receive a priority date before April 12, 2018, when the '970 Application was filed. *Lockwood v. Am. Airlines, Inc.*, 107 F.3d 1565, 1571-72 (Fed. Cir. 1997) (“to gain the benefit of the filing date of an earlier application ... each application in the [priority-chain] must comply with the written description requirement of 35 U.S.C. §112”).

Each prior application must “convey with reasonable clarity to those skilled

⁵ It is notable that PO refers to these applications as “Pre-CIP Applications.” POR at 75,89. When the patent specification was amended extensively to add new matter upon filing the '970 Application, it was not identified to the USPTO as a CIP application.

in the art that, as of the filing date sought, [the inventor] was in possession of the invention.... Entitlement to a filing date does not extend to subject matter which is not disclosed, but would be obvious over what is expressly disclosed.” *PowerOasis*, 522 F.3d at 1306.

PO confuses the standard for demonstrating to priority to an application. *See* POR at 71-72 (claim “will not be invalidated on section 112 grounds simply because the embodiments of the specification do not contain examples explicitly covering the full scope of the claims”). In PO’s cited cases, the patent challenger was seeking a finding of invalidity for lack of written description. *See LizardTech Inc. v. Earth Res. Mapping, Inc.*, 424 F.3d 1336, 1346-1347 (Fed. Cir. 2005) (affirming judgment that claims “are invalid for failure to satisfy the requirements of section 112”); *Fox Factory, Inc. v. SRAM, LLC*, PGR2016-00043, Paper 9 at 6 (P.T.A.B. Apr. 3, 2017) (invalidity basis “of §112(a) (written description)”).

While there are commonalities between invalidity under Section 112 and lack of priority to an earlier application, there are also differences. For example, when considering invalidity under §112, “[o]riginal claims are part of the original specification and in many cases will satisfy the written description requirement.” *Mentor Graphics Corp. v. EVE-USA, Inc.*, 851 F.3d 1275, 1297 (Fed. Cir. 2017). That is not the case for a priority analysis which, as described above, requires examining the disclosures in each parent application. Thus, a patent may be valid

for containing sufficient written-description, but still lack priority to earlier applications (and thus be invalid for obviousness). Also, for priority, “[t]he question is not whether a claimed invention is an obvious variant of that which is disclosed in the specification. Rather, a prior application itself must describe an invention” *Lockwood*, 107 F.3d at 1571-72.

B. The Provisional Does Not Support the ’517 Claims

Even if the Provisional could be legally considered, it does not support the Challenged Claims. Claim limitations lacking earlier support (collectively, “Newly-Introduced Limitations”) are directed to what species of bromine-containing ingredient is added, and where it is added:⁶

- “the coal comprising an additive comprising Br₂, HBr, a bromide compound, or a combination thereof” (claim 1); and
- “the coal comprises added Br₂, HBr, bromide compound, or a combination thereof, added to the coal before the coal enters the combustion chamber, or the combustion chamber comprises added Br₂, HBr, bromide

⁶ The claims require adding bromine-containing ingredients to the combustion chamber, the coal upstream of the combustion chamber, or both. Each alternative must find written-description support. *See Tronzo v. Biomet, Inc.*, 156 F.3d 1154, 1158-60 (Fed. Cir. 1998) (denying priority where earlier application did not provide written-description support for the full scope of alternative shapes encompassed by the claims).

compound, or a combination thereof, or a combination thereof” (claims 29 and 30).

EX1002 ¶¶169-172.

1. **No Disclosure of an Additive Comprising Br₂ or Bromide Compounds or Combinations of Br₂ and HBr with Bromide Compounds in the Provisional**

The Provisional fails to disclose adding to coal or the combustion chamber each of the bromine-containing ingredients recited in the '517 Patent claims each of the Newly-Introduced Limitations, such as Br₂ and “bromide compound.” Example 1E of the Provisional—the “additional substance is hydrohalide (HI, HBr, HCl), etc., 1%B-10% of bromine”—is not sufficient. EX1020, 6; EX1002 ¶¶184-187.

There is no disclosure that this “additional substance” is the “additive” supplied “before the boiler,” discussed below. EX1020, 6. And even if the “additional substance” is added before the boiler, the Provisional discloses at most that this additional substance is hydrogen bromide (HBr). As Mr. Cichanowicz admits, Br₂ is not a subcategory of HBr, and HBr is not a subcategory of Br₂. EX1152, 37:8-13; *see also* EX1024, 323-325 (distinguishing hydrogen bromide from other types of bromine-containing ingredients); EX1002 ¶185. As confirmed by the declaration of named inventor, Mr. Pavlish: “Br₂ is not HBr and does not include HBr.” EX1024, 325. In short, these are completely different chemical species. Thus, disclosure of HBr in the Provisional does not disclose the coal comprising Br₂ (as recited in every challenged claim). EX1002 ¶186.

a. No Disclosure of Br₂ Applied to Coal

Nowhere in its brief does PO address disclosure in the Provisional of Br₂ applied to coal (or the broad class of bromide compound).

Pavlish testified that the inventors never tested adding hydrogen bromide (HBr) or molecular bromine (Br₂) to coal or combustion chamber. EX1150, 61:20-21, 64:10-66:9, 136:5-140:5, 201:18-202:21, 254:9-12. Lead inventor Dr. Olson testified it would be “absolutely stupid” to add “Br₂ in the combustion chamber or upstream of the combustion chamber.” EX1147 at 100:4-25.

b. No Mixing of Br₂ with Coal in Combustion Chamber

PO asserts that the “claim language merely requires combusting coal where the coal being combusted inside the combustion chamber also includes the bromine additive.” POR at 85. But, Claims 29-30 of the '517 Patent do require that the “Br₂, HBr, bromide compound, or a combination thereof” be “added to the coal before the coal enters the combustion chamber.” In any event, there is no disclosure of either in the Provisional.

If PO argues that somehow Br₂ gets formed in the combustion chamber and then it mixes with coal (none of which is disclosed in the Provisional), that too does not happen.

First, Pavlish and Cichanowicz were unaware of any technique that could measure presence of Br₂ in the combustion chamber or mercury-containing gas.

EX1150, 51:25-52:2, 255:16-256:11, 257:21-261:12; *see* EX1152, 157:20-159:9.

Second, Pavlish submitted a chemistry tutorial to the USPTO, asserting that Br_2 would *not* form in the combustion chamber or mercury-containing gas. He simulated what happens to NaBr(s) as it is heated to combustion temperatures and beyond.

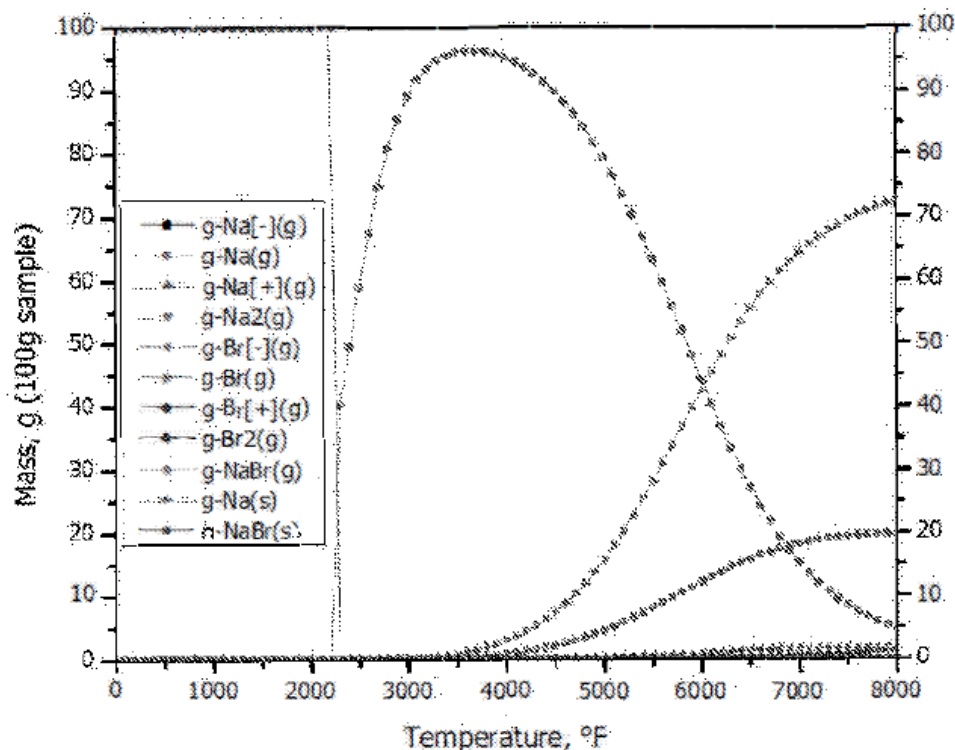


Figure 1. NaBr FactSage equilibrium calculation.

EX1024 at 329. Around 2000°F, NaBr(s) evaporated to form NaBr(g) . Around 3,500°F, NaBr(g) dissociated to form Na(g) and Br(g) atoms (not ions). The combustion chamber operated by Pavlish during testing was at 3,000-4,000°F. EX1150, 200:5-19, 256:17-257:2.

compounds, elemental forms of chemical elements, and the like. FactSage was used to calculate equilibrium concentrations of materials present for a 100 g solid NaBr sample in a coal-combustion furnace as a function of temperature, shown in Figure 1. Figure 1 clearly shows the rapid emergence of gaseous NaBr molecules once the NaBr boiling point of 2,530 °F is reached. At temperatures of around 3,000 °F, nearly all the solid NaBr has been converted to gas phase NaBr molecules. As the gas phase NaBr molecules are brought to temperatures beyond 3,000 °F, dissociation into gaseous sodium atoms and bromine atoms occurs.

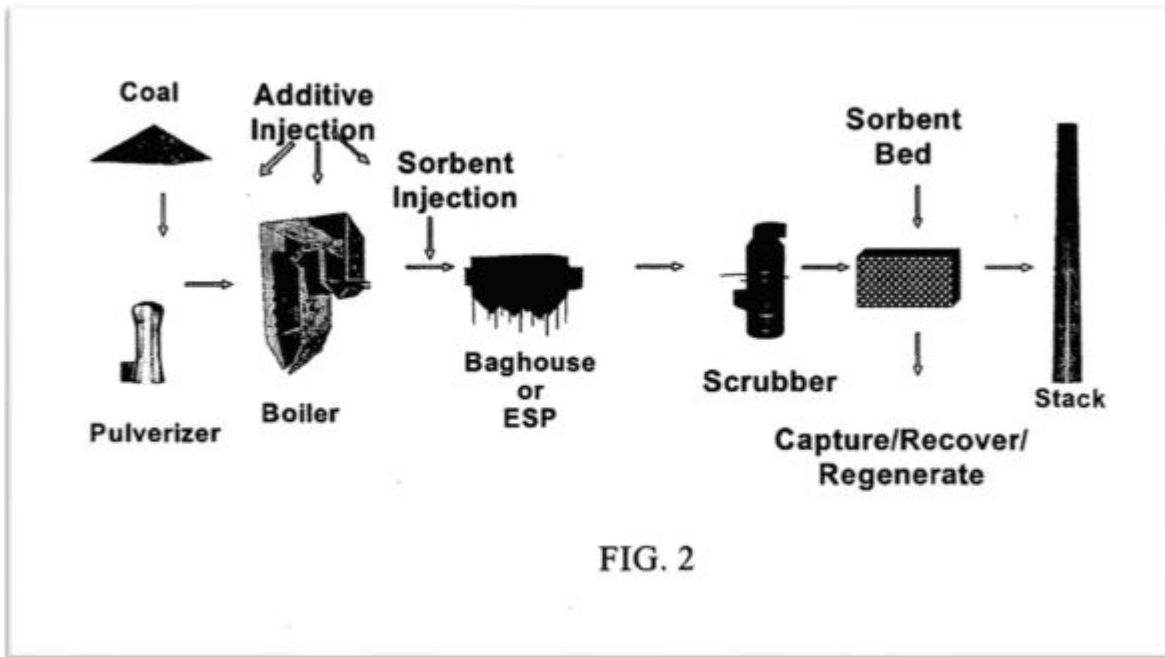
EX1026 at 328 ¶23 As shown in the figure, the gas-phase concentrations of ions (Na⁺, Br⁻) and molecular bromine (Br₂) remained at 0. Mr. Pavlish explained to the USPTO that when tests were conducted by others of this process, “Br₂ was not detected.” EX1026 at 326 ¶19.

In short, questionable disclosure of one species (HBr) in the Provisional does not support the full breadth of the entire class of added “Br₂” or “bromide compound[s].” *See Ariad Pharm., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1350 (Fed. Cir. 2010) (disclosure of a type does not provide sufficient written-description support for a claimed class). There are uncountable forms of bromide compounds, because a “bromide compound” may be any “chemical compound containing a bromide ion or ligand.” EX1002 ¶187. The ’517 Patent claims are not supported by the Provisional.

2. No Disclosure for “the Coal Comprises” Added Bromine Species

Even if the “additive” includes the bromine-containing ingredients of the Newly-Introduced Limitations, the Provisional does not disclose “the coal

comprises” that additive. Nor does the Provisional disclose that the additive added to the coal “before the coal enters the combustion chamber,” as required by Claims 29-30 of the ’517 Patent. Figure 2 of the Provisional labels “Additive Injection” with three arrows vaguely pointing in the direction of the boiler of a coal-fired plant.



DESCRIPTION OF EXEMPLARY EMBODIMENTS

FIG. 2 is a block diagram illustrating the use of the invention in a coal fueled facility. Of course, the invention can also be used in any other desired type of facility. FIG. 2 shows a boiler for burning pulverized coal. The facility utilizes various devices to clean the exhaust of the boiler. In this example, a baghouse or ESP is used to collect particulates in the exhaust. A scrubber and sorbent bed are also used to remove undesired constituents from the flue gas stream, before being fed to the stack. In the example shown, the sorbent is injected into the flue gas after the boiler. The additive can be injected where desired (e.g., before, after, or within the boiler).

EX1020, 15, 16; *see* EX1001, Fig. 11; EX1020, 7. However, this figure and the “additive can be injected where desired (e.g., before, after, or within the boiler)”⁷ does not disclose supplying the claimed bromine-containing ingredients (e.g., Br₂ or any bromide compound) to coal, as opposed to elsewhere upstream of the boiler. EX1002 ¶¶179-182; *see Lockwood*, 107 F.3d at 1572 (obviousness is not enough for written-description support). Other systems in a coal plant “before...the boiler” can deliver halogens, but do not interface with the coal. Exemplary systems include secondary-air systems, low-NO_x overfire air systems, and a specialized additive injection system separate from the coal. EX1152, 58:16-60:5, 61:5-7; EX1027, 13-3 to 13-5; EX1002 ¶182. If PO argues that it “would be obvious over what is expressly disclosed” to add bromine-containing ingredients to coal, that is not the standard for a priority-date analysis. *Lockwood*, 107 F.3d at 1571-72. The Provisional fails to disclose the Newly-Introduced Limitations. EX1002 ¶¶178-183.

3. Species-Genus

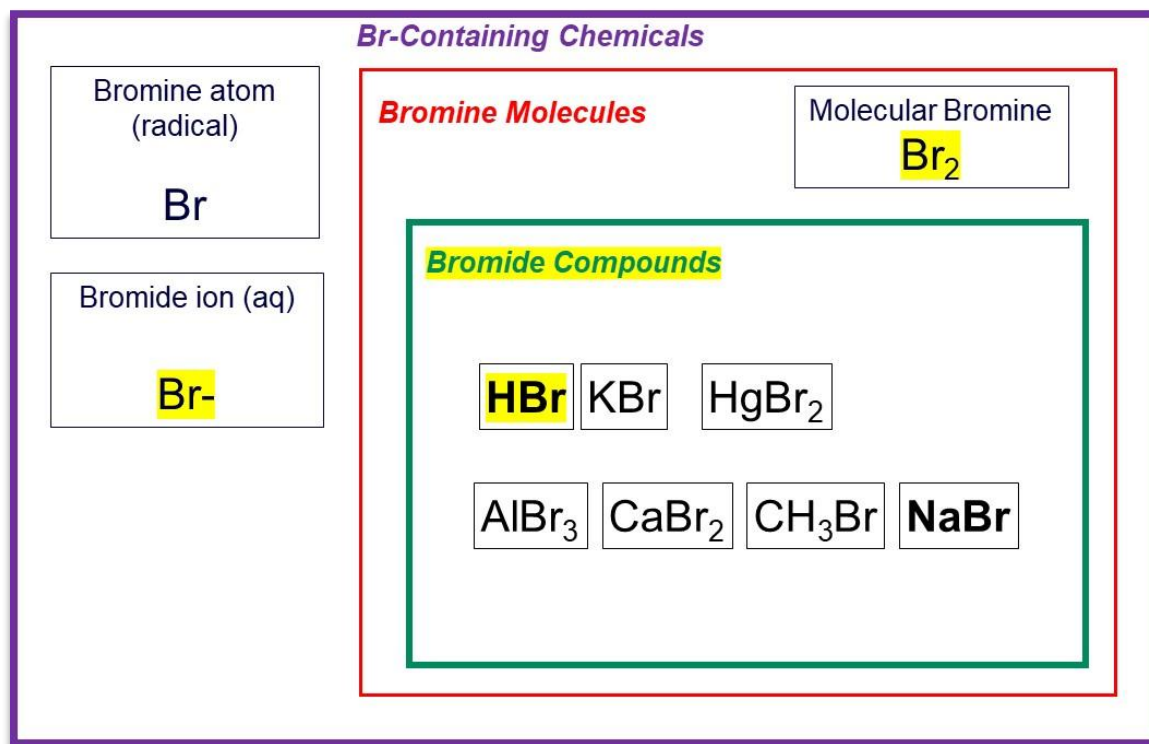
There is no written-description for adding to the coal “Br₂” or a “bromide compound.” PO responds that “the general rule [is] that disclosure of a species

⁷ Petitioner notes that in the subsequent non-provisional applications, this language was not carried forward. Rather, the “additive” in this quote was replaced with “inventive sorbent.”

provides sufficient written description support for a later filed claim directed to a genus.” POR at 72 (quoting *Bilstad v. Wakalopulos*, 386 F.3d 1116, 1125 (Fed. Cir. 2004) and citing similar cases). PO’s arguments are misplaced.

First, even taking PO’s characterization of the Provisional as true, it at best discloses adding one species, HBr. Br₂ is not a genus that contains HBr, and HBr is not a genus that contains Br₂, as Mr. Cichanowicz admits. EX1152, 37:8-13; EX1002 ¶185. HBr and Br₂ have different properties and attributes. EX1002 ¶390.

As Dr. Niksa further explains, Br₂ is also not a species of “bromide compound” and not a species of HBr:

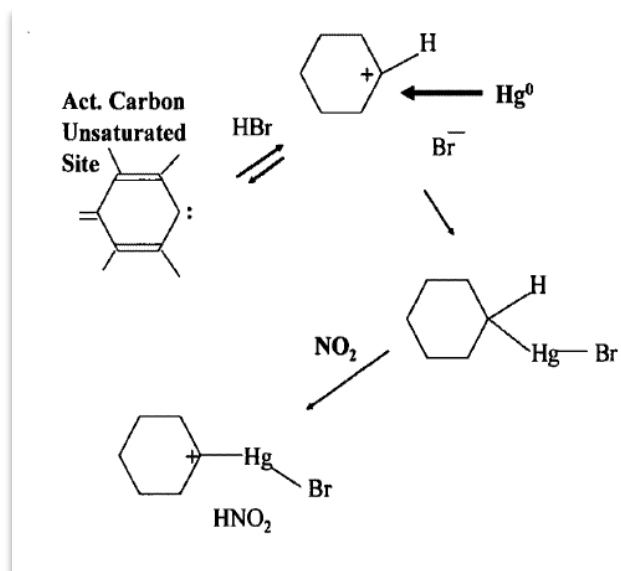


EX1160 ¶12. PO provided no evidence that other species within the broad class of bromide compounds “would perform similarly to the disclosed members,” such as how they mix with coal. *See Bilstad*, 386 F.3d at 1125.

Second, PO suggests that the specification may support more than what it discloses if there is “a reasonable structure-function correlation,” if that correlation is established “by the inventor as described in the specification” or “known in the art at the time of the filing date.” POR at 73. But the case cited by PO involve a “claimed genus” and the patent specifications “only describe species of structurally similar antibodies.” *AbbVie Deutschland GmbH v. Janssen Biotech, Inc.*, 759 F.3d 1285, 1301 (Fed. Cir. 2014). The Federal Circuit affirmed the invalidity finding that the claims lacked written description, because the claims were directed to “achieve a desired result,” and there was not sufficient disclosure in the specification of “species representative” to the accused species. *Id.* at 1301-1302. Here, HBr and Br₂ have different properties (EX1002 ¶390) and, as described above, lack a species-genus relationship.

4. Figure 1 Does Not Support the Claims and Was Later Modified

PO relies on Figure 1 of the Provisional to argue that whatever form of Br gets added to coal or combustion chamber, the same result occurs, “the high heat of the chamber breaks those bonds and forms bromine atoms.” They then form HBr, which reacts with activated carbon to capture mercury. POR at 82.

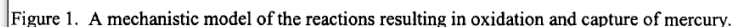


EX1020, Fig. 1. Relying on Figure 1, PO argues (and Cichanowicz copies the language), “[o]f course, the chemical model described above demonstrates that other sources of Bromine ions (i.e., bromides) may be used.” POR at 80. This argument is misplaced for several reasons.

First, the purported “chemical model” of Figure 1 at most relates to how Br, Hg, and activated carbon react with one another, downstream of the combustion chamber. The model says nothing about where chemicals are added to coal, rather than added downstream or formed *in situ*. EX1002 ¶390.

Second, PO provided no evidence that this was known to *the inventors in August 2004*. Even PO’s expert admits that the model of Figure 1 in the Provisional does not describe any real-world chemistry, and is just “cartoony” and “not proven.” EX1152, 133:3-134:24. This reaction model would not have been known to a POSITA by 2004. EX1152, 135:7-136:18. Mr. Pavlish also did not believe in

The chemical model continued to evolve from its first introduction in August 2004 (EX1020, Fig. 1) to the non-provisional applications filed in 2005 and later (including in Olson-235 and Olson-646). *See, e.g.*, EX1148 at Fig. 2; EX1004 (family tree). Consider the comparison below:



to the system (or what kind of starting material was used). EX1160 ¶¶54, 58.

5. **Dr. Niksa's Analysis Is Consistent with Olson-646 and Olson-235**

PO contrasts Dr. Niksa's analysis for Olson-646 and Olson-235 with those of priority. POR at 15-16. There are some clear differences, however.

First, Dr. Niksa never asserts that Olson-646 anticipates any claims. Rather, it only renders claims obvious, when in combination with a primary reference.

Second, Dr. Niksa never asserts that Olson-235 discloses Br-containing ingredients on coal. In fact, he states, "Olson-235 fails to disclose that the coal comprises any bromine-containing chemicals 'added to coal upstream of the combustion chamber.'" EX1002 ¶733. Rather, Olson-235 discloses another of the claimed alternatives, the "halogen or halide promoter is introduced ... into a combustion chamber that produces a mercury-containing gas." *Id.* (citing EX1018 at 22:39-42).

Third, Olson-235 (USP 8,652,235) was filed as a CIP in 2009, with additional disclosure not present in the earlier applications or Provisional.

C. **Disclosure of the Provisional Is Not Part of the Non-Provisional Applications**

If PO alleges the Provisional itself provides sufficient disclosure for the Newly-Introduced Limitations (it does not), this fails because PO cannot demonstrate that the parent applications to the '970 Application (filed 2018, upon which the '517 Patent depends for priority) include the disclosure from the

Provisional. *Lockwood*, 107 F.3d at 1571 (“[E]ach application in the chain must describe the claimed features.”); *Droplets, Inc. v. E*TRADE Bank*, 887 F.3d 1309, 1320 (Fed. Cir. 2018) (“[I]f any application in the priority chain fails to make the requisite disclosure of subject matter, the later-filed application is not entitled to the benefit [of a priority date] preceding the break in the priority chain.”); *accord DDR Holdings, LLC v. Priceline.com LLC*, 122. F.4th 911, 917 (Fed. Cir. 2024) (“skilled artisan would deem significant the [non-provisional]’s deletion of the provisional application’s” subject matter, and finding the deleted matter not within the scope of the claims).

1. The Incorporation Is Ineffective

To incorporate another document, “the host document must identify with detailed particularity what specific material it incorporates and clearly indicate where that material is found in the various documents.” *Callaway Golf Co. v. Acushnet Co.*, 576 F.3d 1331, 1346 (Fed. Cir. 2009). Between the Provisional and the ’517 Patent are four patents that cause a break in the priority chain: 8,168,147; 8,512,655; 8,821,819; and 9,757,689. EX1004. These intervening patents purport to claim priority to the Provisional “to the extent appropriate.” EX1033-1035, EX1065. PO could have incorporated and claimed priority to the entire provisional “full stop”; instead, PO claimed priority to the Provisional to a limited extent. *See Midwest Energy Emissions Corp. v. Arthur J. Gallagher*, No. 19-1334-CJB, 2023

WL 7411160, at *3 (D. Del. Nov. 3, 2023) (Provisional not properly incorporated into '517 patent); *Zenon Envtl., Inc. v. U.S. Filter Corp.*, 506 F.3d 1370, 1379 (Fed. Cir. 2007) (“The plain language expressly limits the incorporation to only relevant disclosures of the patents, indicating that the disclosures are not being incorporated in their entirety.”).

2. The Provisional Is Essential Material

The Provisional cannot be incorporated to provide written-description support for the additional reason that its disclosures would be deemed “essential material.”

a. “Essential material” cannot be incorporated from unpublished applications

“‘Essential material’ may be incorporated by reference, but only by way of an incorporation by reference to a U.S. patent or U.S. patent application publication....” 37 C.F.R. §1.57(d) (current); 37 C.F.R. §1.57(c) (2005) (similar restriction). A provisional application is neither a “U.S. patent” nor a “U.S. patent application publication.” 35 U.S.C. §122(b)(2)(A)(iii). Thus, PO cannot incorporate by reference the Provisional into the Pre-2018 Applications, because it is: (1) “essential material” to the Newly-Introduced Limitations; (2) “essential material” to the claims of the Pre-2018 Applications and thus absent during the *Lockwood* analysis; and (3) barred from incorporation by the close of prosecution. *See ZTE (USA), Inc. v. CyWee Group Ltd.*, IPR2019-00143, 2021 WL 641742, *54 (P.T.A.B. Feb. 17, 2021) (incorporation by reference of provisional was “ineffective” as to essential

matter)

b. Provisional Is “Essential” for ’517 Patent Claims

The Provisional cannot be incorporated by reference into the intervening applications because it is essential material for the Newly-Introduced Limitations.

“Essential material” is material that is necessary to ... [p]rovide a written description of the claimed invention, ... as required by 35 U.S.C. 112(a)

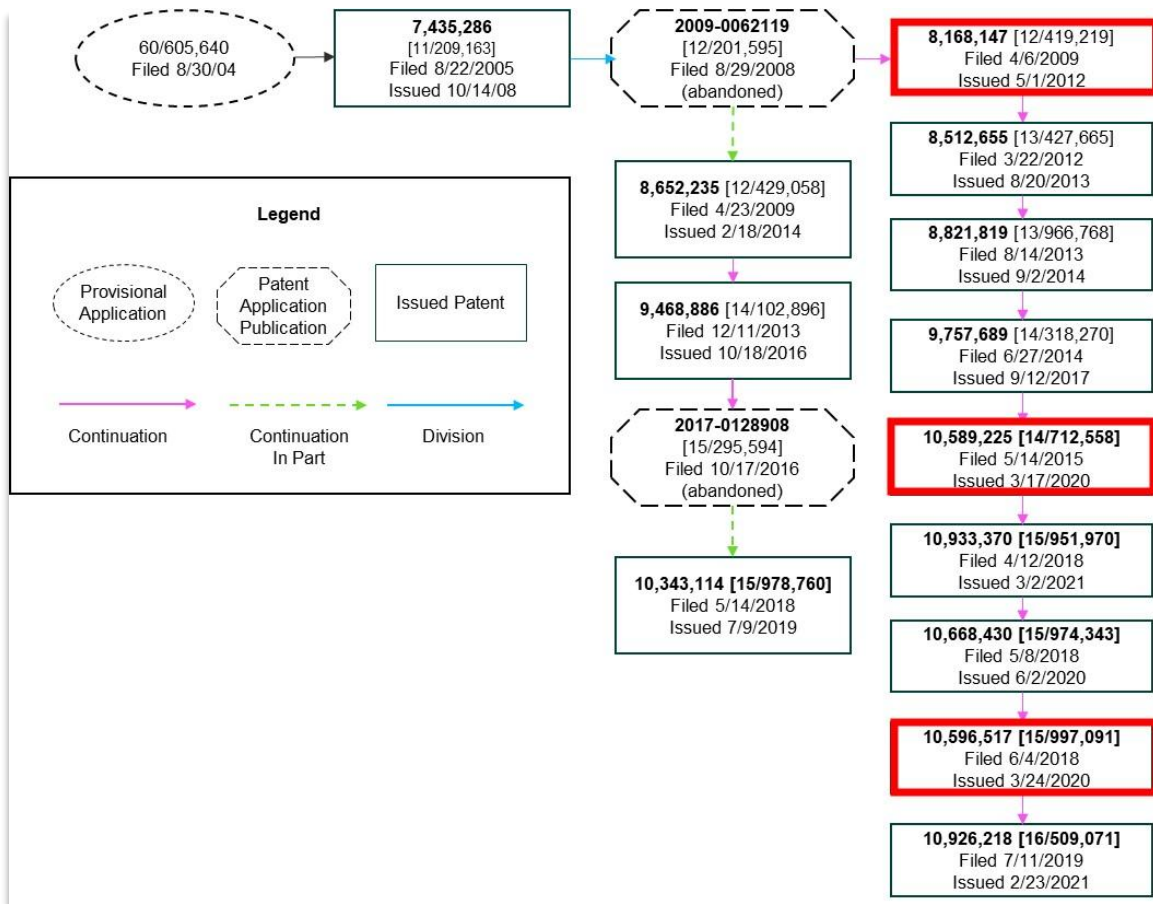
37 C.F.R. §1.57(d)(1). The specifications of Pre-2018 Applications do not support the Newly-Introduced Limitations. Thus, the disclosure of the Provisional is “necessary” to provide written description support for those limitations. Even PO’s testifying expert in the Delaware case admitted that Figure 2 of the Provisional and surrounding text was “essential material for the patents in this case” (which included the ’517 Patent and parent ’225 and ’147 Patents). EX1093, 237:20-241:9. The Provisional is essential material for the Newly-Introduced Limitations, and essential material cannot be incorporated by reference from provisional applications. Priority is broken.

c. Provisional Is “Essential” for Claims of Parent Patents

The Provisional is not only “essential” for the Newly-Introduced Limitations, but also “essential” to provide written-description support for claims of parent patents. *See Maquet Cardiovascular LLC v. Abiomed, Inc.*, 627 F. Supp. 3d 72, 81-82 (D. Mass. 2022) (analyzing whether material was essential to claims of

intervening applications). PO cites to the *Maquet* case, but then fails to address it.

The '517 Patent claims priority to 8,168,147 ('147 Patent) and 10,589,225 ('225 Patent).



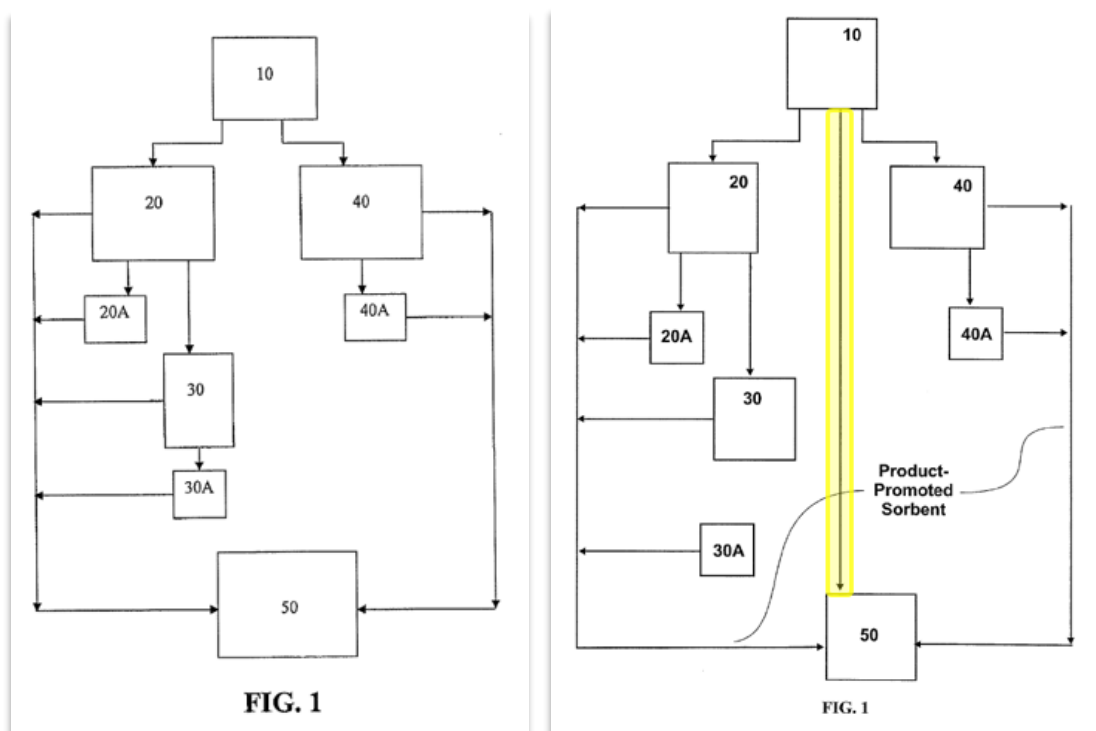
EX1004 (annotated).

i. '147 Patent claims 18-19

Claims 18-19 of the '147 Patent collectively require “injecting the particulate sorbent material at a sorbent material injection rate and injecting separately the bromine containing promoter into [cl. 19—a mercury containing gas that is a transport gas] whereby in-flight reaction produces the promoted brominated

sorbent.” EX1065, cls. 18, 19. EX1002, ¶¶194-197. The ’163 and ’595 Applications (parents to the ’147 Patent, and which also omit portions of the Provisional) do not disclose the subject matter of Claims 18-19. EX1020, 5-8, 15, 260; EX1021, 236-265; EX1022, 256-284; EX1002, ¶¶211-212. As discussed above, those applications describe treating a base activated-carbon sorbent with a bromine promoter prior to injecting the prepared promoted sorbent into a mercury-containing flue gas, such that: (a) the sorbent material and bromine containing promoter are not injected “separately” into the mercury-containing gas (they are injected together); and (b) an in-flight reaction between sorbent and promoter occurs prior to injection into the mercury-containing gas, and not in the “gas stream [that] is a mercury-containing gas.” EX1002 ¶¶198-205.

Notably, Replacement-Figure 1, as found in the issued ’147 Patent, is not the same as the version originally filed in the ’163 and ’595 Applications. EX1021, 272. On November 4, 2009, applicants filed a replacement set of Figures 1-10 during prosecution of the ’219 Application (’147 Patent), revised Figure 1 is shown on the right (annotation in yellow) and original Figure 1 on the left:



EX1025, 541-551, 571. There is no textual support describing the direct line between block 10 (activated carbon) and block 50 (flue gas), highlighted above in yellow, and no support for adding activated carbon directly to the mercury-containing (flue) gas independently and separately from the halide promoter as claimed in claims 18 and 19. Further, the specification refers to this embodiment as one where no halogen promotion occurs, such as where an alkali component is used instead of a halogen promoter. EX1065, 10:7-12, 20:60-21:16, Fig. 10. EX1002, ¶¶206-210. Thus, the only support for these claims (if any) would be from Figure 2 of the Provisional, making it “essential material” to the ’147 Patent.

ii. ’225 Patent claims 1, 14, 16-17, 20-21, 23

Claims 14 and 23 of the ’225 Patent require “combusting coal in a combustor

comprising pyrolysis char and an additive comprising HBr, a bromide compound, or a combination thereof, to form the mercury-containing gas” and “the sorbent is free of contact with a halogen or halide promoter prior to the addition of the sorbent to the mercury-containing gas,” respectively. EX1067; EX1002 ¶¶213-214.

As discussed above for the '147 Patent, the '225 Patent specification discloses that any contact between the activated-carbon sorbent and the bromine-containing promoter occurs before the sorbent enters the mercury-containing gas, and the sorbent is not “free of contact with a halogen or halide promoter prior to the addition of the sorbent to the mercury-containing gas.” EX1002 ¶¶215-216. Any support for Claim 23 of the '225 Patent would be from the Provisional, making it “essential material” to the '225 Patent.

Regarding claim 14, there is no disclosure in the Pre-2018 Applications of adding HBr, a bromide compound, or any bromine-containing ingredients in the combustion chamber (i.e., “combustor” recited in claim 14 of the '225 Patent). There is no disclosure in the Pre-2018 Applications of HBr being present in the combustion chamber, because any bromine-containing promoter is introduced downstream of the combustion chamber. In fact, this limitation in claim 14, and other '225 Patent claims (e.g., 16, 17, 20, 21) that recite adding bromine-containing ingredients (e.g., HBr, a bromide compound) to the coal and/or combustion chamber, was not present in the originally filed application for the '225 Patent. *Compare*

EX1067, cls. 14, 16, 17, 20, 21 *with* EX1068, 41. Such limitations were introduced for the first time during prosecution upon the Applicants' filing of a June 13, 2018 Supplement Amendment presenting twenty-one new claims. EX1068, 1637-1651. The '225 Patent application as filed (and the preceding Pre-2018 Applications) does not disclose adding the claimed bromine-containing species to the coal and/or combustion chamber. EX1002 ¶¶213, 218.

Regarding claim 1 of the '225 Patent, there is no disclosure in the Pre-2018 Applications of "combusting a mixture comprising coal, pyrolysis char, and an additive comprising HBr, a bromide compound, or a combination thereof, to form the mercury-containing gas." EX1067, cl.1. The only disclosure of adding bromine-containing ingredients in the specification and the Pre-2018 Applications involves additions downstream of the combustion process. Notably, the Pre-2018 Applications (e.g., '163 and '595 Applications) omit the series of numbered "outline[s] of examples of the invention"; example number 1E in the Provisional referring to an "additional substance" is not carried over to the Pre-2018 Applications or '225 Patent). Nor is Figure 2 of the Provisional carried over into the Pre-2018 Applications. Thus, the support for these limitations, and claims 1, 14, 16-17, and 20-21 of the '225 Patent, (if any) would be from the Provisional, making it "essential material" to the '225 Patent. EX1002 ¶¶217-218.

3. **Harmonizing M.P.E.P. 608.01(p), Rule 1.57(b), and Rule 1.57(d)**

Incorporation by reference under 37 C.F.R. §1.57 is allowed to “safeguard against the omission of a portion of a prior application for which priority is claimed.” M.P.E.P. 608.01(p)(I)(2)(B). This safeguard is unavailable for the challenged patent here, because the safeguard contemplates a specific scenario: a patentee files a child application that omits material from a parent application, but learns during prosecution of the child that the omitted material is needed for written-description support. “The inclusion of such an incorporation by reference statement in the later-filed application will permit applicant to include subject matter from the prior application into the later-filed application without the subject being considered new matter.” M.P.E.P. 608.01(p)(I)(2)(B). Because a provisional cannot be incorporated by reference under 37 C.F.R. §1.57(d), there are limits to when M.P.E.P. 608.01(p)(I)(2)(B) can be used to add omitted material from a provisional:

[1] The “inadvertently omitted portion of the specification or drawing(s) is completely contained in the prior-filed [parent] application;” and

[2] “The application must be amended to include the inadvertently omitted portion of the specification or drawing(s) ... in no case later than the close of prosecution” of the child application.

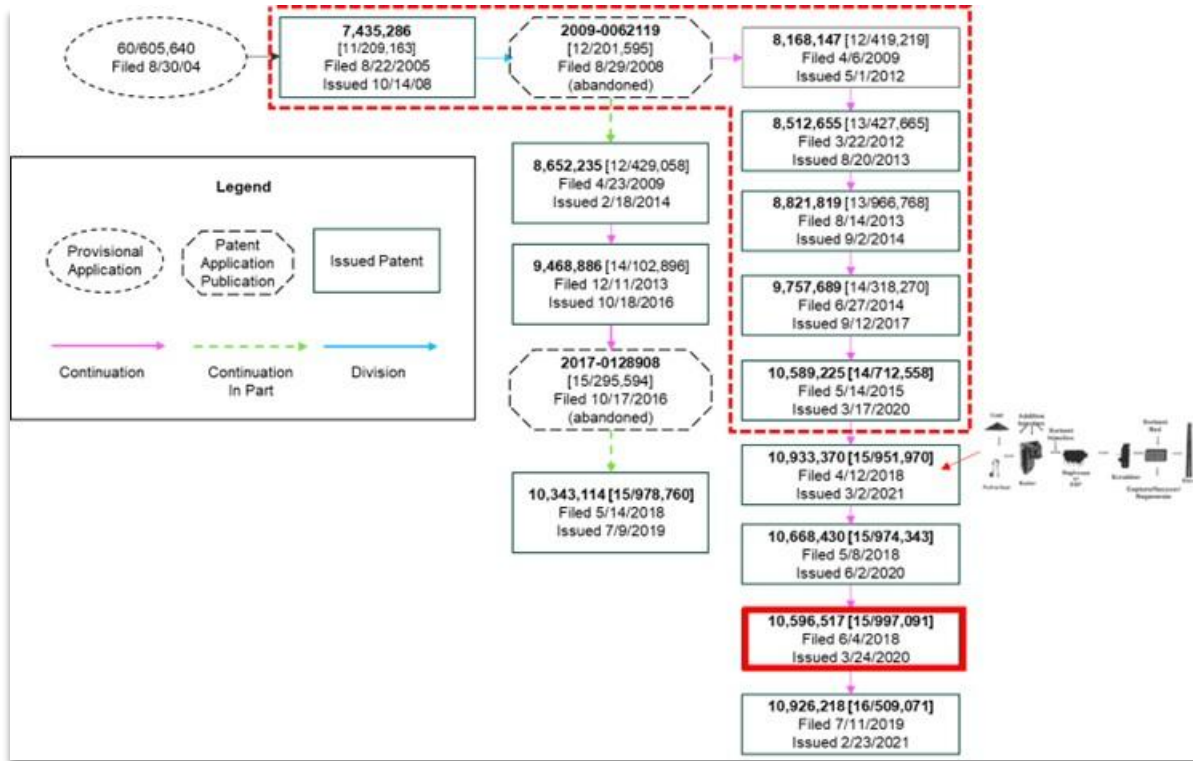
37 C.F.R. §1.57(b) (quoted in M.P.E.P. 608.01(p)(I)); *see* M.P.E.P. 217 (analyzing 37 C.F.R. §1.57(b)). The ’517 Patent and its parents fail both requirements.

First, as explained above, the full scope of the ’517 Patent claims is not

“completely contained” in the Provisional. Second, the physical incorporation that occurred in April 2018 in the ’970 Application was too late: by then, the Pre-2018 Applications (’558, ’270, ’768, ’665, ’219, ’595, and ’163 Applications) were either abandoned or issued, but were never “amended to include the inadvertently omitted portion of the [Provisional before] the close of prosecution.” 37 C.F.R. §1.57(b); *see* M.P.E.P. 217(III) (Example 3) (when application #2 and application #3 in priority chain omit material from application #1, the omitted material cannot be added in application #3 after close of prosecution of application #2).

D. The Parent Non-Provisional Applications Do Not Support the Challenged Claims

The Challenged Claims also are not supported by the earlier-filed “application[s] in the chain,” each of which breaks priority. *See Lockwood*, 107 F.3d at 1572. Other than alterations made to a replacement-Figure 1 during prosecution of the ’219 Application (’147 Patent), the specifications (i.e., other than the claims) are substantively identical between the applications shown in the dotted red box below.



PO addresses only the '595 Application, but not the '147 Patent or the '225 Patent

PO admits that “[t]he '595 Application does not contain provisional figure 2.”

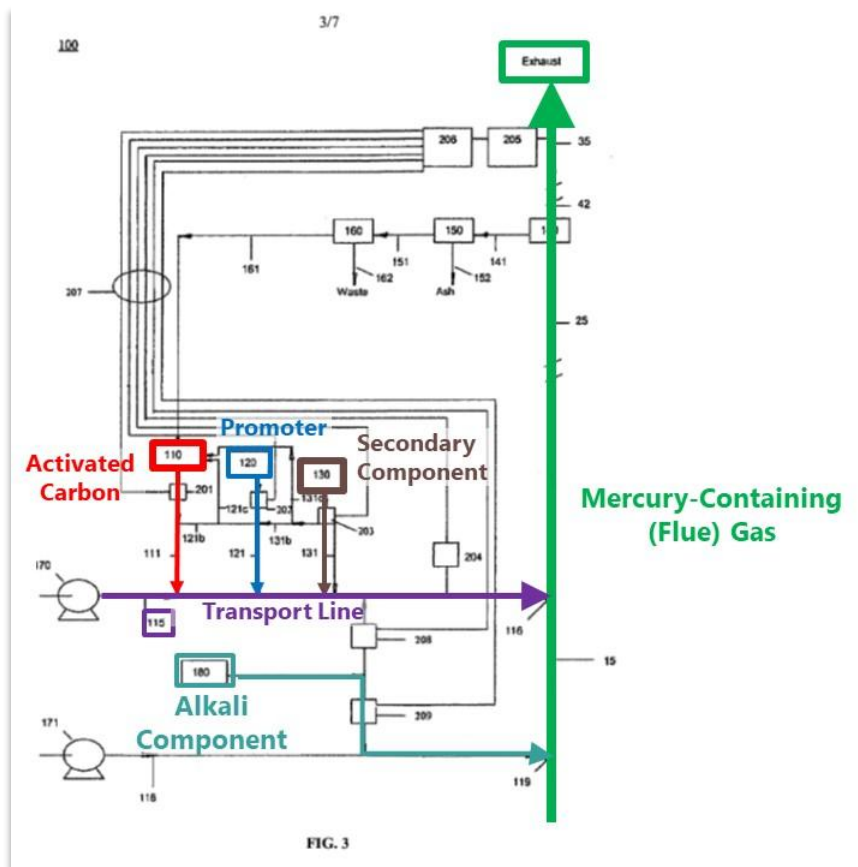
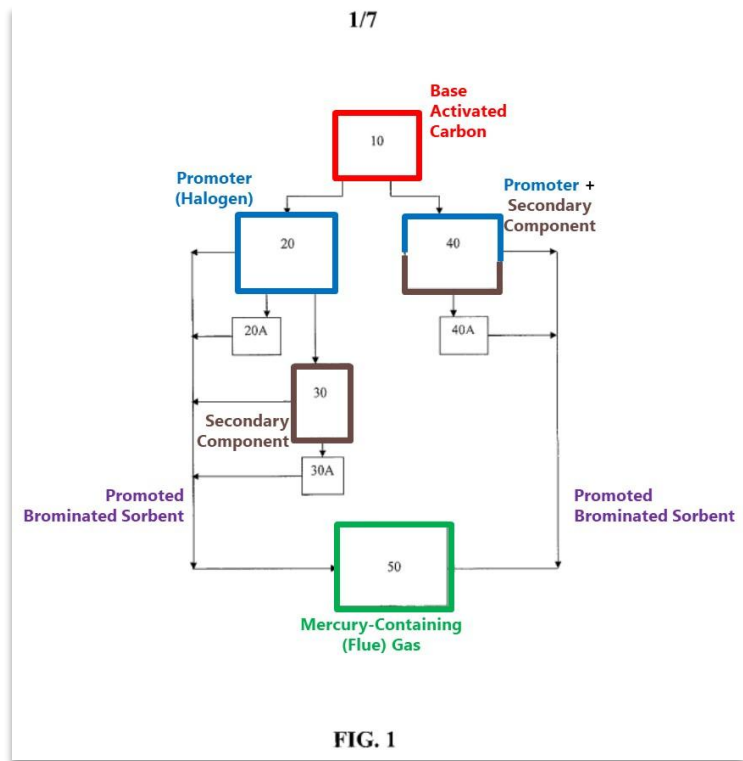
POR at 95. PO cannot point to a single embodiment in which bromine-containing ingredients are applied to coal, and instead cites to an example where “the promoter and sorbent were both injected downstream of the boiler” (i.e., not applied to coal). POR at 27.

PO next cites to a paragraph that states, “In this example, the halogen/halide promoted carbon sorbent was injected into the flue gas after the boiler. In general, however, the inventive sorbent can be injected where desired (e.g., before, after, or within the boiler).” POR at 95 (citing '595 Application ¶107). The Board properly rejected this argument.

First, this language was not present in the Provisional. The Provisional stated that the “additive” can be injected where desired, but this states that the “inventive sorbent” can be injected where desired.

Second, when activated carbon (whether pre-brominated or not) is injected into the boiler, it combusts and can no longer be used as a sorbent. EX1150, 182:13-184:4, 200:17-201:5, 202:22-203:14. Thus, PO’s read would reduce the claims to a one-part process, with no downstream sorbent injection.

In sum, the ’595 Application does not support adding any halogens to the coal or combustion chamber, let alone the claimed species. This is because the Pre-2018 Applications are directed to preparing a brominated activated carbon (purple) outside mercury-containing flue gas (green), and then injecting the pre-brominated sorbent into the mercury-containing flue gas (green) downstream from the combustion chamber:



EX1022, 263-264, 295-297 (annotated); EX1002 ¶¶188-193. Indeed, the named inventors and PO's expert in the Delaware Litigation were asked about the specification of the '147 Patent (12/419,219, filed in 2009), and they confirmed that none of the examples disclosed adding bromine to coal. EX1095 (Olson), 128:20-25; EX1097 (Pavlish), 116:22-125:17; EX1093 (O'Keefe 1), 156:5–170:5.

V. THE PETITION IS NOT TIME-BARRED

After PO filed the POR, the Board authorized additional discovery and ordered the parties to file Supplemental POR and Petitioner Reply briefs directed specifically to RPI and privity. *See* POR at 60 n.23. Because the Board already addressed RPI/privity in its original Institution Decision and the Supplemental briefing is due after this Reply, Petitioner will further address RPI/privity in its Supplemental Reply. Here, Petitioner briefly addresses evidence that the Board indicated in the Institution Decision was ambiguous due to redactions.

A. Former Petitioners

Before the first institution decision (9/8/2025), IPL & WPL were terminated. Papers 31, 33. WEC and MidAmerican were later terminated. Papers 43, 50, 51, 60. Two petitioners remain in the proceeding: PacifiCorp and BHE. Pursuant to the Director Review Order (Paper 55), the Board is expected to issue a revised institution decision, addressing RPI and privity issues.

The Board should not consider RPI and privity status for former petitioners.

The time-bar statute does not preclude parties from *filing* an IPR petition; rather, the statute directs when petitions “may not be *instituted*.” 35 U.S.C. §315(b). “When the Board finds that an IPR is barred under § 315(b), it denies institution. It does not reject the petitioner's filing. The focus of § 315(b) is on institution.” *Power Integrations v. Semiconductor Components Indus., LLC*, 926 F.3d 1306, 1314-1315 (Fed. Cir. 2019). If the Board still considers former petitioners, they are addressed below.

B. Chem-Mod

PO again asserts, “Petitioners have argued that Chem-Mod and its affiliates defended PO’s infringement claims and negotiated a license on their behalf.” POR at 67-68 (citing EX2009 at 91). This is false. Exhibit 2009 does not state that Chem-Mod negotiated a license “on [MidAmerican’s] behalf.”

The Board found MidAmerican’s and WPL’s pleadings “ambiguous at best” regarding PO’s unfounded accusation that Chem-Mod obtained licenses on behalf of MidAmerican and WPL. Paper 34 at 16. Accordingly, Petitioners submit the following exhibits:

- **EX1155:** 4/2/2025 email from PO to MidAmerican discussing the Chem-Mod agreement.
- **EX1157:** Unredacted version of EX2009 (MidAmerican answer).
- **EX1158:** Unredacted version of EX2010 (WPL’s answer).

Chem-Mod did not negotiate a license on behalf of MidAmerican or WPL, but rather entered into a license for itself and its affiliates (none of whom are petitioners) for sales by Chem-Mod and its affiliates. That MidAmerican's and WPL's later purchase of materials from Chem-Mod benefited from this prior license agreement (i.e., PO cannot obtain double recovery) does not create privity or RPI. Further, the redactions in WPL's answer the Board found ambiguous addressed patent misuse and say nothing about Chem-Mod. *Compare* EX2010 at 104-105 *with* EX1158.

Compare the license to Chem-Mod (EX2053) with the licenses granted to former petitioners to terminate these proceedings.⁸ If Chem-Mod negotiated a license on behalf of any petitioners, that raises two questions. First, why did PO sue WPL, MidAmerican, and other petitioners in Iowa? Second, why are the same power plants (identified as "GS" for "Generating Station") from the Chem-Mod Agreement *again* included in the current licenses to former petitioners? This includes the Columbia plant (WPL) and Walter Scott, Louisiana, and George Neal plants (MidAmerican), identified in both agreements. *Compare* EX2053 at Ex. D *with* EX1135 (WPL) §2.1 and EX1143 (MidAmerican) §2.1. Chem-Mod did not negotiate a license on former petitioners' behalf.

⁸ The licenses were filed under seal, but the parties consented to sharing them with Petitioners.

C. Talen

The Board speculated as to the redactions in PacifiCorp's pleadings, due to PO's failure to file unredacted versions. Unredacted answers were later submitted as EX2050-EX2051. Additional bases for PacifiCorp's defenses are in the following exhibits:

- **EX1153-EX1154:** correspondence between PacifiCorp and PO regarding the parties' contentions.
- **EX1156:** PacifiCorp's Rule 12(c) motion.
- **EX1159:** MidAmerican's Rule 12(c) motion

PacifiCorp never asserted that Talen negotiated a settlement agreement on its behalf. Rather, PO drafted a release (EX2052 §3.1) and covenant not to sue (EX2052 §2.2) that was broad enough to encompass PacifiCorp and MidAmerican.

Following the Board-ordered additional discovery, the remaining Petitioners submitted declarations, confirming that they did not direct, control, or exercise influence in: the Delaware Litigation; the filing of the 2020 IPR proceedings; or negotiating the Talen Agreement. EX1144; EX1145. There is no privity/RPI with Talen.

VI. CONCLUSION

Petitioners respectfully request that the Challenged Claims be cancelled.

Respectfully submitted,

March 13, 2026
Date

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ATTORNEYS FOR PETITIONERS

CERTIFICATE OF COMPLIANCE

Pursuant to 37 C.F.R. §42.24(d), the undersigned certifies that the foregoing Petition, exclusive of the exempted portions as provided in 37 C.F.R. §42.24(a), contains 5,508 words which is no more than 5,600 words and therefore complies with the type-volume limitations of 37 C.F.R. §42.24(c)(1). The word count was calculated by using Microsoft Word's word count from Sections I-III, V, and VI.

As per the Board's email (EX3002) authorizing additional words to address the priority date arguments, Petitioner certifies that there are less than 5,000 words in Section IV pertaining to priority date.

March 13, 2026

Date

/s/ David J. Tobin

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LEAD ATTORNEY FOR PETITIONERS

CERTIFICATE OF SERVICE

Pursuant to 37 CFR § 42.6(e)(4), the undersigned certifies that on March 13, 2026, a complete copy of the foregoing Petitioners' Reply to Patent Owner's Response and Exhibits 1147-1160 was served on Lead and Back-up Counsel for Petitioner at the service address provided in Patent Owner's Mandatory Notices:

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March 13, 2026

Date

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