

UNITED STATES PATENT AND TRADEMARK OFFICE

PATENT TRIAL AND APPEAL BOARD

PacifiCorp,
Interstate Power & Light Company,
MidAmerican Energy Company,
WEC Energy Group, Inc., and
Wisconsin Power & Light Company

Petitioners

v.

Birchtech Corp.

Patent Owner

IPR2025-00688
Patent No. 10,933,370

PETITION FOR *INTER PARTES* REVIEW

TABLE OF CONTENTS

TABLE OF CONTENTS	i
TABLE OF AUTHORITIES	iv
TABLE OF EXHIBITS.....	vii
TABLE OF CHALLENGED CLAIMS.....	xxii
I. INTRODUCTION	1
II. MANDATORY NOTICES [37 C.F.R. §42.8(A)(1)].....	1
A. Real Party-In-Interest [37 C.F.R. §42.8(b)(1)]	1
B. Related Matters [37 C.F.R. §42.8(b)(2)].....	2
C. Lead and Back-Up Counsel [37 C.F.R. §42.8(b)(3)].....	7
D. Service Information [37 C.F.R. §42.8(b)(4)]	9
III. FEES	9
IV. REQUIREMENTS FOR <i>INTER PARTES</i> REVIEW [37 C.F.R. §42.104(a), (b)(1)-(b)(3)]	10
A. Standing.....	10
B. Identification of Challenged Claims and Grounds.....	10
C. Claim Construction [37 CFR §42.104(b)(3)].....	10
V. OVERVIEW OF '370 PATENT	11
A. Level of Ordinary Skill	11
B. The Alleged Invention of the '370 Patent.....	11
C. Prosecution History of the '370 Patent	12
D. State of the Art	16
1. Mercury and Halogens.....	16
2. Coal-Fired Power Plants	17
3. EPA Regulations.....	17
4. Mercury Removal Using Activated Carbon and Halogens.....	18
VI. THE '370 PATENT IS NOT ENTITLED TO PRIORITY BEFORE THE ASSERTED ART	19
A. Requirements to Demonstrate Priority.....	21
B. No Support in Parent Applications	22

C.	PO Cannot Rely on the Provisional for Support	25
1.	The Reference to the Provisional Is Unclear and Is Ineffective	26
2.	The Provisional Is “Essential Material”	27
3.	The Provisional Does Not Support the ’370 Patent Claims	33
VII.	THE ASSERTED REFERENCES	36
A.	Sjostrom (EX1010) and Eckberg (EX1011)	37
B.	Olson-646 (EX1012)	39
C.	Baldrey (EX1015)	39
D.	Analogous Art	40
VIII.	GROUND 1: ANTICIPATION OF THE CHALLENGED CLAIMS (Baldrey)	41
A.	Overview of EX1015 (“Baldrey”).....	41
B.	Disclosure of Baldrey	42
1.	Independent Claim 1	42
2.	Claims Depending from Claim 1	49
3.	Independent Claim 17	55
IX.	GROUND 2: OBVIOUSNESS OVER BALDREY IN VIEW OF OLSON- 646.....	56
A.	Overview of EX1012 (“Olson-646”)	56
B.	Overview of the Combination and Reasons to Combine	58
C.	Disclosure and Teachings of the Combination	58
1.	Independent Claim 1	59
2.	Claims Depending from Claim 1	61
3.	Other Claims	65
X.	GROUND 3: OBVIOUSNESS OVER SJOSTROM IN VIEW OF OLSON- 646.....	65
A.	Overview of EX1010 (“Sjostrom”).....	65
B.	Overview of the Combination and Reasons to Combine	66
C.	Disclosure and Teachings of the Combinations.....	69
1.	Independent Claim 1	69

2.	Claims Depending from Claim 1	80
3.	Independent Claim 17	89
XI.	GROUND 4: OBVIOUSNESS OVER SJOSTROM IN VIEW OF OLSON-646, FURTHER IN VIEW OF ECKBERG	90
A.	Overview of EX1011 (“Eckberg”)	91
B.	Overview of the Combination and Reasons to Combine	92
C.	Disclosure and Teachings of the Combination	95
1.	Independent Claim 1	95
2.	Claims Depending from Claim 1	97
3.	Independent Claim 17	99
4.	Other Claims	100
XII.	THE BOARD SHOULD NOT DISCRETIONARILY DENY INSTITUTION	100
XIII.	CONCLUSION	102
	CERTIFICATE OF COMPLIANCE	104
	CERTIFICATE OF SERVICE	105

TABLE OF AUTHORITIES

	Page(s)
Cases	
<i>In re Applied Materials, Inc.</i> , 692 F.3d 1289 (Fed. Cir. 2012)	<i>passim</i>
<i>Ariad Pharms., Inc. v. Eli Lilly & Co.</i> , 598 F.3d 1336 (Fed. Cir. 2010)	34
<i>Becton, Dickinson & Co. v. B. Braun Melsungen AG</i> , IPR2017-01586, Paper 8 (Dec. 15, 2017)	101, 102
<i>Belcher Pharms., LLC v. Hospira, Inc.</i> , 11 F.4th 1345 (Fed. Cir. 2021)	16
<i>Callaway Golf Co. v. Acushnet Co.</i> , 576 F.3d 1331 (Fed. Cir. 2009)	26
<i>DDR Holdings, LLC v. Priceline.com LLC</i> , 122 F.4th 911 (Fed. Cir. 2024)	25
<i>Droplets, Inc. v. E*TRADE Bank</i> , 887 F.3d 1309 (Fed. Cir. 2018)	25
<i>GoPro, Inc. v. Contour IP Holding LLC</i> , 908 F.3d 690 (Fed. Cir. 2018)	37
<i>Koninklijke Philips N.V. v. Google LLC</i> , 948 F.3d 1330 (Fed. Cir. 2020)	16
<i>Lockwood v. Am. Airlines, Inc.</i> , 107 F.3d 1565 (Fed. Cir. 1997)	21, 22, 25, 28
<i>Maquet Cardiovascular LLC v. Abiomed, Inc.</i> , 627 F. Supp. 3d 72 (D. Mass. 2022)	29
<i>Midwest Energy Emissions Corp. v. Arthur J. Gallagher</i> , No. 19-1334-CJB, 2023 WL 7411160 (D. Del. Nov. 3, 2023)	26

<i>Mueller Sys., LLC v. Rein Tech, Inc.</i> , IPR2020-00100, 2020 WL 2478524 (P.T.A.B. May 12, 2020)	19
<i>NRG Energy, Inc. et al. v. Midwest Energy Emissions Corp.</i> , IPR2020-00832, Paper 17, 2020 WL 6277239 (P.T.A.B. Oct. 26, 2020)	4, 27, 28, 32
<i>NRG Energy, Inc. et al. v. Midwest Energy Emissions Corp.</i> , IPR2020-00834, Paper 18, 2020 WL 6277747 (P.T.A.B. Oct. 26, 2020)	4
<i>NRG Energy, Inc. et al. v. Midwest Energy Emissions Corp.</i> , IPR2020-00926, Paper 19, 2020 WL 7061347 (P.T.A.B. Dec. 2, 2020)	5
<i>NRG Energy, Inc. et al. v. Midwest Energy Emissions Corp.</i> , IPR2020-00928, Paper 17, 2020 WL 7074473 (P.T.A.B. Dec. 2, 2020)	<i>passim</i>
<i>Pfizer Inc. v. Sanofi Pasteur Inc.</i> , 94 F.4th 1341 (Fed. Cir. 2024)	60, 76, 82, 89
<i>PowerOasis, Inc. v. T-Mobile USA, Inc.</i> , 522 F.3d 1299 (Fed. Cir. 2008)	19, 22
<i>Tronzo v. Biomet, Inc.</i> , 156 F.3d 1154 (Fed. Cir. 1998)	20
<i>UCB, Inc. v. Actavis Lab'ys UT, Inc.</i> , 65 F.4th 679 (Fed. Cir. 2023)	59
<i>Zenon Env't., Inc. v. U.S. Filter Corp.</i> , 506 F.3d 1370 (Fed. Cir. 2007)	26
<i>ZTE (USA), Inc. v. CyWee Grp. Ltd.</i> , IPR2019-00143, 2021 WL 641742 (P.T.A.B. Feb. 17, 2021)	28
Statutes	
35 U.S.C. § 112(a)	28
35 U.S.C. § 122(b)(2)(A)(iii)	27

35 U.S.C. § 314(a) 100

35 U.S.C. § 325(d) 101

Other Authorities

37 C.F.R. § 1.57 32

37 C.F.R. § 1.57(b) 33

37 C.F.R. § 1.57(c).....27

37 C.F.R. § 1.57(d) 27, 28, 29, 32

37 C.F.R. § 1.57(d)(1).....28

M.P.E.P. § 201.08 19, 102

M.P.E.P. § 217 33

M.P.E.P. § 608.01(p)(I) 32, 33

TABLE OF EXHIBITS

Exhibit	Description of Exhibits
1001	U.S. Patent No. 10,933,370 to Olson et al. (filed April 12, 2018) (“370 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. 10,933,370 (“370 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”)

Exhibit	Description of Exhibits
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	U.S. Patent Publication No. 2011/0030592 to Baldrey (filed Feb. 10, 2011) (“Baldrey”)
1016	RESERVED
1017	RESERVED
1018	RESERVED
1019	File History of U.S. Patent Application No. 15/974,343, which ultimately issued as U.S. Patent No. 10,668,430 (“430 Patent File History”).
1020	File History of U.S. Patent Prov. App. No. 60/605,640 (“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”)

Exhibit	Description of Exhibits
1024	RESERVED
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-

Exhibit	Description of Exhibits
	Boiler-Provisional as the original version (“Downs-Boiler-Redline”)
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”)

Exhibit	Description of Exhibits
1041	N.N. Greenwood and A. Earnshaw, CHEMISTRY OF THE ELEMENTS, 2nd ed. (Butterworth-Heinemann: 1997) (“ Greenwood ”)
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 ”)

Exhibit	Description of Exhibits
1049	NETL - Mercury Emissions Control, February, 2003, available at https://web.archive.org/web/20030315093905fw_/http://www.netl.doe.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/eurtcl.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.g

Exhibit	Description of Exhibits
	ov/coalpower/environment/mercury/regs.html (“ Mercury Emissions Control ”)
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

Exhibit	Description of Exhibits
	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 ”)
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	RESERVED
1067	U.S. Patent No. 10,589,225
1068	RESERVED

Exhibit	Description of Exhibits
1069	U.S. Patent Pub. No. 2018/0229182 to Olson et al. (published Aug. 16, 2018) (“Published ’970 Application”)
1070	Roop Chand Bansal, et al., ACTIVE CARBON (Marcel Dekker:1988). (“Bansal”)
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

Exhibit	Description of Exhibits
	& 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 95th Annual 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 June 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”)

Exhibit	Description of Exhibits
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/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 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)

Exhibit	Description of Exhibits
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 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.

Exhibit	Description of Exhibits
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.
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

Exhibit	Description of Exhibits
1104	<i>IN RE: MIDWEST ENERGY EMISSIONS CORP. PATENT LITIGATION</i> , No. 4:24-md-03132-SHL-WPK, Dkt. No. 60 (S.D. Iowa Mar. 7, 2025) (“ Dkt No. 60 ”)
1105	<i>NRG Energy, Inc. et al. v. Midwest Energy Emissions Corp.</i> , IPR2020-00926, Paper 13 (P.T.A.B. Sep. 4, 2020)
1106	Clarion Energy Content Directors, “A Variety of Hg Capture Solutions Are Available” (June 1, 2009), available at https://www.power-eng.com/environmental-emissions/a-variety-of-hg-capture-solutions-are-available/ (“ Variety of Hg Capture Solutions ”)
1107	Modern Power Systems, “Full scale tests show KNXTM is effective for mercury control” (October 1, 2009), available at https://www.modernpowersystems.com/analysis/full-scale-tests-show-knxtm-is-effective-for-mercury-control/ (“ KNXTM is effective ”)

Other than prosecution histories, EX1019-EX1023, EX1025-EX1026, all citations to exhibits reference original page numbers found in the underlying document, and all emphases are added.

TABLE OF CHALLENGED CLAIMS

Claim Element	Claim Language from '370 Patent
1(Preamble)	1(pre). A method for separating mercury from a mercury-containing gas, the method comprising:
1(a)	combusting a mixture of coal and an additive in a combustion chamber, to form the mercury-containing gas, wherein the additive is chosen from halides, halogens, salts thereof, and combinations thereof;
1(b)	adding a particulate sorbent material comprising activated carbon into the mercury-containing gas,
1(c)	wherein a weight ratio of the additive added to the coal, added to the combustion chamber, or a combination thereof, to an amount of the sorbent material added to the mercury-containing gas is from about 1:100 to about 30:100;
1(d)	contacting mercury in the mercury-containing gas with the sorbent material, to form a mercury-sorbent; and
1(e)	separating the mercury-sorbent from the mercury-containing gas.
2	2. The method of claim 1, further comprising adding the additive to the coal before combusting the coal.
3	3. The method of claim 2, wherein the additive mixed with the coal is in a liquid.
4	4. The method of claim 3, wherein the liquid is a hydrocarbon, supercritical carbon dioxide, water, salt solution, or a combination thereof.
5	5. The method of claim 1, wherein carbocations in the activated carbon of the mercury-sorbent accept electrons from mercury atoms of the mercury-sorbent.

Claim Element	Claim Language from '370 Patent
6	6. The method of claim 1, wherein the additive is substantially in vapor form in the mercury-containing gas.
7	7. The method of claim 1, wherein the additive is chosen from Cl ₂ , HCl, sodium chloride, calcium chloride, and a combination thereof.
8	8. The method of claim 1, wherein the additive is chosen from Br ₂ , HBr, sodium bromide, calcium bromide, and a combination thereof.
9	9. The method of claim 1, wherein the additive is chosen from PBr ₃ , SCl ₂ , and a combination thereof.
10	10. The method of claim 1, wherein the additive is chosen from I ₂ , HI, sodium iodide, calcium iodide, potassium iodide, and combinations thereof.
11	11. The method of claim 1, wherein the activated carbon is chosen from powdered activated carbon, granular activated carbon, carbon black, carbon fiber, aerogel carbon, pyrolysis char, and combinations thereof.
12	12. The method of claim 1, further comprising adding an alkaline component to the mercury-containing gas, the alkaline component chosen from alkali elements, alkaline earth elements, alkali salts, alkaline earth salts, and combinations thereof.
13	13. The method of claim 1, further comprising contacting the sorbent material with a mercury-stabilizing reagent chosen from S, Se, H ₂ S, SO ₂ , H ₂ Se, SeO ₂ , CS ₂ , P ₂ S ₅ , and combinations thereof.
14	14. The method of claim 1, further comprising contacting the sorbent material with a secondary component chosen from halogens, hydrogen halides, Group V halides, Group VI halides, and combinations thereof.

Claim Element	Claim Language from '370 Patent
15	15. The method of claim 14, wherein the secondary component is chosen from halogens, halide salts, HI, HBr, HCl, and combinations thereof.
16	16. The method of claim 14, wherein the secondary component is chosen from I ₂ , HI, and combinations thereof.
17(preamble)	17. A method for separating mercury from a mercury-containing gas, the method comprising:
17(a)	combusting coal comprising an additive in a combustion chamber, wherein the additive is chosen from halides, halogens, salts thereof, and combinations thereof, to form the mercury-containing gas, wherein the additive comprises a and b, b and c, a and c, or a, b, and c: a) I ⁻ and/or I ₂ , b) Br ⁻ and/or Br ₂ , c) Cl ⁻ and/or Cl ₂ ;
17(b)	injecting a sorbent material comprising activated carbon into the mercury-containing gas,
17(c)	wherein a weight ratio of the additive added to the coal, added to the combustion chamber, or a combination thereof, to an amount of the sorbent material added to the mercury-containing gas is from about 1:100 to about 30:100;
17(d)	contacting mercury in the mercury-containing gas with the sorbent material, to form a mercury-sorbent; and
17(e)	separating the mercury-sorbent from the mercury-containing gas.

Claim Element	Claim Language from '370 Patent
18	18. The method of claim 1, wherein the additive comprises a and b, b and c, a and c, or a, b, and c: a) I^- and/or I_2 , b) Br^- and/or Br_2 , c) Cl^- and/or Cl_2 .

I. INTRODUCTION

Petitioners request IPR of Claims 1-18 of U.S. Patent 10,933,370 (“**370 Patent**” or “**Challenged Patent**”). EX1001. The Petition is supported by the expert declaration of Dr. Stephen Niksa.¹ EX1002 (declaration); EX1003 (CV).

II. MANDATORY NOTICES [37 C.F.R. §42.8(A)(1)]

A. REAL PARTY-IN-INTEREST [37 C.F.R. §42.8(B)(1)]

The real parties-in-interest are the Petitioners: PacifiCorp; Interstate Power & Light Company; MidAmerican Energy Company; WEC Energy Group, Inc.; and Wisconsin Power & Light Company (collectively, “**Petitioners**”).

Petitioners also identify the following real-parties-in-interest (in addition to the Petitioners themselves): Alliant Energy Corporation; Alliant Energy Corporate Services, Inc; and Berkshire Hathaway Energy Company. These entities were previously parties to the lawsuit in the Southern District of Iowa where they have been accused of infringing the Challenged Patent.

Petitioner PacifiCorp identifies the following additional real-parties-in-interest: Berkshire Hathaway Energy Company; MidAmerican Funding, LLC; MHC Inc.; and PPW Holdings LLC.

¹ Named inventor of the Challenged Patent, Mr. Pavlish, admitted that Dr. Niksa is knowledgeable in the field. EX1097, 253:21–254:17.

Petitioner Interstate Power & Light Company identifies the following additional real-parties-in-interest: Alliant Energy Corporation and Alliant Energy Corporate Services, Inc.

Petitioner MidAmerican Energy Company identifies the following additional real-parties-in-interest: MidAmerican Funding, LLC and MHC Inc.

Petitioner Wisconsin Power & Light Company identifies the following additional real-parties-in-interest: Alliant Energy Corporation; Alliant Energy Corporate Services, Inc.; and Madison Gas and Electric Company.

Other than Petitioners and the above-identified real-parties-in-interest, no other person or entity is funding this petition, advising on strategy for this petition, or exercising any control over Petitioners' decision to file the petition (or the arguments included therein).

Petitioner WEC Energy Group, Inc., out of an abundance of caution, also identifies Wisconsin Public Service Corporation as a potential real party-in-interest to the Petitioner WEC Energy Group, Inc. This potential real-party-in-interest is not funding this petition, advising on strategy for this petition, or exercising any control over Petitioners' decision to file the petition (or the arguments included therein).

B. RELATED MATTERS [37 C.F.R. §42.8(B)(2)]

Petitioners are concurrently filing a second petition against the Challenged Patent. The current petition asserts a priority date of no earlier than April 12, 2018,

the filing date of the '370 Patent , because the earlier-filed applications to which the '370 Patent claims priority do not contain written-description support for the Challenged Claims. The other petition assumes *arguendo* that the Challenged Claims of the '370 Patent have priority back to the earliest-filed Provisional Application, August 30, 2004.

Petitioners previously filed two petitions against U.S. Patent No. 10,343,114 (“the '114 Patent”), a counterpart with substantially similar claims. Petitioners also filed two petitions against U.S. Patent No. 10,596,517 (“the '517 Patent”), two petitions against U.S. Patent No. 10,668,430 (“the '430 Patent”), and two petitions against U.S. Patent No. 10,589,225 (“the '225 Patent”)—counterpart patents with substantially similar claims:

- *Berkshire Hathaway Energy Co. et al. v. Birchtech Corp.*, IPR2025-00274, Paper 1 (P.T.A.B. Jan. 17, 2025).
- *Berkshire Hathaway Energy Co. et al. v. Birchtech Corp.*, IPR2025-00278, Paper 1 (P.T.A.B. Jan. 17, 2025).
- *Berkshire Hathaway Energy Co. et al. v. Birchtech Corp.*, IPR2025-00280, Paper 1 (P.T.A.B. Jan. 24, 2025).
- *Berkshire Hathaway Energy Co. et al. v. Birchtech Corp.*, IPR2025-00281, Paper 1 (P.T.A.B. Jan. 24, 2025).
- *Berkshire Hathaway Energy Co. et al. v. Birchtech Corp.*, IPR2025-00422, Paper 1 (P.T.A.B. Feb. 11, 2025).
- *Berkshire Hathaway Energy Co. et al. v. Birchtech Corp.*, IPR2025-00423, Paper 1 (P.T.A.B. Feb. 11, 2025).

- *PacifiCorp et al. v. Birchtech Corp.*, IPR2025-00424, Paper 1 (P.T.A.B. Mar. 4, 2025).
- *PacifiCorp et al. v. Birchtech Corp.*, IPR2025-00425, Paper 1 (P.T.A.B. Mar. 4, 2025)

Though no petitions for IPR have previously been filed against the '370 Patent, the Board previously granted institution of IPR on two petitions against the related '114 Patent that had been filed by NRG, Vistra, and Talen in the following proceedings:

- *NRG Energy, Inc. et al. v. Midwest Energy Emissions Corp.*, IPR2020-00832, Paper 17, 2020 WL 6277239 (P.T.A.B. Oct. 26, 2020). EX1026, 16-63.
- *NRG Energy, Inc. et al. v. Midwest Energy Emissions Corp.*, IPR2020-00834, Paper 18, 2020 WL 6277747 (P.T.A.B. Oct. 26, 2020). EX1026, 64-108.

Prior to institution, Vistra and Midwest Energy Emissions Corp. (“ME2C” or “Patent Owner” (“PO”)) filed a joint motion to terminate as to Vistra as a result of settlement. Shortly after institution, before ME2C filed any patent owner response (37 CFR §42.120), the remaining petitioners (NRG and Talen) and ME2C jointly requested that the proceedings be terminated pursuant to a settlement. EX1026, 1-10.

After NRG, Vistra, and Talen filed the petitions in IPR2020-00832 and IPR2020-00834, AEP Generation Resources Inc. filed two petitions which it characterized as “copycat” petitions. AEP stated that if the petitions were granted

in IPR2020-00832 and IPR2020-00834, then AEP “will file a motion for joinder under 37 CFR §§42.22 and 42.122(b) to join the instituted prior IPRs.” IPR2020-01294 and IPR2020-01295, Paper 2 (July 15, 2020). AEP withdrew its petitions prior to institution. EX1026, 12-15.

The Board also granted institution of IPR on two petitions against U.S. Patent No. 8,168,147 (“the ’147 Patent”)—a parent patent to the ’370 Patent with overlapping priority-date issues—that had been filed by NRG, Vistra, and Talen in the following proceedings:

- *NRG Energy, Inc. et al. v. Midwest Energy Emissions Corp.*, IPR2020-00926, Paper 19, 2020 WL 7061347 (P.T.A.B. Dec. 2, 2020).
- *NRG Energy, Inc. et al. v. Midwest Energy Emissions Corp.*, IPR2020-00928, Paper 17, 2020 WL 7074473 (P.T.A.B. Dec. 2, 2020).

As with the IPR2020-00832 and IPR2020-00834 proceedings, the IPR2020-00926 and IPR2020-00928 proceedings were jointly terminated pursuant to settlement shortly after institution.

Patent Owner has asserted the Challenged Patent in district court in the following matters:

- *Midwest Energy Emissions Corp. v. Tucson Electric Power Co. et al.*, No. 3:24-cv-08145-DJH (D. Ariz.) (filed July 17, 2024).
- *Midwest Energy Emissions Corp. v. Berkshire Hathaway Energy Co. et al.*, No. 4:24-cv-00248 (S.D. Iowa) (filed July 17, 2024).
- *Midwest Energy Emissions Corp. v. Ameren Corp. et al.*, No. 4:24-cv-00980 (E.D. Mo.) (filed July 17, 2024).

- *In re Midwest Energy Emissions Corp. Pat. Litig.*, No. 4:24-md-3132 (S.D. Iowa) (consolidating the Iowa, Arizona, and Missouri cases on Dec. 17, 2024).
- *Midwest Energy Emissions Corp. v. Berkshire Hathaway Energy Co., et al.*, No. 2:25-cv-00015 (D. Wy.) (filed Jan. 14, 2025).
- *Midwest Energy Emissions Corp. v. Wisconsin Power & Light Co.*, No. 3:25-cv-00026 (W.D. Wis.) (filed Jan. 14, 2025).
- *Birchtech Corp. f/k/a/ Midwest Energy Emissions Corp. v. Evergy, Inc., et al.*, No. 4:25-cv-00050 (W.D. Mo.) (filed Jan. 23, 2025).
- *Midwest Energy Emissions Corp. v. Evergy, Inc. et al*, No. 4:25-cv-00046 (S.D. Iowa) (filed Feb. 6, 2025).

Other than WEC (who is not a defendant in any case), Petitioners have been defendants in the Iowa case. On January 10, 2025, the district court in Iowa granted a motion to dismiss, dismissing Berkshire Hathaway Energy (“BHE”) outright from the litigation and transferring PacifiCorp to the District of Wyoming. *See In re Midwest Energy Emissions Corp. Pat. Litig.*, No. 4:24-md-3132, ECF 19 (S.D. Iowa Jan. 10, 2025). In that same order, the Iowa court transferred Wisconsin Power & Light Co. to the District of Wisconsin.

According to U.S. Patent & Trademark Office Patent Center, the ’370 Patent was filed as App. No. 15/951,970 (“the ’970 Application”) on April 12, 2018, and purports to claim priority as follows:

- Continuation of U.S. Patent Application No. 14/712,558, filed on May 14, 2015 (“the ’558 Application”) and issued on March 17, 2020, as U.S. Patent No. 10,589,225, which is a:

- Continuation of U.S. Patent Application No. 14/318,270, filed on June 27, 2014 (“the ’270 Application”) and issued on September 12, 2017, as U.S. Patent No. 9,757,689, which is a:
- Continuation of U.S. Patent Application No. 13/966,768, filed on August 14, 2013 (“the ’768 Application”) and issued on September 2, 2014, as U.S. Patent No. 8,821,819, which is a:
- Continuation of U.S. Patent Application No. 13/427,665, filed on March 22, 2012 (“the ’665 Application”) and issued on August 20, 2013, as U.S. Patent No. 8,512,655, which is a:
- Continuation of U.S. Patent Application No. 12/419,219, filed on April 6, 2009 (“the ’219 Application”) and issued on May 1, 2012, as U.S. Patent No. 8,168,147, which is a:
- Continuation of U.S. Patent Application No. 12/201,595, filed on Aug. 29, 2008 (“the ’595 Application”) and abandoned on September 30, 2010, which is a:
- Division of U.S. Patent Application No. 11/209,163, filed on Aug. 22, 2005 (“the ’163 Application”) and issued on September 24, 2008, as U.S. Patent No. 7,435,286, which is a non-provisional of:
- U.S. Provisional Patent Application No. 60/605,640, filed on August 30, 2004 (the “Provisional”).

The prior proceedings all involved ME2C. On November 7, 2024, ME2C filed a notice with the USPTO that it had changed its name to Birchtech Corp. *See* Reel 069187, Frame 0413. Yet, ME2C is still proceeding in the district-court litigations as a plaintiff under the ME2C name.

C. LEAD AND BACK-UP COUNSEL [37 C.F.R. §42.8(B)(3)]

LEAD COUNSEL	BACK-UP COUNSEL
Brian W. Oaks (Reg. No. 44,981) McDermott Will & Emery LLP 300 Colorado Street, Suite 2200	David J. Tobin (Reg. No. 60,776) McDermott Will & Emery LLP 2501 North Harwood Street, Suite 1900

LEAD COUNSEL	BACK-UP COUNSEL
Austin, TX 78701 Tel: 512-726-2574 Email: boaks@mwe.com	Dallas, TX 75201 Tel: (214) 210-2793 Email: dtobin@mwe.com Syed K. Fareed (Reg. No. 67,088) McDermott Will & Emery LLP 300 Colorado Street, Suite 2200 Austin, TX 78701 Tel: (512) 726-2579 Email: sfareed@mwe.com Christian T. Tatum (Reg. No. 81,270) McDermott Will & Emery LLP 300 Colorado Street, Suite 2200 Austin, TX 78701 Tel: (512) 298-4614 Email: ctatum@mwe.com
	R. Scott Johnson (Reg. No. 45,792) Fredrikson & Byron, P.A. 111 E Grand Ave, Suite 301 Des Moines, IA 50309 Tel: 515-242-8900 Email: rsjohnson@fredlaw.com Thomas M. Patton (Reg. No. 76,193) Fredrikson & Byron, P.A. 11 E. Grand Ave., Suite 301 Des Moines, IA 50309 Tel: 515-242-8900 Email: tpatton@fredlaw.com
	Michelle M. Kemp (Reg. No. 48,438) Perkins Coie LLP 33 East Main Street, Suite 201 Madison, WI 53703 Tel: (608) 663-7460

LEAD COUNSEL	BACK-UP COUNSEL
	Email: MKemp@perkinscoie.com
	Michael T. Piery (Reg. No. 71915) QUARLES & BRADY LLP 411 E Wisconsin Avenue, Suite 2400 Milwaukee, WI 53202 Tel.: (414) 277-5000 E-mail: michael.piery@quarles.com
	Lauren C. Bolcar (Reg. No. 68994) QUARLES & BRADY LLP 2020 K Street NW, Suite 400 Washington, DC 20006 Tel.: (202) 372-9600 E-mail: lauren.bolcar@quarles.com

D. SERVICE INFORMATION [37 C.F.R. §42.8(B)(4)]

Petitioners may be served at lead counsel's address provided above and consent to e-mail service, provided it is made to all the following e-mail addresses:

dtobin@mwe.com; boaks@mwe.com; PacifiCorp-PTAB-ME2C@mwe.com;
mkemp@perkinscoie.com; rsjohnson@fredlaw.com; tpatton@fredlaw.com;
MidAmerican@fredlaw.com; Michael.piery@quarles.com;
lauren.bolcar@quarles.com.

III. FEES

Payment for fees is authorized from Deposit Account 50-0417.

IV. REQUIREMENTS FOR *INTER PARTES* REVIEW [37 C.F.R. §42.104(A), (B)(1)-(B)(3)]

A. STANDING

Petitioners certify the '370 Patent is eligible for IPR, and Petitioners are not barred or estopped from requesting IPR challenging the identified claims on the grounds herein.

B. IDENTIFICATION OF CHALLENGED CLAIMS AND GROUNDS

There is a reasonable likelihood that the petitioned claims are unpatentable as follows:

Ground	'370 Claims	Basis for Challenge
1.	1-4, 6-8, 10-11, 13-18	§102: Anticipated by Baldrey (EX1015)
2.	1-18	§103: Obvious over Baldrey (EX1015) and Olson-646 (EX1012)
3.	1-18	§103: Obvious over Sjostrom (EX1010) and Olson-646 (EX1012)
4.	1-18	§103: Obvious over Sjostrom (EX1010), Olson-646 (EX1012), and Eckberg (EX1011)

EX1002 ¶13.

C. CLAIM CONSTRUCTION [37 CFR §42.104(B)(3)]

Petitioners do not, at this time, contend that any term requires construction. All terms have been accorded their plain and ordinary meaning. EX1002 ¶¶212-215.

V. OVERVIEW OF '370 PATENT

A. LEVEL OF ORDINARY SKILL

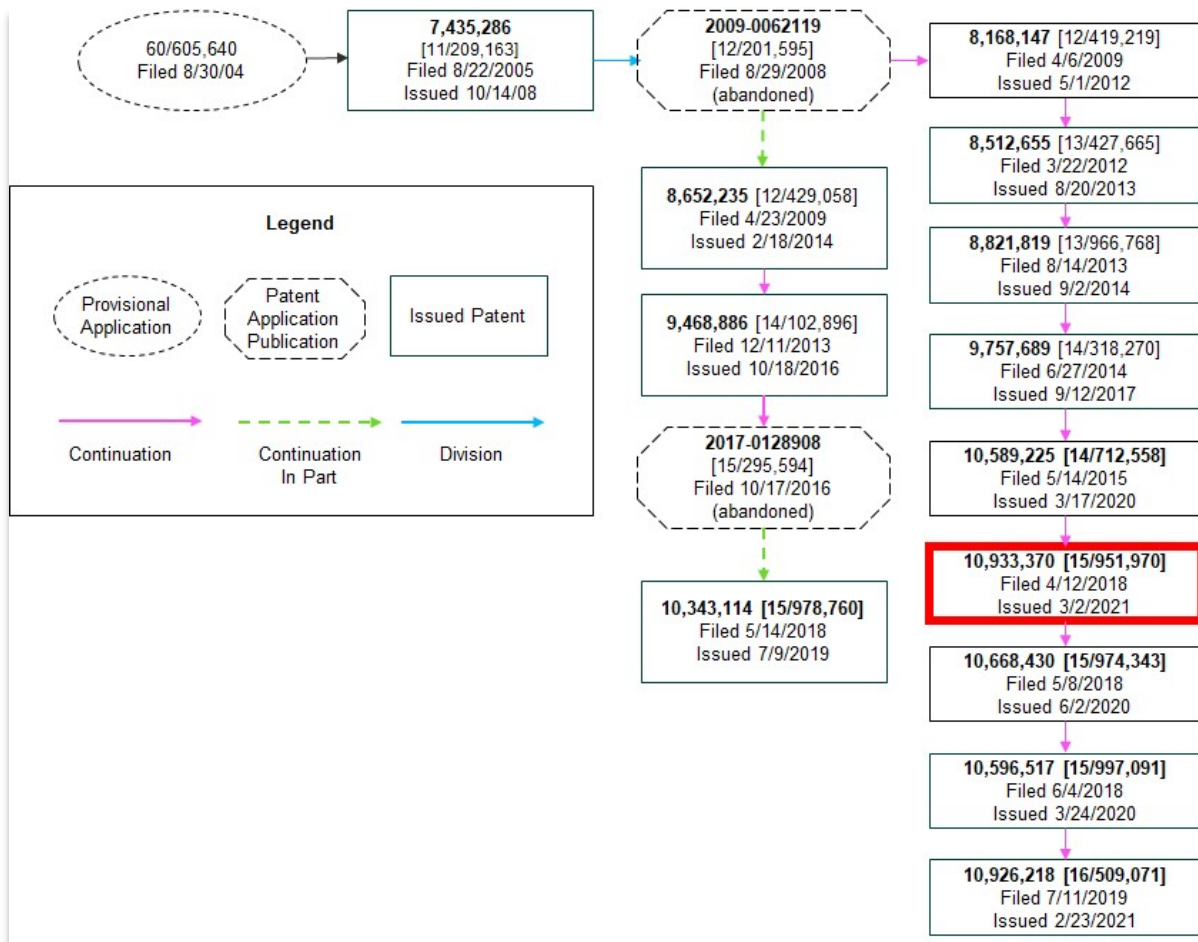
A person of ordinary skill in the art (“POSITA”) would have at least a bachelor’s degree in chemical engineering, mechanical engineering, or a related field of study with at least two years of experience implementing pollution control in power generation plants for natural gas, coal, and/or industrial waste incineration. EX1002 ¶¶48-51.

B. THE ALLEGED INVENTION OF THE '370 PATENT

The '370 Patent relates to removing mercury from flue gas. EX1001, 1:41-45. The Patent admits that known “mercury control methods” included injecting activated-carbon sorbent, including “expos[ing] a finely powdered activated carbon to a molecular bromine gas at an elevated temperature or to HBr to produce a sorbent with good mercury removal ability.” EX1001, 2:2-7, 30:27-32. Each independent claim includes: adding an additive chosen from halides, halogens, salts thereof, and combinations thereof to coal; combusting the coal; and contacting mercury in the resulting mercury-containing gas with activated-carbon sorbent, added within a claimed range of weight ratios compared with the additive. Even this combination of elements was known in the art. EX1002 ¶¶152-156, 208-211.

C. PROSECUTION HISTORY OF THE '370 PATENT

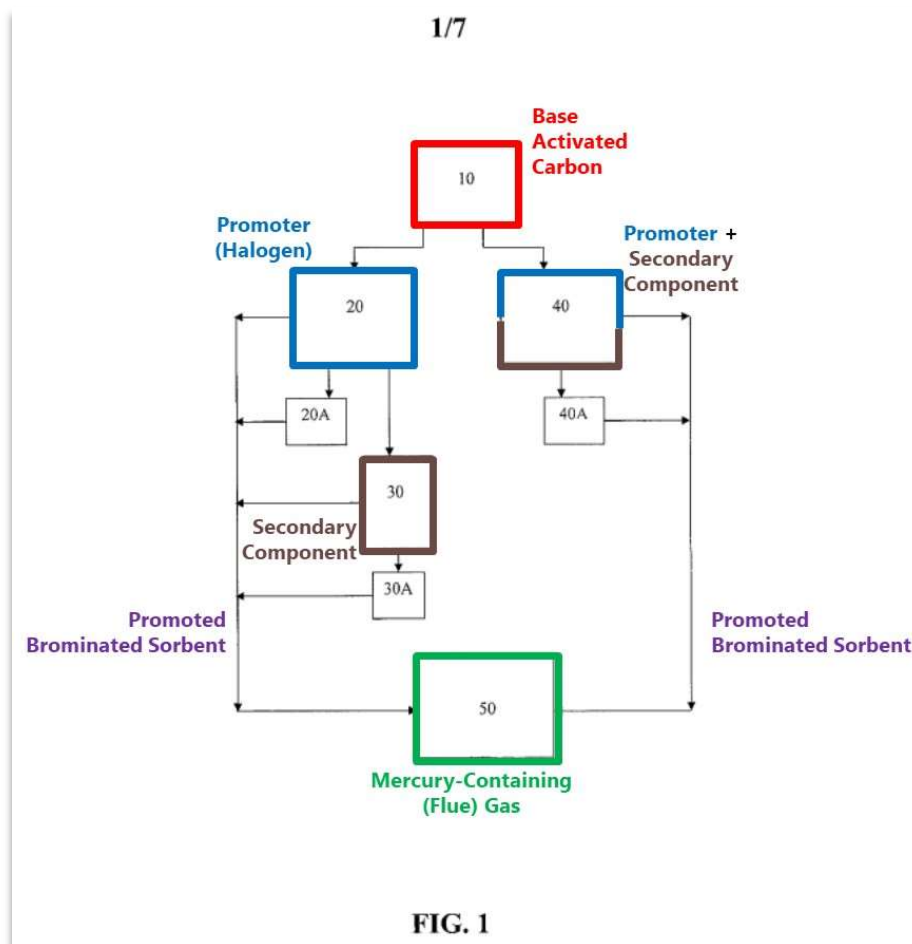
The '370 Patent was filed April 12, 2018, as Application 15/951,970 (“’970 Application”) (EX1019), ultimately stemming from App. No. 60/605,640 (the “Provisional”) (EX1020) filed August 30, 2004. EX1002 ¶¶157-165.

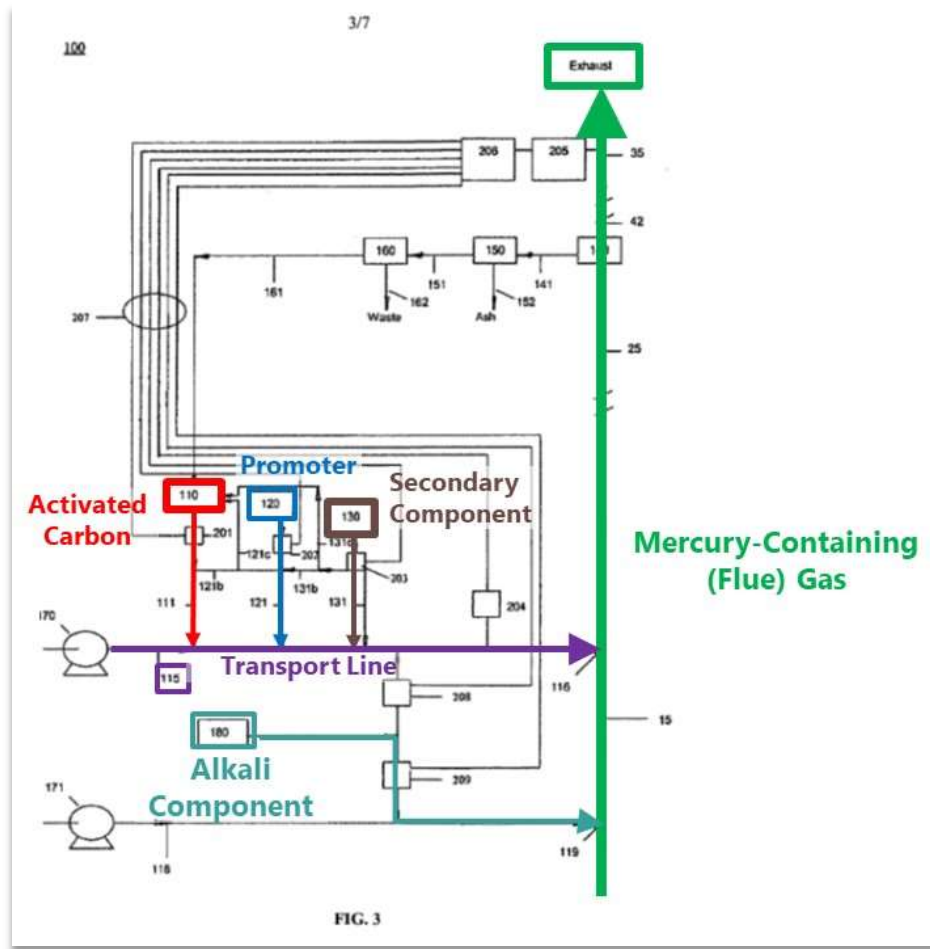


EX1004 (annotated).

Prior to the '970 Application, the parent specifications were directed to preparing brominated activated-carbon sorbent outside mercury-containing flue gas and then injecting the pre-brominated sorbent into mercury-containing flue gas

(downstream from the combustion chamber), as shown in Figures 1 and 3 of the '595 Application (filed 8/29/2008):





EX1022, 295, 297 (annotated); EX1002 ¶¶180-185. The power-generation industry, however, combined the two known components in a different way; they applied halogens directly to coal before combustion, so the halogens contact activated-carbon sorbent inside the mercury-containing gas. PO improperly filed the '970 Application (EX1023) in April 2018 as a continuation; it amended the specification to add significantly more disclosure than the preceding '558 Application. See EX1063-EX1064 (redline comparisons).

During prosecution, the claims were amended in November 2020 to add a ratio to the claims:

Independent claim 1 is presently amended to recite “...wherein a weight ratio of I_2 , Br_2 , Br_2 , Cl_2 , Cl_2 , or a combination thereof in the additive fed to the combustion chamber to an amount of the sorbent material added to the mercury-containing gas is from 1:100 to 30:100...”
Independent claim 20 is correspondingly amended. Support can be found in the present published U.S. application at paragraphs [0021], [0025], and [0072].

Applicants distinguished prior art based on this amendment. EX1023, 1592-1609.²

Two months earlier, in September 2020, PO argued to the PTAB for a parent to the '370 Patent (in order to seek an earlier invention date) that the 1-30 ratio should be given “no patentable weight.”

Here, Petitioners' expert testified—and ME2C does not dispute—that the 1%-30% range limitation is not entitled to any patentable weight. See Ex. 1003 at ¶ 369 (“Through routine process optimization and routine experimentation, a POSITA would have adjusted the rate of addition of the promoter and/or the rate of addition of the sorbent material to achieve a range from about 1 g to about 30 g of promoter per 100 grams of the sorbent material . . . The range presented nothing more than optimization of result-effective variables that would have been obvious to a POSITA.”).

EX1105 (IPR2020-00926, Paper 13), 34-35. The '370 Patent examiner was not provided with this information and ultimately allowed the claims based on the 1-

² The claims were ultimately amended by the Examiner to replace the specified ions and molecular halogens with “additive.” EX1023, 1576.

30% ratio. EX1002 ¶¶162-165; EX1023, 1574; *see Belcher Pharms., LLC v. Hospira, Inc.*, 11 F.4th 1345 (Fed. Cir. 2021) (“alleged critical improvement over the prior art was therefore already within the public domain, just not before the examiner”).

D. STATE OF THE ART

The inquiry into whether the “differences between the invention and the prior art would have rendered the invention obvious to a [POSITA] necessarily depends on such artisan’s knowledge,” including “assessment of the background knowledge possessed” by a POSITA. *Koninklijke Philips N.V. v. Google LLC*, 948 F.3d 1330, 1337 (Fed. Cir. 2020) (citations omitted). The subjects below would have been “within the general knowledge of a skilled artisan” by 2004. *Id.* at 1338. EX1002 ¶52.

1. Mercury and Halogens

It was known that halogens exist in nature as diatomic molecules (e.g., Cl₂, Br₂), halides/halide compounds (e.g., sodium chloride), and hydrohalides (e.g., hydrogen bromide). EX1040; EX1002 ¶¶53-68 (chemistry fundamentals). It was known that mercury generally exists as elemental (Hg⁰) and oxidized (Hg₂²⁺ (mercurous) or Hg²⁺ (mercuric)). EX1052, 2-1; EX1002 ¶65.

2. Coal-Fired Power Plants

It was known that pulverized-coal firing was performed by feeding particle-sized coal to a combustion chamber, known as a “boiler.” EX1027, 11-13, 12-2, 12-8, 13-1, 18-1. Combustion gases with entrained particles, mercury (Hg), and other pollutants are referred to as flue gases. EX1027, 19-1; EX1053, 1.1-1 to 1.1-11; EX1002 ¶¶69-77 (discussing EX1027, Plate 8, 8-3, 13-3–13-5, 18-2, 18-3, 19-6).

Various downstream components were used to control undesirable flue-gas constituents, including electrostatic precipitators (“ESP”) for particulates. EX1027, 33-1–33-7; EX1053, 1.1-6–1.1-9; EX1037; EX1045; EX1002 ¶¶78-96, 211.

3. EPA Regulations

It was known that mercury posed health concerns. EX1051, ES-27, 7-45; EX1052, 2-6; EX1053, 1.1-1 to 1.1-11. In 2000, the EPA announced plans to further regulate mercury emissions. EX1039, 2-8. The timetable to update mercury-emissions standards was set for December 2003, to be finalized December 2004. EX1039, 8; EX1050. The EPA passed the Clean Air Mercury Rule in 2005, but gave the industry advanced notice. EX1055-EX1058. State governments were also interested in regulating mercury emissions. EX1009. The power-generation industry mobilized a massive response to evaluate mercury-emissions controls in the early 2000s. EX1039; EX1049; EX1002 ¶¶116-128.

4. Mercury Removal Using Activated Carbon and Halogens

Even before EPA regulations, activated-carbon sorbents were used to remove mercury, and researchers were investigating improving their effectiveness. EX1060, 2-54; EX1038; EX1002 ¶¶97-103.

By 1998, “[a]ctivated carbons ha[d] been the most thoroughly studied sorbent for the capture of mercury.” EX1038, 22; EX1002 ¶98. The named inventors admitted that “activated carbon was the most common [or heavily] studied sorbent for mercury control.” EX1096 (Holmes), 41:5-9; EX1095 (Olson), 114:21-25; *see* EX1097 (Pavlish), 210:4-18; EX1001, 2:5-10, 28:11-19 (known “mercury control methods” included activated carbon); EX1002 ¶¶104-115, 209-211.

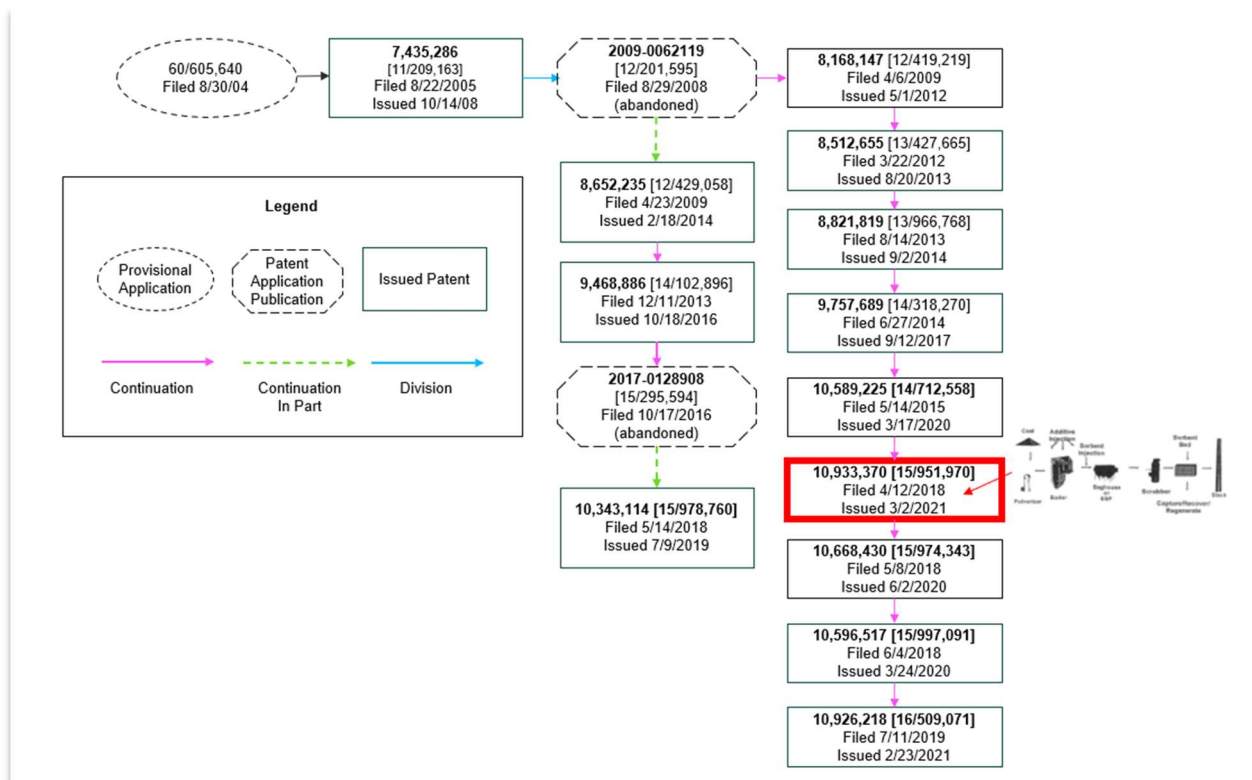
Olson admitted his research group was not the first “to conceive of adding a bromine compound to the furnace or to the flue gas.” EX1095, 145:25-146:4. By 1934, halogens were known to improve activated carbon in removing mercury. *See* EX1029, 1:33-41; *see* EX1002 ¶132. By 1970, it was shown that carbon adsorbed up to 31-38% of bromine. EX1002 ¶¶109-111; EX1042, 255-262; EX1070, iii-viii, 238, 259, 391. In 1999, researchers demonstrated that flue-gas mercury chemically bonded with halogenated activated-carbon sorbents. EX1043, 119; EX1041, 804, 1212-1213. By 2004, these findings were generalized to interpret capturing elemental and oxidized mercury on activated-carbon sorbents. EX1044, 4-5;

EX1062 at 2-3 (halides “improve[d] Hg capture both by conversion of the Hg⁰ to the more easily removed Hg²⁺ forms and by enhancing the reactivity of Hg⁰ with activated carbons”); EX1002 ¶¶129-151 (state of the art, supported by EX1005-EX1006, EX1008, EX1012-EX1014, EX1028, EX1036, EX1046-EX1048; EX1106-1107).

VI. THE '370 PATENT IS NOT ENTITLED TO PRIORITY BEFORE THE ASSERTED ART

Petitioners assert prior art dated before the 2018 filing date of the '370 Patent, including Sjostrom/Eckberg (2005), Olson-646 (2006), and Baldrey (2011). *Infra* §VII. Accordingly, the burden of production shifts to PO to “argue or produce evidence” that the '370 Patent is entitled to an earlier filing date. *Mueller Sys., LLC v. Rein Tech, Inc.*, IPR2020-00100, 2020 WL 2478524, at *10 (P.T.A.B. May 12, 2020); *see PowerOasis, Inc. v. T-Mobile USA, Inc.*, 522 F.3d 1299, 1304-05 (Fed. Cir. 2008) (burden on PO to “prove entitlement to claim priority to an earlier filing date”); M.P.E.P. §201.08 (USPTO does not make findings of priority as a matter of course during prosecution). PO cannot meet this burden.

Despite being filed as a continuation, the '970 Application specification was amended upon filing in April 2018.



EX1004 (annotated). The changes to the specification added a figure and were extensive. EX1064 (comparing '558 to '970 published applications).

Before April 2018, a POSITA would not have concluded Applicants were in possession of the subject matter of the issued claims of the '370 Patent. Limitations from independent claims that deprive the '370 Patent of earlier priority (collectively, “Newly-Introduced Limitations”) are directed to what additive is chosen and where it is added:³

³ The claims require multiple alternatives, and each alternative must find written-description support. *See Tronzo v. Biomet, Inc.*, 156 F.3d 1154, 1158-60 (Fed. Cir.

- “combusting ... coal and an additive in a combustion chamber ..., wherein the additive is chosen from halides, halogens, salts thereof, and combinations thereof...the additive added to the coal, added to the combustion chamber, or a combination thereof” (Claims 1 and 17).
- “wherein the additive comprises a and b, b and c, a and c, or a, b: a) I⁻ and/or I₂, b) Br⁻ and/or Br₂ c) Cl⁻ and/or Cl₂” (Claim 17).

The Newly-Introduced Limitations have no written-description support in parent applications. EX1002 ¶¶166-169.

A. REQUIREMENTS TO DEMONSTRATE PRIORITY

Without support in earlier-filed applications for the Newly-Introduced Limitations, PO cannot receive a priority date before its April 2018 filing date. *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”).

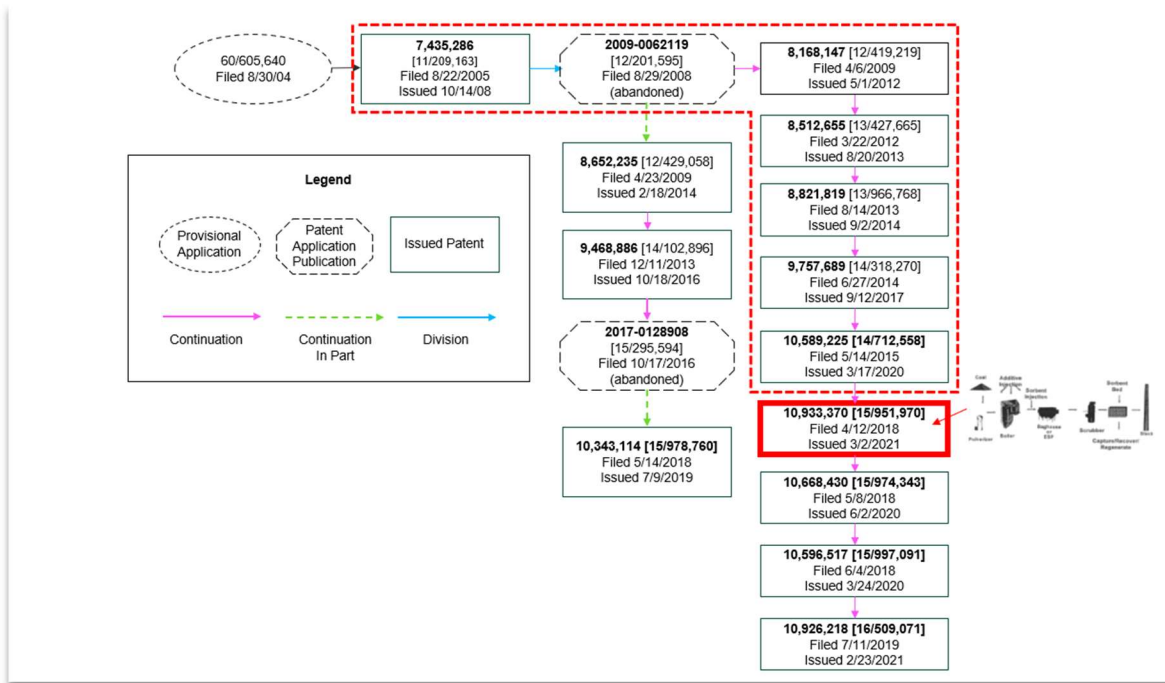
PO must demonstrate that each prior application “convey[s] with reasonable clarity to those skilled in the art that, as of the filing date sought, [the inventor] was in possession of the invention....Entitlement to a filing date does not extend to subject matter which is not disclosed, but would be obvious over what is expressly

1998) (denying priority where earlier application did not provide written-description support for the full scope of alternative shapes encompassed by the claims).

disclosed.” *PowerOasis*, 522 F.3d at 1306. “The 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, and do so in sufficient detail that one skilled in the art can clearly conclude that the inventor invented the claimed invention as of the filing date sought.” *Lockwood*, 107 F.3d at 1571-72 (emphasis added). PO must demonstrate that the Provisional and all intervening applications—expressly or inherently—disclose the Newly-Introduced Limitations.

B. NO SUPPORT IN PARENT APPLICATIONS

The Newly-Introduced Limitations 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, discussed below), the specifications (i.e., other than the claims) are substantively identical between the ’558, ’270, ’768, ’665, ’219, ’595, and ’163 Applications (shown below) (collectively, “Pre-2018 Applications”).



The Pre-2018 Applications do not support adding any halogens to the coal or combustion chamber, let alone the “halides, halogens, salts thereof, and combinations thereof” claimed in the ’370 Patent. The Pre-2018 Applications are directed to preparing brominated-activated carbon (purple) outside mercury-containing flue gas (green), and then injecting the pre-brominated sorbent into mercury-containing flue gas (green) downstream from the combustion chamber. *See supra* §V.C. Indeed, named inventor Dr. Olson confirmed that the ’147 Patent specification does not have any examples of adding bromine-containing chemicals to coal or to combustion chamber. EX1095, 128:20-129:10. He further testified that there was not “any bromine-containing promoter introduced in the system by injecting it into the combustion zone in the examples of the ’147 Patent.” EX1095,

129:1-10; *see also* EX1097 (Pavlish), 116:22-125:17 (no examples of bromine-containing chemicals added to coal); EX1093 (technical expert, O’Keefe), 156:5-170:5 (no examples of injecting activated-carbon sorbent separate from bromine-containing chemicals).

The Pre-2018 Applications also fail to disclose “halides, halogens, salts thereof, and combinations thereof” (Claims 1 and 17), because there is no disclosure of the “salts thereof,” regardless of where halides or halogens are added. First, the mention of a “salt” in the Pre-2018 Applications is one of criticism: “In the conventional view therefore, a halide-salt-treated activated carbon will not effectively oxidize elemental mercury and capture elemental mercury.” EX1022, 269 ¶[0069]. Second, as confirmed by the dependent claims, the independent ’370 Patent claims are broad enough to include Cl₂ (Claim 7) and I₂ (Claim 10) within the scope of “halogens.” The Pre-2018 Applications also criticize these options: “In the molecular elemental form of the halogens, including F₂, Cl₂, Br₂, I₂, the reaction with a hot flue gas components leave little to react with elemental mercury.” EX1022, 268-269 ¶[0068]. There is no disclosure of mixing these species with coal (Claims 1 and 17), and certainly no disclosure of mixing them in combination (Claim 17). Third, the class of materials embodied in “halides, halogens, salts thereof, and combinations thereof” in independent Claims 1 and 17 includes the following additives mixed with coal combusted in the combustion chamber: “sodium bromide”

and “calcium bromide” (Claim 8), and “sodium iodide, calcium iodide, potassium iodide” (Claim 10). These species are not even mentioned in the Pre-2018 Applications. Fourth, there is no disclosure in the Pre-2018 Applications of bromide/iodide/chloride ions as additives, and certainly not in combination with one another (Claims 17-18). The Newly-Introduced Limitations are not supported by the Pre-2018 Applications. EX1002 ¶¶185-188.

C. PO CANNOT RELY ON THE PROVISIONAL FOR SUPPORT

To the extent PO alleges that the Provisional itself provides sufficient disclosure for the Newly-Introduced Limitations in the Pre-2018 Applications, this fails because there is not an unbroken chain of support leading up to the '370 Patent. *Lockwood*, 107 F.3d at 1572 (“Each 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) (determining “skilled artisan would deem significant the [non-provisional]’s deletion of the provisional application’s” subject matter, and finding deleted matter outside scope of claims). There is no unbroken priority chain because: (1) the language referencing the Provisional was insufficient in the Pre-2018 Applications;

(2) the Provisional is “essential material” and cannot be incorporated to provide written-description support; and (3) the Provisional does not fully support the ’370 Patent claims.

1. The Reference to the Provisional Is Unclear and 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 ’370 Patent are four patents that break the priority chain: 8,168,147; 8,512,655; 8,821,819; and 9,757,689. EX1004. These intervening patents purports 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) (holding Provisional was not properly incorporated into related patents, including the immediate parent of the ’370 Patent); *Zenon Env’t., 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.”).

The Board previously held that a parent to the '370 Patent—U.S. Patent No. 8,168,147 (App. No. 12/419,219)—“claims priority ‘to the extent appropriate’ and fails to identify with detailed particularity the specific material incorporated and fails to clear[ly] indicate where that material is found in the various documents....This ambiguity creates an additional concern regarding the chain of priority for the '219 application.” *NRG Energy*, No. IPR2020-00928, 2020 WL 7074473, at *13 (finding '147 Patent does not have priority to Provisional). The Provisional is not properly incorporated into the Pre-2018 Applications.

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 is neither a “U.S. patent” nor a “U.S. patent application publication.” 35 U.S.C. §122(b)(2)(A)(iii) (2013) (“application shall not be published if that application is—a provisional application”); 35 U.S.C. §122(b)(2) (A)(iii) (2006) (similar). PO cannot incorporate by reference the Provisional into the Pre-2018

Applications, because it is “essential material” and absent during the *Lockwood* analysis, and barred from incorporation by the close of prosecution. *See ZTE (USA), Inc. v. CyWee Grp. Ltd.*, IPR2019-00143, 2021 WL 641742, *54 (P.T.A.B. Feb. 17, 2021) (incorporation by reference of provisional “ineffective” as to essential matter).

b. Provisional Is “Essential” for ’370 Patent Claims

The Provisional cannot be incorporated by reference into the Pre-2018 applications, because it is essential material for the Newly-Introduced Limitations.

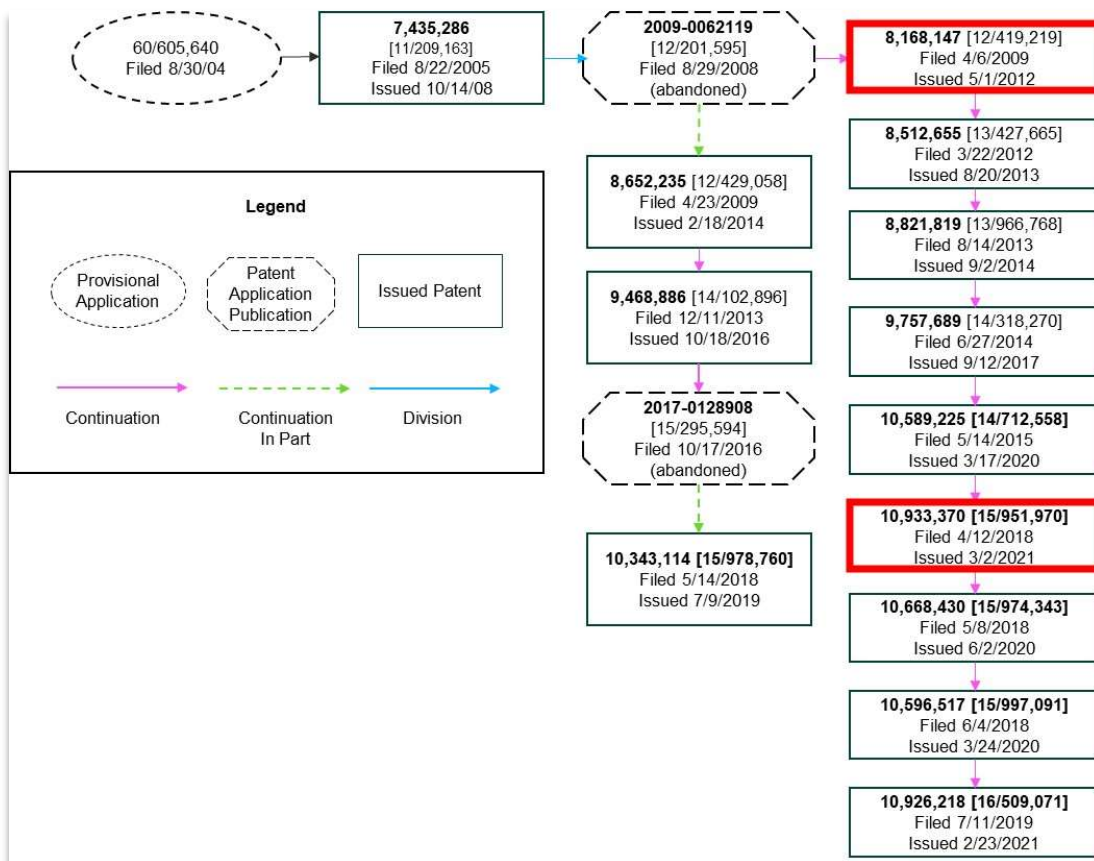
“Essential material” is material that is necessary to...[p]rovide a written description of the claimed invention,...as required by 35 U.S.C. 112(a)

37 C.F.R. §1.57(d)(1). As discussed *supra* §VI.B, the Pre-2018 Applications do not support the Newly-Introduced Limitations, such as adding halogens to the combustion chamber or coal. Thus, the disclosure of the Provisional is “necessary” to provide written-description support for those limitations. This should not be in dispute, because PO’s testifying expert in the Delaware case admitted that Figure 2 of the Provisional and surrounding text (correlating to Figure 11 of the ’370 Patent) was “essential material for the patents in this case” (which included both the immediate parent and immediate child of the ’370 Patent). EX1094, 237:20-241:9. Essential material cannot be incorporated by reference from provisional applications. *See NRG Energy*, IPR2020-00832, Paper 17, 2020 WL 6277239, at *12 (applying Rule 1.57(d) and holding the Provisional cannot be incorporated by reference into counterpart of ’370 Patent); IPR2020-00928, Paper 17, 2020 WL

7074473, at *10 (applying predecessor to Rule 1.57(d) and holding the Provisional cannot be incorporated by reference into parent of '370 Patent).

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

The Provisional cannot be incorporated by reference into the Pre-2018 Applications, because it is “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). One such patent is U.S. Patent Nos. 8,168,147 ('147 Patent).

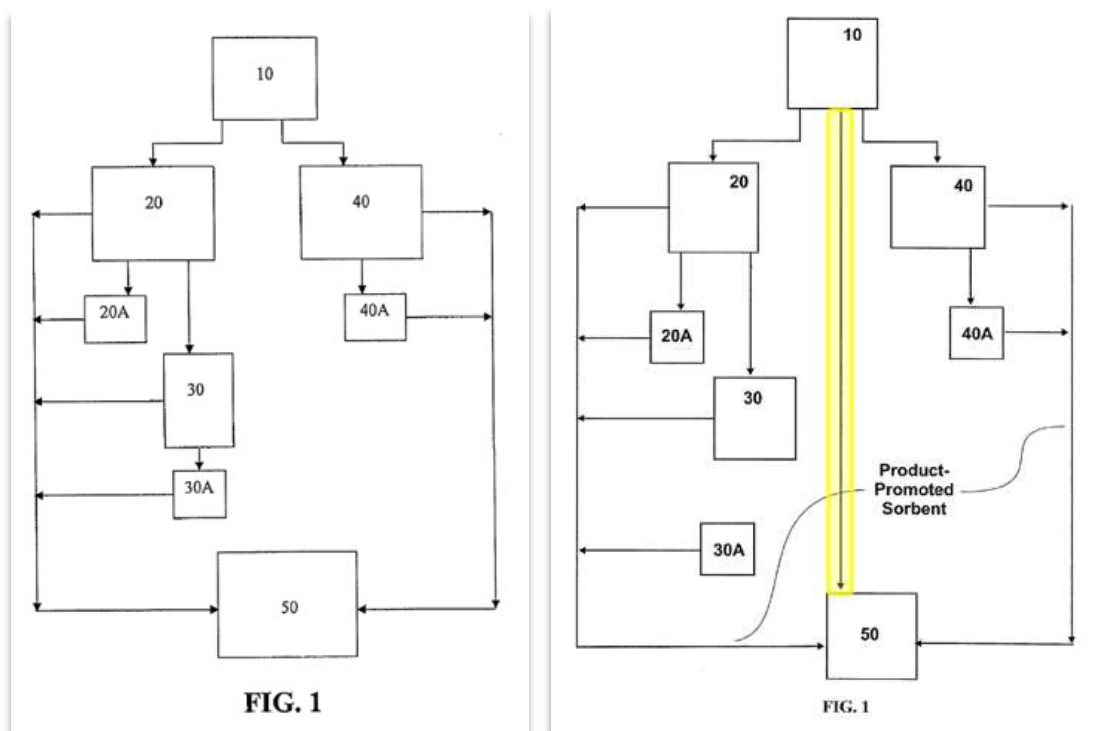


EX1004 (annotated).

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 ¶¶189-193. The '163 and '595 Applications (parents to the '147 Patent, which also omt 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 ¶¶194-195, 206-207. As discussed above, those applications describe treating a base activated-carbon sorbent with a bromine promoter prior to injecting the sorbent into a mercury-containing flue gas. The sorbent material and bromine containing promoter are not injected “separately” into the mercury-containing gas (they are injected together), and an in-flight reaction between sorbent and promoter occurs prior to injection into the mercury-containing gas (not in the “gas stream [that] is a mercury-containing gas”). EX1002 ¶¶195-198; *see NRG Energy*, IPR2020-00928, 2020 WL 7074473, at *11 (finding for '147 Patent that “[t]here is no suggestion that bromine and the activated carbon are separately injected into mercury-containing flue gas”).

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 (annotated 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), and there is no support that the line added in Replacement-Figure 1 teaches adding activated carbon directly to mercury-containing (flue) gas independently and separately from the halide promoter, as recited in Claims 18-19. Even if PO could rely on Replacement-Figure 1, it still fails to support Claims 18-19, as 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 ¶¶199-205; *see NRG Energy*, No. IPR2020-00928, 2020 WL 7074473, at *12 (finding that Figure 1 does not provide written-description support for '147 Patent claims 18-19). 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.

d. Cannot Physically Incorporate After Close of Prosecution

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 applies when 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) allows addition of 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 ’370 Patent and its parents fail both requirements. As explained below, the scope of the ’370 Patent claims is not “completely contained” in the Provisional. Second, the April 2018 physical incorporation into the ’970 Application was too late: the intervening ’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, omitted material cannot be added in application #3 after close of prosecution of application #2).

3. The Provisional Does Not Support the ’370 Patent Claims

Even if the Provisional could be legally considered, it does not fully support the Newly-Introduced Limitations. There would still be no written-description support for the Newly-Introduced Limitations prior to the ’970 Application’s 2018 filing date.

**a. Additive Chosen from Halides, Halogens, Salts
Thereof, and Combinations Thereof**

The Provisional fails to disclose an additive “chosen from halides, halogens, salts thereof, and combinations thereof.” Example 1E of the Provisional, reciting that the “additional substance is hydrohalide (HI, HBr, HCl), etc., 1%B-10% of bromine,” is not sufficient. EX1020, 6; EX1002 ¶¶170-171.

Though the Provisional states that an “additive” is supplied “before, after, or within the boiler” (EX1020, 6), there is no disclosure that the “additive” is the same “additional substance” of Example 1E. This additive is “added to the flue gas as a sorbent mixture or co-injected,” but not added to the coal or combustion chamber. EX1020, 7. And even if the “additional substance” is interpreted to mean the “additive,” the Provisional discloses at most that this additional substance is a hydrohalide (e.g., hydrogen bromide). During prosecution of the child ’430 Patent (as well as other related patents), PO distinguished “hydrogen bromide” from other halogens and halides, such as those in the Newly-Introduced Limitations. EX1019, 426-429; EX1002 ¶¶172-173.

A disclosure of one species (hydrohalides) in the Provisional does not support the full breadth of the entire class of added “halides, halogens, salts thereof, and combinations thereof.” *See Ariad Pharms., 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 nearly infinite forms of bromide compounds, because as Mr. Pavlish stated, a “bromide compound” may be any “chemical compound containing a bromide ion or ligand.” EX1019, 425. Independent Claims 1 and 17 are even broader, in that they recite “halides” and “halogens.” Further, there is no disclosure of any halide “salts thereof,” let alone the entire class. EX1019, 425; EX1002 ¶¶173-174.

Thus, a POSITA would not have understood the Provisional’s disclosure to demonstrate the inventors were in possession of the broad class of additives “chosen from halides, halogens, salts thereof, and combinations thereof.” EX1002 ¶¶171-174. The Newly-Introduced Limitations are not supported by the Provisional.

b. The Additive Comprises “a and b, b and c, a and c, or a, b and c:” where “a) I⁻ and/or I₂, b) Br⁻ and/or Br₂ c) Cl⁻ and/or Cl₂.”

Claim 17 of the ’370 Patent requires multiple additives in combination. To the extent the Provisional discloses an HBr additive in Example 1E, that is not sufficient to support even Br₂. As declared by named inventor Mr. Pavlish during prosecution of the child ’430 Patent: “Br₂ is not HBr and does not include HBr.” EX1019, 428. Thus, disclosure of HBr does not disclose the Br₂ of Claim 17 and certainly does not disclose I₂ or Cl⁻. EX1002 ¶178. There is also no disclosure of the additive comprising “I⁻ and/or I₂” and “Cl⁻ and/or Cl₂” so there is no disclosure

of the claimed combination of “a and c.” The Provisional fails to expressly or inherently disclose the Newly-Introduced Limitations. EX1002 ¶¶175-179.

* * *

Under any legal theory, parent applications to the '370 Patent fail to provide written-description support for the Newly-Introduced Limitations, thereby limiting the '370 Patent claims to a priority date after Baldrey, Sjostrom, Eckberg, and Olson-646.

VII. THE ASSERTED REFERENCES

Petitioner asserts four prior-art references in this petition:

References	Prior-Art Status
Baldrey , EX1015 US2011/0030592	§§102(a), 102(b), 102(e) (pre-AIA) §102(a)(1) (post-AIA) Published: February 10, 2011
Sjostrom , EX1010 Eckberg , EX1011	§§102(a)-102(b) (pre-AIA) §102(a)(1) (post-AIA) Presented January 26, 2005, at EUEC, publicly accessible by February 2005
Olson-646 , EX1012 US2006/0048646	§§102(a)-102(b) (pre-AIA) §102(a)(1) (post-AIA) Published: March 9, 2006

A. SJOSTROM (EX1010) AND ECKBERG (EX1011)

The Board previously found in IPR2020-00832 that Sjostrom and Eckberg qualify as printed publications, and found in IPR2020-00928 that Sjostrom qualified as a printed publication (Eckberg was not raised in that petition). EX1026, 51; *NRG Energy*, IPR2020-00928, 2020 WL 7074473, at *18.

Sjostrom and Eckberg were presented January 25, 2005, at the Electric Utilities Environment Conference (“2005 EUEC”) in Arizona, and mailed on CD to conference attendees (including Dr. Niksa) by February 2005.

A conference paper qualifies as prior art “so long as the relevant public has a means of accessing” it. *GoPro, Inc. v. Contour IP Holding LLC*, 908 F.3d 690, 693 (Fed. Cir. 2018). The Sjostrom and Eckberg presentations meet the *GoPro* standard.

Dr. Niksa personally attended 2005 EUEC (and other years), including delivering presentations. EX1030, 3, 32, 114.

Wednesday, 1/26/2005

A7 Mercury - Measurement & Modeling Wednesday; 7:30-9:30am

Chairs: Raj Singhvi – US EPA/ERTBI

Constance Senior – Reaction Engineering International

- a. **A Multipathway Health Risk Assessment Model for Mercury Emissions**
– Khanh Tran - AMI Environmental
- b. **Geographic Variation of Mercury Content, and Mercury Emissions Predicted for Existing Technologies, by U.S. County of Coal Origin.**
– Jeffrey C. Quick - Utah Geological Survey
- c. **Measurement and Control of Mercury Emissions in Utility Boilers**
– Constance Senior and Bradley Adams - Reaction Engineering International
- d. **The Impact of Wet FGD Scrubbing On Hg Emissions From Coal-Fired Power Stations**
– Stephen Niksa - Niksa Energy Associates; Naoki Fujiwara - Coal Research Laboratory

EX1030, 7. The EUEC served as a direct link from vendors of technologies and services for mercury-emissions control and engineers and technical staff at utilities implementing those controls. EX1002 ¶¶125, 260-265.

Sjostrom and Eckberg were presented consecutively on “1/25/2005” in the “Mercury-Control” session:

Tuesday, 1/25/2005

A3 Mercury - Control Tuesday; 7:30-9:30am
Chairs: George Offen – EPRI
Ram Srivastava – SAIC/NETL

b. Full-Scale Evaluations of Mercury Control Technologies with PRB Coals
Sharon Sjostrom, Travis Starns, Jerry Amrhein, and Jean Bustard – ADA ES, Inc.; Wayne Penrod and Corey Lineville – Sunflower Electric Power Corporation; Rich Phillips and Tom Hart – Ameren; Andrew O’Palko – U.S. DOE-NETL; Ramsay Chang, Ph.D. – EPRI

c. Mercury Control Evaluation of Halogen Injection into a Texas Lignite-Fired Boiler
Craig Eckberg, John Hudspeth, Mike Meyers and Jim Russell – Texas Genco; Katherine Dombrowski and Carl Richardson – URS Corporation; Ramsay Chang – EPRI

EX1030, 23. Hundreds of people attended the 2005 EUEC, as confirmed by an attendee list sent to all attendees, including Dr. Niksa, shortly after the conference.⁴ EX1030, 106-118; EX1002 ¶¶266-268.

⁴ The public accessibility of Sjostrom and Eckberg is further supported by the 3/3/2005 Internet Archive copy of EUEC website, <https://web.archive.org/web/20050303090129/http://www.euec.com/>. EX1061 (“200503”); EX1091 (explaining date stamps of Internet Archive); EX1099, 5

Sjostrom and Eckberg presented in “Track A-Air Quality” during the “Mercury-Control Session.” EX1030, 2, 3. Hundreds of people attended the Track A presentations, including engineers, regulatory-compliance specialists, project managers from utilities, and other POSITAs. EX1002 ¶¶125, 268-271.

The CD mailed to each recipient included the conference program containing a navigable index of PDF copies of all presentations given at the conference, including Sjostrom and Eckberg. EX1030. EX1010 (Sjostrom) and EX1011 (Eckberg) are the versions contained on the CD that Dr. Niksa received in February 2005. EX1030-EX1031; EX1002 ¶¶269-270.

B. OLSON-646 (EX1012)

Olson-646 is a publication of a counterpart to the '370 Patent. It was published more than one year before the earliest (April 2018) priority date of the Challenged Claims, and thus qualifies as prior art. EX1002 ¶¶282-283.

C. BALDREY (EX1015)

Baldrey is a patent application publication that published February 10, 2011, more than one year before the earliest priority date of the challenged claims. EX1002 ¶¶288-289.

(sponsoring EX1061). The 2005 EUEC had “over 956 participants” and “EUEC Conference Proceedings [were] mailed out the week of February 21st.” EX1061.

D. ANALOGOUS ART

Sjostrom, Eckberg, Baldrey, and Olson-646 are analogous art to the '370 Patent, as they are in the same field of endeavor and reasonably pertinent to the problems being faced by the '370 Patent inventors. The field of endeavor of the Challenged Patent is “removal of pollutants from flue gas or product gas from a gasification system,” more specifically removal of “mercury...from gas streams generated during the burning or gasification of fossil fuels.” EX1001, 1:41-43. The specific problem faced by the inventors of the Challenged Patent was needing “more economical and effective mercury removal technology.” EX1001, 2:38-39; EX1002 ¶¶272, 279, 284, 290.

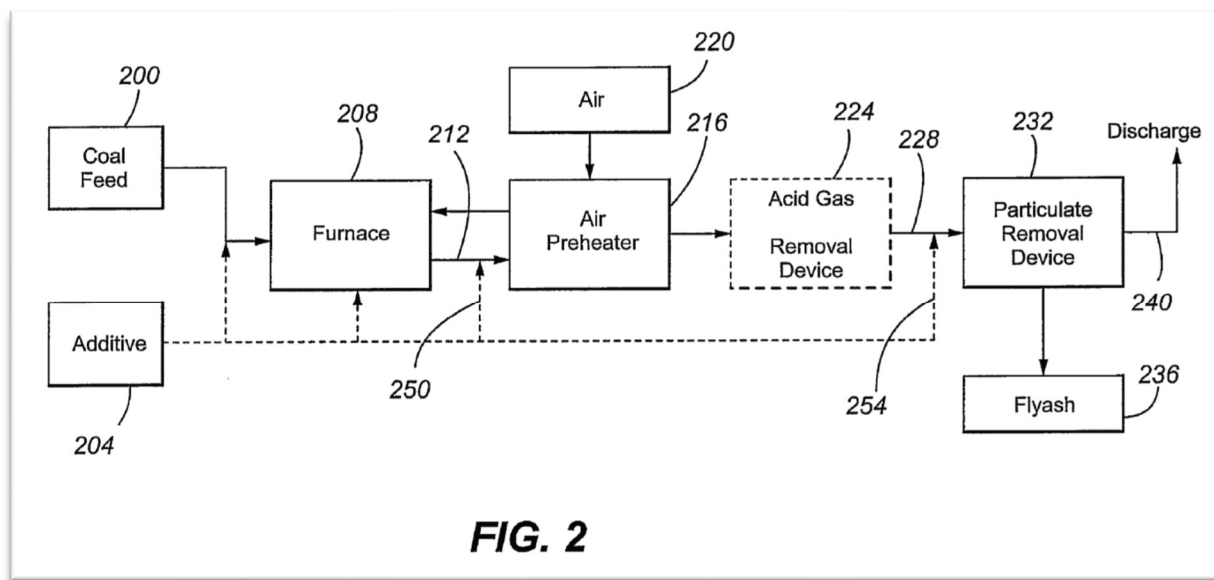
The field of endeavor of Sjostrom is “Mercury Control Technologies,” and the problem faced was a need to “enhanc[e] mercury removal for western coals.” EX1010, 1, 4. The field of endeavor of Eckberg is “Mercury Control Evaluation of Halogen Injection into a Texas Lignite-Fired Boiler,” and the problem faced was a need to “enhance mercury removal.” EX1011, 1, 3. The field of endeavor of Baldrey relates “particularly to additives for mercury removal,” and the problem

faced was “a need for an effective mercury control methodology” for “lower rank coals.” EX1015 ¶¶[0002], [0007]; EX1002 ¶¶272, 279, 290.⁵

VIII. GROUND 1: ANTICIPATION OF THE CHALLENGED CLAIMS (BALDREY)

A. OVERVIEW OF EX1015 (“BALDREY”)

Baldrey describes a process for adding a halogen additive (“additive” 204) to coal (“coal feed” 200), either upstream of the combustion chamber (“furnace” 208) or directly into the combustion chamber:



EX1015 Fig. 2; *see* ¶[0089] (“additive [] can be combined and introduced with the coal feed 200 [or] injected into the furnace atmosphere independently of the coal

⁵ Olson-646 (EX1012) is from the same family as the '370 Patent, has the same field of endeavor, and is analogous art. EX1002 ¶284.

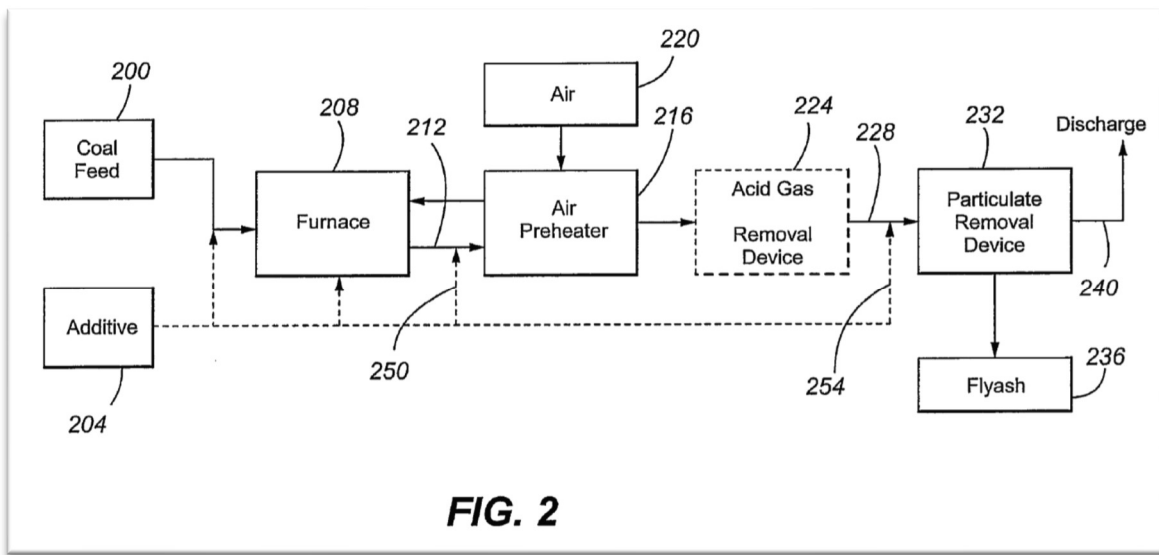
feed”). This additive may include “one or more diatomic halogens (e.g., Cl_2 and Br_2), interhalogen compounds (e.g., BrCl), and halide salts to act as elemental mercury oxidants.” *Id.* ¶[0070]. “[T]he additive of the present invention is believed to promote mercury oxidation and sorption by ... suitable mercury sorbents” *Id.* ¶[0031]; EX1002 ¶¶291-292.

B. DISCLOSURE OF BALDREY

1. Independent Claim 1

a. Element 1(Pre): “A method for separating mercury from a mercury-containing gas, the method comprising”

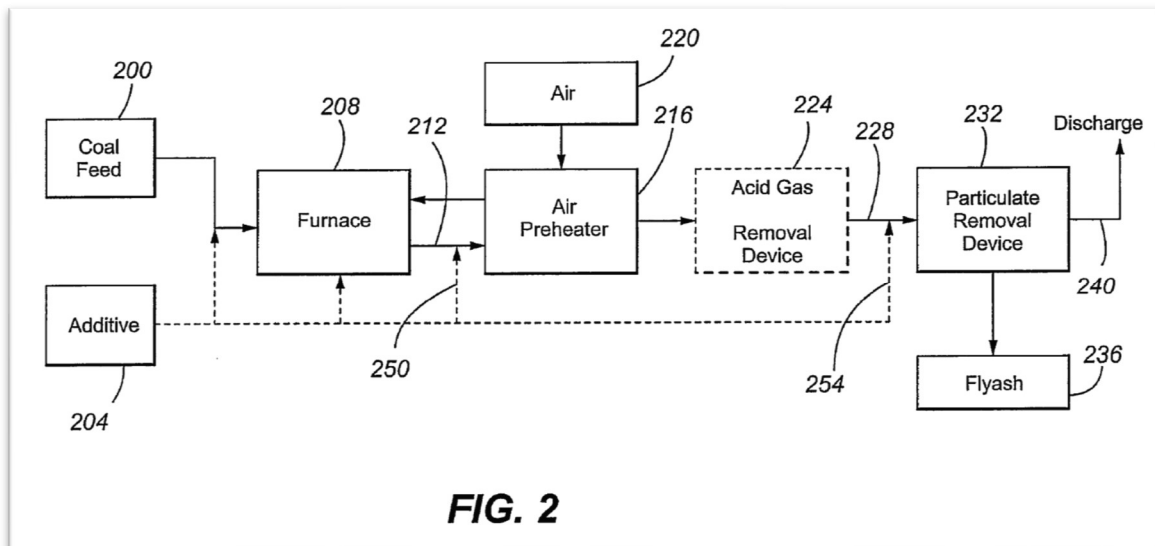
Baldrey discloses “additives for coal-fired power plants and particularly to additives for mercury removal.” EX1015 ¶[0002]; *see* ¶¶[0031], [0069] (separating mercury using “suitable mercury sorbents”). Baldrey’s method for separating mercury from mercury-containing gas is shown in Figure 2:



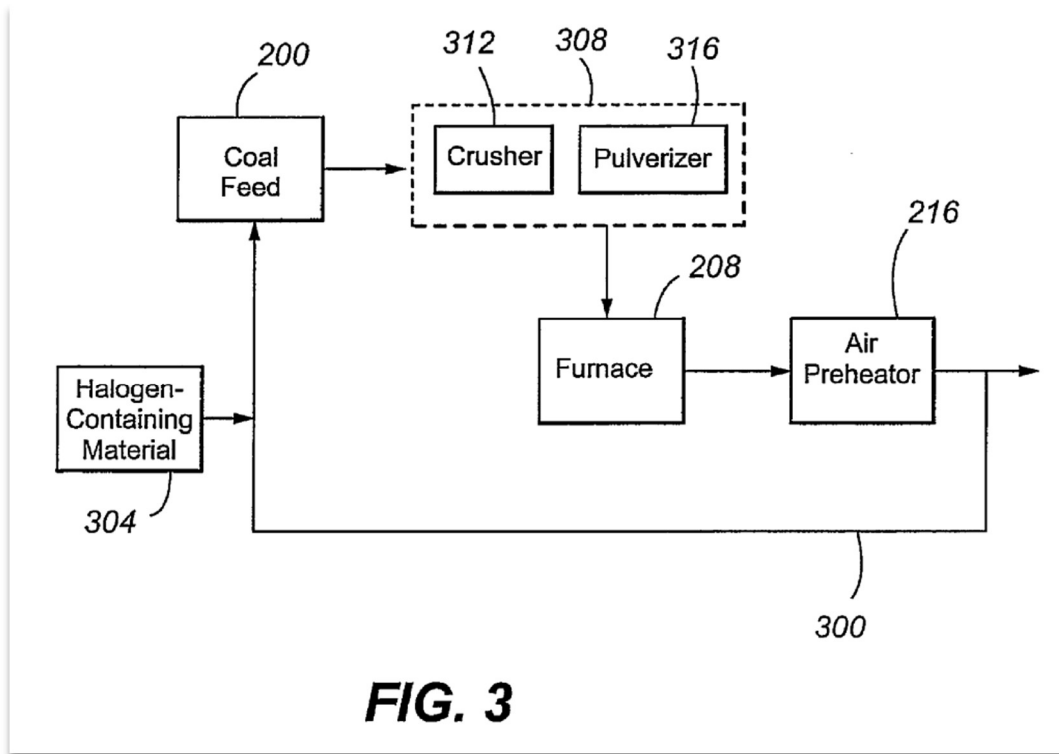
EX1002 ¶¶500-501.

- b. Element 1(a): “combusting a mixture of coal and an additive in a combustion chamber, to form the mercury-containing gas, wherein the additive is chosen from halides, halogens, salts thereof, and combinations thereof;”**

Baldrey adds coal **200** to furnace **218** (combustion chamber) to combust the coal to form mercury-containing flue gas **212**:



EX1015, Fig.2, ¶¶[0079]-[0088]. As shown in Figures 2 and 3, Baldrey discloses mixing “Coal Feed **200**” with an “Additive **204**” before the coal enters the combustion chamber **208** and/or in the combustion chamber itself.



EX1015 Figs. 2-3; *see* ¶[0089]; EX1015 cl. 29 (“coal feed is contacted with the added halogen-containing compound before introduction of the coal feed to the furnace”). EX1002 ¶¶502-503.

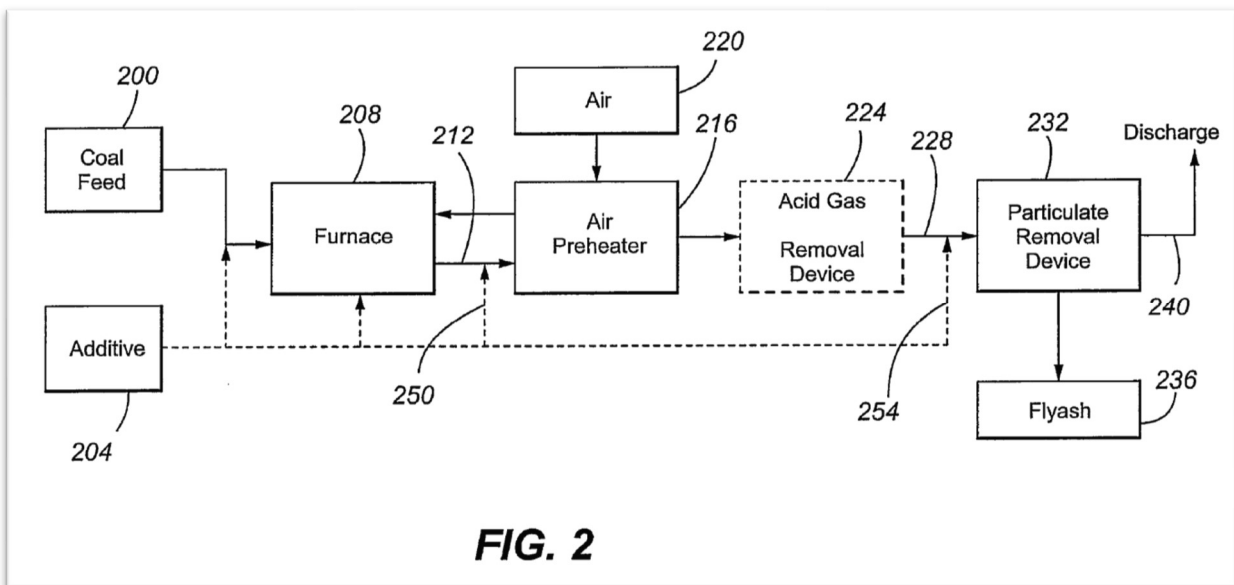
“[T]he additive includes ... one or more diatomic halogens (e.g., Cl₂ and Br₂), interhalogen compounds (e.g., BrCl), and halide salts to act as elemental mercury oxidants.” EX1015, ¶[0070]; *see* ¶¶[0006], [0096]. Baldrey identifies several other chlorine-containing, bromine-containing, and iodine-containing salts:

Preferred supplemental halide salts are calcium chloride (CaCl₂), iron (III) chloride (FeCl₃), copper (II) chloride (CuCl₂), magnesium bromide (MgBr₂), calcium bromide, sodium bromide, potassium iodide, and also the hydrated states of these halide salts.

EX1015 ¶[0070]; *see* ¶[0031] (“[s]upplemental halogen addition” occurs “either with the coal or downstream in the mercury oxidation region”); EX1002 ¶503.

c. Element 1(b): “adding a particulate sorbent material comprising activated carbon into the mercury-containing gas,”

Baldrey discloses “activated carbon injection into coal-fired flue ducts.” EX1015, ¶¶[0071]; *see* ¶¶[0068]-[0069], [0097], [0105]-[0106] (further disclosure of “activated carbon”). The activated-carbon sorbent is added to the mercury-containing gas, downstream of the combustion chamber, “at either of locations 250 and 254 for plants with no FGD scrubbing or at location 254 for plants with SDA followed by particulate control device (FF or cold-side ESP)”:



EX1015, ¶[0106], Fig. 2; EX1002 ¶504.

d. Element 1(c): “wherein a weight ratio of the additive added to the coal, added to the combustion chamber, or a combination thereof, to an amount of the sorbent material added to the mercury-containing gas is from about 1:100 to about 30:100;”

Baldrey discloses the halogen concentration added to coal and combustion chamber, as well as the sorbent concentration in mercury-containing gas. The ratio of the two is within the claimed range. EX1002 ¶¶505-513.

Regarding the halogen/halide concentration, Baldrey states: “[i]n the second formulation, the additive contains preferably ... from about 0.1 to about 50 wt.% halogen, more preferably from about 0.5 to about 10 wt.% halogen, and even more preferably from about 0.5 to about 5.0 wt.% halogen.”⁶ EX1015 ¶[0073]. Within the additive, Baldrey expressly discloses 0.5% halogen/halide concentration as a data point, and also suggests such a concentration to avoid “undesirable fouling or corrosion.” See EX1015 ¶¶[0095], [0097]; EX1002 ¶506.

Regarding the overall additive concentration, “the additive of the ... second formulation[]” is introduced to provide a concentration “from about 0.3 to about 100

⁶ Baldrey uses the term “additive” to refer to a mixture of “one or more additive metal catalysts” and halogen-containing materials (e.g., “Cl₂ and Br₂ ... [and] halide salts”). EX1015 ¶[0070].

lbs additive/MMacf in the [mercury-containing] flue gas, or in an amount ranging from about 0.1 to about 3.0% by weight of the coal feed 200, with from about 0.5 to about 1.5% being preferred.” EX1015 ¶[0075]. Because Baldrey’s additive comprises 0.5 wt% halogens/halides (EX1015 ¶[0073]), a total additive concentration of 100 lbs additive/MMacf (EX1015 ¶[0075]) in the mercury-containing gas provides a halogen/halide concentration of 0.5 lbs. halogen/MMacf. EX1002 ¶¶506, 510.

Regarding the sorbent concentration, Baldrey discloses “from about 0.1 to about 10.0 lbs sorbent/MMacf in the flue gas.” EX1015 ¶[0075]. EX1002 ¶508.

Dividing the two numbers—the halogen/halide concentration (0.5 lbs./MMacf of flue gas) and the activated-carbon concentration (10 lbs./MMacf of flue gas)—provides a ratio of 5 grams of the halogen-containing additive per 100 grams of activated-carbon sorbent added to the mercury-containing gas. This is within the claimed range of 1:100-30:100. EX1002 ¶¶509-511.

Multiple other values disclosed by Baldrey are also within the claimed range. Even using an intermediate halogen concentration disclosed in Baldrey (2.5 wt.% halogen in the additive) with 10 lbs/MMacf sorbent, that still provides a ratio of 25 grams of the halogen-containing additive per 100 grams of activated-carbon sorbent, also within the claimed range of 1:100-30:100. EX1015 ¶[0073]; EX1002 ¶¶512-513. PO’s expert in the Delaware Litigation stated that “power plants employing

bromine additives and activated carbon would necessarily produce a sorbent that is 1 g to 30 g bromine per 100 g of activated carbon,” and then cited to this analysis for a claim that requires “the mercury-containing gas comprises about 1 g to about 30 g of the element bromine per 100 g of the sorbent. EX1092, 153-154 (claims 4, 29). PO further argued to the Board for a parent patent that the 1-30 ratio should be given “no patentable weight.” EX1105, 34-35.

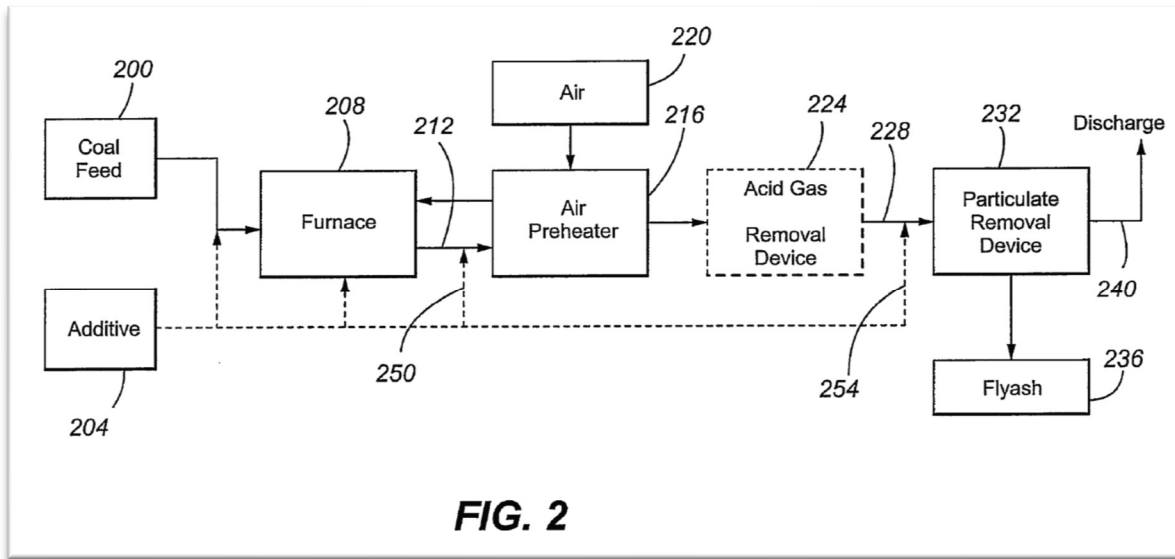
e. Element 1(d): “contacting mercury in the mercury-containing gas with the sorbent material, to form a mercury-sorbent; and”

Baldrey discloses that “oxidized mercury can [] bind to surface sites within the fly ash or to activated carbon,” and “[o]xidation and capture of the oxidized mercury are [] accomplished at the surface of the injected sorbent, generally powdered activated carbon.” EX1015, ¶¶[0069], [0071]. To “bind” and “capture” mercury at the surface of the sorbent requires the mercury to at least make contact with the sorbent. EX1002 ¶514.

f. Element 1(e): “separating the mercury-sorbent from the mercury-containing gas.”

Baldrey discloses that “a particulate removal device 232, such as a fabric filter baghouse or cold-side electrostatic precipitator, to remove preferably most and more preferably substantially all of the particles, particularly fly ash 236 and sorbent (if any), in the flue gas. Most of the oxidized mercury and excess halogens are absorbed

by the fly ash and/or mercury sorbent of the third formulation and is therefore removed by the device 232.” EX1015, ¶[0085]; *see* ¶[0071]. Baldrey depicts this process below:

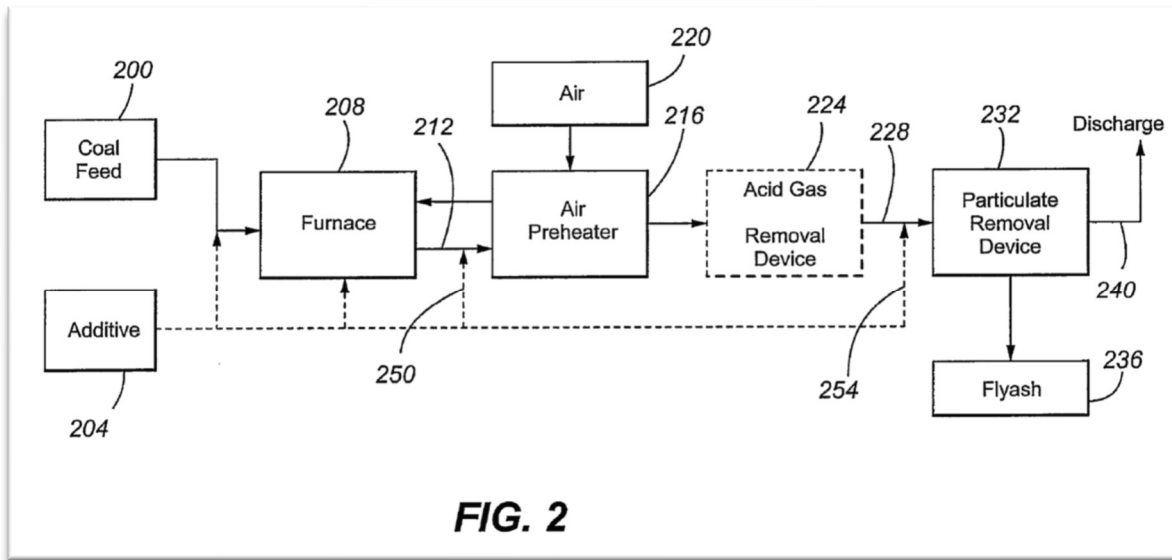


EX1015, Fig. 2; EX1002 ¶515.

2. Claims Depending from Claim 1

a. **Claim 2: “adding the additive to the coal before combusting the coal.”**

Baldrey discloses this limitation. As discussed for Element 1(a), the halogen-containing additive (204) is added to the coal (200) upstream of the combustion chamber (208).



EX1015, Fig.2; *see* [0093], [0111], Fig.3, cl.29; EX1002 ¶516.

b. Claims 3-4:

3: “the additive mixed with the coal is in a liquid.”

4: “the liquid is a hydrocarbon, supercritical carbon dioxide, water, salt solution, or a combination thereof.”

As discussed for Element 1(a), the additive includes halide salt solutions, such as “calcium chloride (CaCl_2), ... magnesium bromide (MgBr_2), calcium bromide, sodium bromide, [and] potassium iodide.” EX1015, ¶[0070]. Baldrey further teaches that “addition of the additive to the coal feed **200** or direct injection of the additive **200**, as a powdered solid or liquid atomized solution containing the additive into the boiler via overfire air (OFA) ports, are preferred options.” EX1015 ¶[0093];

see ¶[0111] (additive sprayed “in liquid form”). A liquid atomized solution of halide salt is an exemplary salt solution.

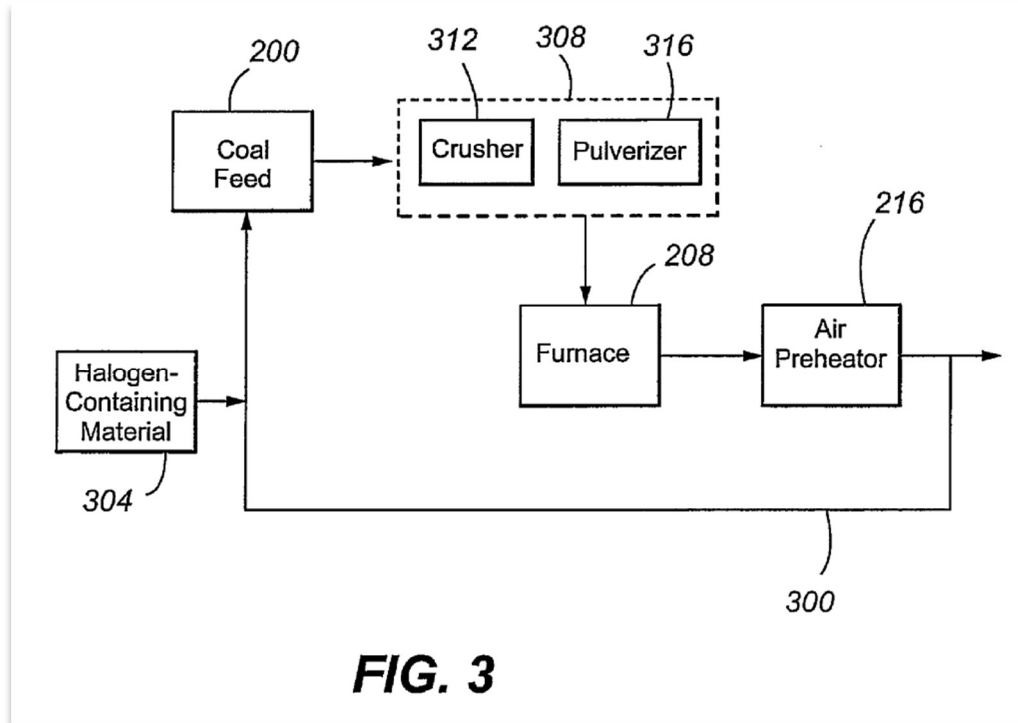


Fig. 3; EX1002 ¶¶517-518.

c. Claim 6: “the additive is substantially in vapor form in the mercury-containing gas.”

“When the coal feed is combusted, the halogen enters the vapor phase.” EX1015 ¶[0038]; see ¶¶[0108]-[0109] (“at least most of the selected additive component decomposes into a vapor-phase element in the flue gas”); ¶[0101] (“flue gas or duct temperature ranges from about 470 to about 250°C”). Baldrey also discloses that additive may be “one or more diatomic halogens (e.g., Cl₂ and Br₂),” EX1015 ¶[0070], and the boiling point of Br₂ is only 58.8°C; EX1002 ¶519.

d. Claims 7, 8, 10:

7: “the additive is chosen from Cl₂, HCl, sodium chloride, calcium chloride, and a combination thereof.”

8: “the additive is chosen from Br₂, HBr, sodium bromide, calcium bromide, and a combination thereof.”

10: “the additive is chosen from I₂, HI, sodium iodide, calcium iodide, potassium iodide, and combinations thereof.”

As discussed above for Element 1(a), Baldrey discloses that the additive includes “one or more diatomic halogens (e.g., Cl₂ and Br₂) [Claims 7-8] ... and halide salts Preferred supplemental halide salts are calcium chloride (CaCl₂) [Claim 7], ... calcium bromide, sodium bromide [Claim 8], potassium iodide [Claim 10], ...” EX1015 ¶[0070]; EX1002 ¶¶520-521, 522.

e. Claim 11: “the activated carbon is chosen from powdered activated carbon, granular activated carbon, carbon black, carbon fiber, aerogel carbon, pyrolysis char, and combinations thereof.”

The “injected sorbent” is “generally powdered activated carbon.” EX1015 ¶[0071]; *see* ¶[0097]; EX1002 ¶523.

f. Claim 13: “contacting the sorbent material with a mercury-stabilizing reagent chosen from S, Se, H₂S, SO₂, H₂Se, SeO₂, CS₂, P₂S₅, and combinations thereof.”

Baldrey discloses that the “additive comprises ... sulfur” (S) at quantities of up to 0.1% or 0.5%. EX1015 at claims 4, 6, 36; ¶[0019]. Baldrey also discloses that “sulfur dioxide (SO₂)” is one of the “dominant flue gas species” formed from coal combustion. EX1015 ¶[0004]. The sulfur (from additive) and SO₂ (from coal combustion) contacts the sorbent material in the mercury-containing gas. EX1002 ¶524.

g. Claims 14-16:

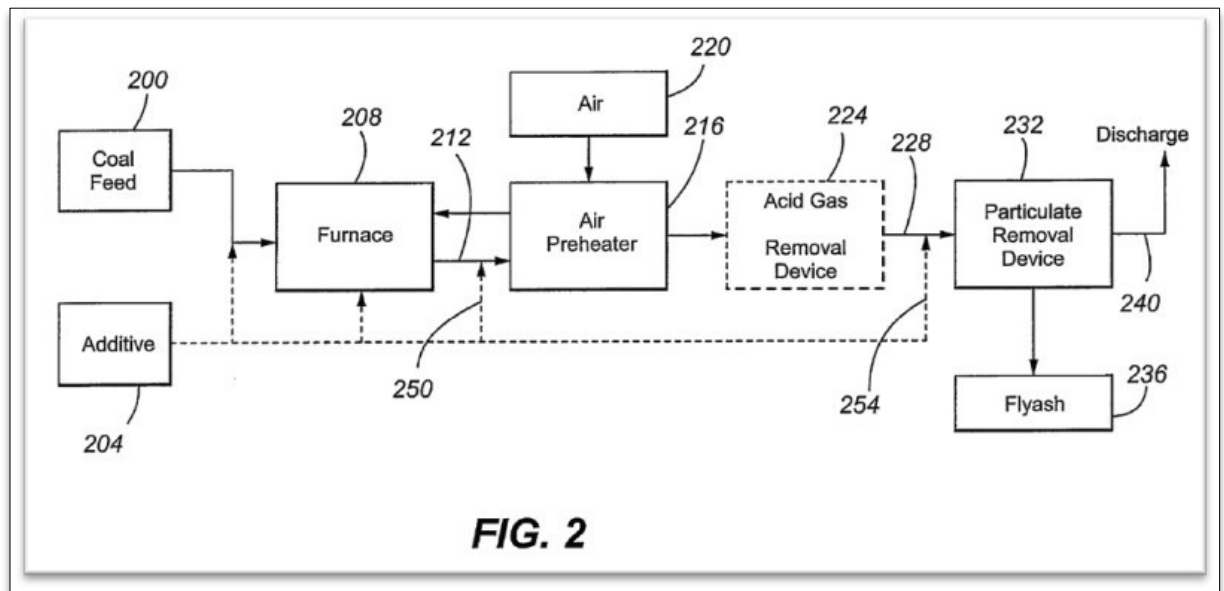
14: “contacting the sorbent material with a secondary component chosen from halogens, hydrogen halides, Group V halides, Group VI halides, and combinations thereof.”

15: “the secondary component is chosen from halogens, halide salts, HI, HBr, HCl, and combinations thereof.”

16: “the secondary component is chosen from I₂, HI, and combinations thereof.”

As discussed for Element 1(a), the additives of Baldrey include one or more “diatomic halogens” (e.g., Br₂ or Cl₂). EX1015 ¶[0070]. These halogens also qualify as a secondary component. As shown in Figure 2 below, Baldrey teaches that halogen-containing additives (item 204) can be applied not only to the coal and

combustion chamber, but also to the sorbent in mercury-containing gas: “at either of locations 250 and 254 for plants with no FGD scrubbing or at location 254 for plants with SDA followed by particulate control device (FF or cold-side ESP).” EX1015 ¶[0106]; ¶[0168] (“the different components of the additive can be added to the coal feed and/or flue gas”).



EX1015, Fig. 2. Baldrey also discloses hydrogen halides, because upon injecting halogen-containing additives “into the flue gas upstream of the particulate control device” at which temperatures “the halogens are present primarily in the form of the hydrogen species, HCl, HBr and HI.” EX1015 ¶[0101]; EX1002 ¶¶525-527.

h. Claim 18: “the additive comprises a and b, b and c, a and c, or a, b, and c: a) I^- and/or I_2 , b) Br^- and/or Br_2 , c) Cl^- and/or Cl_2 .”

Baldrey discloses Claim 18. As discussed for Element 1(a) and Claims 7 and 10, Baldrey discloses that “[i]n a second formulation, the additive includes one or more additive metal catalysts or a precursor thereof and one or more diatomic halogens (e.g., Cl_2 and Br_2), interhalogen compounds (e.g., $BrCl$), and halide salts to act as elemental mercury oxidants.” EX1015, ¶[0070]; EX1002 ¶528.

3. Independent Claim 17

Claim 17 is nearly identical to Claims 1 and 18, with minor changes, as shown below:

~~17.~~ A method for separating mercury from a mercury-containing gas, the method comprising:

combusting ~~a mixture of~~ coal ~~and~~ comprising an additive in a combustion chamber, ~~to form the mercury-containing gas,~~ wherein the additive is chosen from halides, halogens, salts thereof, and combinations thereof; ~~18.~~ to form the mercury-containing gas, wherein the additive comprises a and b, b and c, a and c, or a, b, and c:

a) I^- and/or I_2 ,

b) Br^- and/or Br_2 ,

c) Cl^- and/or Cl_2 ;

~~adding a particulate~~ injecting a sorbent material comprising activated carbon into the mercury-containing gas, wherein a weight ratio of the additive added to the coal, added to the combustion chamber, or a combination thereof, to an amount of the sorbent material added to the mercury-containing gas is from about 1:100 to about 30:100;

contacting mercury in the mercury-containing gas with the sorbent material, to form a mercury-sorbent; and

separating the mercury-sorbent from the mercury-containing gas.

Claim 17 is obvious for the reasons described for Claims 1 and 18 (and claims 7 and 10, explaining how Baldrey discloses combinations of halogens). EX1002 ¶¶529-535.

IX. GROUND 2: OBVIOUSNESS OVER BALDREY IN VIEW OF OLSON-646

A. OVERVIEW OF EX1012 (“OLSON-646”)

Olson-646 describes a proposed reaction mechanism between bromine, activated carbon, and mercury:



EX1012, Fig. 2 (annotated). Olson-646 explains “hydrogen bromide [HBr] reacts with the unsaturated structure of the activated carbon.” EX1012 ¶[0054]. “Molecular bromine [Br₂] or a bromine compound reacts to form a similar structure, with a positive carbon that is active for oxidizing the mercury with subsequent capture by the sorbent.” EX1012 ¶[0054]. Olson-646 further discloses that other halogens or halides can also be used. EX1012 ¶¶[0025], [0067]. Olson-646 provides typical process conditions involved when reacting activated carbon with a halogen-containing reagent. EX1002 ¶¶285-287.

B. OVERVIEW OF THE COMBINATION AND REASONS TO COMBINE

A POSITA would have been motivated to combine Baldrey with Olson-646, with reasonable expectation of success, because both references are directed towards the same goal of removing mercury from coal-combustion flue gases. EX1002 ¶¶537-542.

As described above in Ground 1 and further below, Baldrey enhances the effectiveness of mercury removal with activated carbon sorbent by adding halogens/halides to the coal or combustion chamber, and adding activated-carbon sorbent (and also halogens/halides) downstream of the combustion chamber. Olson-646 provides additional implementational details, including the ratios of halogen/halides to activated-carbon sorbent, and other downstream processes. The implementation details provided in Olson-646 are simply proposed workable ranges (e.g., halogen:sorbent ratios), which were conventional and known in the art, and would have been selected, or at least tried, as part of routine process optimization by a POSITA applying the teachings of Baldrey. EX1002 ¶¶537-542; *In re Applied Materials, Inc.*, 692 F.3d 1289, 1297-98 (Fed. Cir. 2012).

C. DISCLOSURE AND TEACHINGS OF THE COMBINATION

Elements and claims not mentioned below are disclosed or rendered obvious for the reasons stated above in Ground 1. EX1002 ¶¶536, 543.

1. **Independent Claim 1**

- a. **Element 1(c): “wherein a weight ratio of the additive added to the coal, added to the combustion chamber, or a combination thereof, to an amount of the sorbent material added to the mercury-containing gas is from about 1:100 to about 30:100;”**

This claim would have further been obvious over Baldrey. Baldrey discloses ranges for the additive concentration in coal and ranges for the sorbent concentration in the flue gas. Values within that range meet this claim limitation for the reasons described in Ground 1. *See UCB, Inc. v. Actavis Lab'ys UT, Inc.*, 65 F.4th 679, 687, 689 (Fed. Cir. 2023) (“If the prior art discloses a point within the claimed range the prior art anticipates the claim. ... A presumption of obviousness applies ‘[w]here a claimed range overlaps with a range disclosed in the prior art.’”)

It would have been obvious to try other ratios, such as by increasing halogen concentration (while reducing activated-carbon injection rates), or decreasing halogen concentration (while increasing active-carbon injection) as part of routine process optimization to achieve the desired mercury removal. EX1002 ¶545.

Claim Element 1(c) is merely an attempt to claim a workable range for combinations of conventional halogens (bromine, chlorine, iodine) being used in a conventional way (to oxidize mercury and promote activated carbon) with a conventional sorbent (activated carbon). Nothing in the '370 Patent specification

attributes significance to the claimed range or establishes that the claimed range “achieves unexpected results.” The range presents nothing more than optimization of “result-effective” variables that would have been obvious to a POSITA. *Applied Materials*, 692 F.3d at 1297-98; see *Pfizer Inc. v. Sanofi Pasteur Inc.*, 94 F.4th 1341, 1347 (Fed. Cir. 2024) (“decades-old legal principle that “where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation”); EX1002 ¶546.⁷ Patent Owner previously admitted this is correct concerning U.S. Patent 8,168,147 (parent to Challenged Patent):

As explained above, by September 2003, the inventors reduced all aspects of the ’147 patent claims to practice except for the claimed ratio of 1-30 grams of promoter per 100 grams of sorbent (i.e., a 1%-30% ratio). ... [T]his range limitation is entitled to no patentable weight.

EX1105 (IPR2020-00926, Paper 13), 34.

Petitioners’ expert testified—and ME2C does not dispute—that the

⁷ PO’s expert in the Delaware Litigation stated that “power plants employing bromine additives and activated carbon would necessarily produce a sorbent that is 1 g to 30 g bromine per 100 g of activated carbon,” and then cited to this analysis for a claim that requires “the mercury-containing gas comprises about 1 g to about 30 g of the element bromine per 100 g of the sorbent. EX1092, 153-154 (claims 4, 29).

1%-30% range limitation is not entitled to any patentable weight. See Ex. 1003 at ¶ 369 (“Through routine process optimization and routine experimentation, a POSITA would have adjusted the rate of addition of the promoter and/or the rate of addition of the sorbent material to achieve a range from about 1 g to about 30 g of promoter per 100 grams of the sorbent material . . . The range presented nothing more than optimization of result-effective variables that would have been obvious to a POSITA.”).

EX1105, 35.

Claim 1 is also obvious over Olson-646, which discloses the needed for activated-carbon sorbent, how it contacts the mercury, and how it is removed by a particulate control device. EX1002 ¶¶544, 548-550. Olson-646 also repeatedly discusses the ratio of halogen/halide promoter to sorbent: “the promoter is added at from about 1 to about 30 grams per 100 grams of activated carbon.” EX1012 ¶¶[0023], [0027]; *see* claims 3, 17, 37, 47; EX1002 ¶547.

2. Claims Depending from Claim 1

a. Claim 5: “carbocations in the activated carbon of the mercury-sorbent accept electrons from mercury atoms of the mercury-sorbent.”

Claim 5 presents a model of the chemistry proposed to take place when halogen-containing promoters contact activated-carbon sorbent. It is disclosed near-verbatim in Olson-646. EX1012 ¶[0093]; EX1002 ¶551.

b. Claim 6: “the additive is substantially in vapor form in the mercury-containing gas.”

The claim is further obvious over Olson-646, which teaches “the halogen/halide promoter is in gaseous or vapor form” that comprises “gaseous HBr or Br₂.” EX1012 ¶[0066]. When heated, the halogen additives of Baldrey react to form the gas-phase promoters called for by Olson 646. EX1002 ¶552; EX1015 ¶¶[0004], [0096]; EX1095 (Olson Dep.), 98:23-100:3, 231:3-9.

c. Claim 9: “the additive is chosen from PBr₃, SCl₂, and a combination thereof.”

Olson-646 describes that “the halogen or halide promoter ... may preferably comprise ... PBr₃ or SCl₂.” EX1012 ¶[0052]; *see* ¶¶[0067], [0132]-[0133]; *see* ¶¶[0023], [0037] (“the promoter is added at from about 1 to about 30 grams per 100 grams of activated carbon.”); EX1002 ¶553.

d. Claim 12: “adding an alkaline component to the mercury-containing gas, the alkaline component chosen from alkali elements, alkaline earth elements, alkali salts, alkaline earth salts, and combinations thereof.”

Claim 12 would have been obvious over Baldrey in view of Olson-646. Olson-646 teaches “adding an optional alkali component.” EX1012, ¶[0017]. Olson-646 further discloses “co-injecting an optional alkaline material” into the mercury-containing gas (i.e., along with the sorbent), which includes “alkaline and alkaline earth components, to improve the efficiency of mercury capture by

capturing oxidized mercury and/or capturing gaseous components that might otherwise reduce sorbent capacity.” EX1012, ¶[0026]; *see* ¶¶[0040]-[0041] (activated-carbon sorbent with “co-injected alkali material”). These components include “calcium oxide, sodium carbonate, and the like,” each of which are alkaline earth salts and alkali salts, respectively. *Id.*; *see* ¶¶[0026], [0127], cls. 31, 40. A POSITA would have co-injected alkaline components into the mercury-containing gas, along with the activated-carbon sorbent, to “improve the efficiency of mercury capture,” as taught by Olson-646. EX1002 ¶¶554-555, 131.

e. Claim 13: “contacting the sorbent material with a mercury-stabilizing reagent chosen from S, Se, H₂S, SO₂, H₂Se, SeO₂, CS₂, P₂S₅, and combinations thereof.”

Claim 13 is further obvious over Olson-646, which discloses this limitation almost verbatim. EX1012 ¶[0017]; *see* ¶¶[0021], [0025], cls. 12, 14, 28-29, 44. A POSITA would have been motivated to add these components “to stabilize” the mercury binding to activated carbon. *Id.* ¶[0074]; EX1002 ¶556.

f. Claims 14-16:

14: “contacting the sorbent material with a secondary component chosen from halogens, hydrogen halides, Group V halides, Group VI halides, and combinations thereof.”

15: “the secondary component is chosen from halogens, halide salts, HI, HBr, HCl, and combinations thereof.”

16: “the secondary component is chosen from I₂, HI, and combinations thereof.”

Claims 14-16 are obvious over the combination of Baldrey and Olson-646. In addition to the reasons discussed for these claims in Ground 1, Olson-646 refers to a “secondary component” and teaches embodiments wherein the “optional secondary component compris[es] a halogen or a hydrohalide,” and wherein it is “selected from the group consisting of Group V halides, Group VI halides, HI, HBr, HCl, and combinations thereof.” *See, e.g.*, EX1012 ¶¶[0011], [0014]-[0015], [0017], [0025], [0067], [0074], cls. 4-8, 11, 24-27, 38-43. These secondary components are added, “such that the reactivity and mercury capacity of the sorbent are enhanced,” by reacting with SO_x to minimize competition with mercury for active binding sites on activated-carbon sorbent. EX1012 ¶¶[0014], [0128]; EX1002 ¶¶557-562.

3. Other Claims

Claims 2-4, 7-8, 10-11, and 17-18 are anticipated by Baldrey, as addressed in Ground 1. Because anticipation is the epitome of obviousness, these claims are obvious as well. EX1002 ¶563.

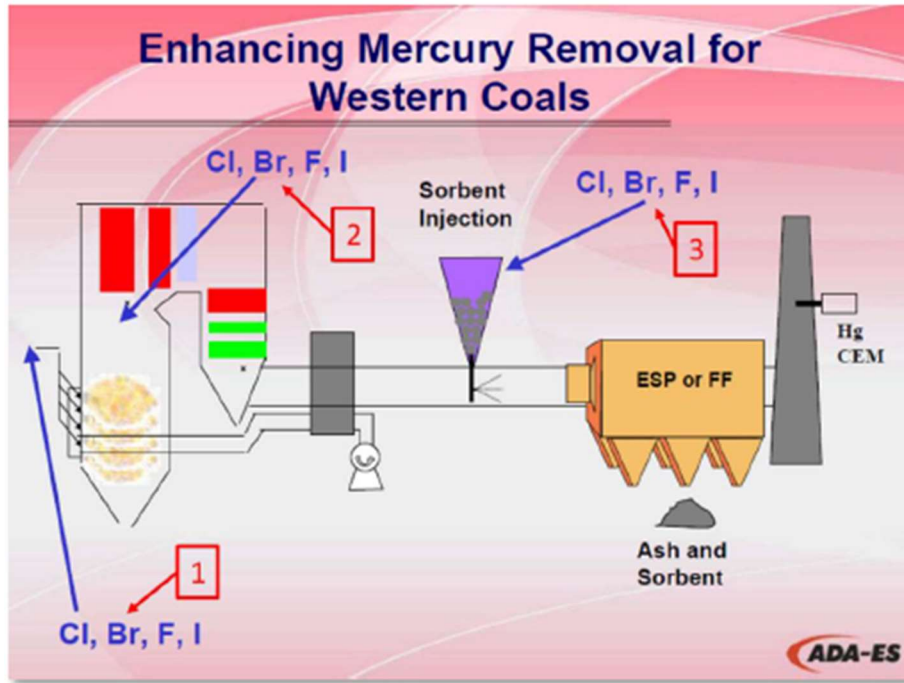
X. GROUND 3: OBVIOUSNESS OVER SJOSTROM IN VIEW OF OLSON-646

Ground 3 asserts obviousness of Claims 1-18 over Sjostrom in view of Olson-646. EX1002 ¶¶13, 564, 573.

Ground 3 relies largely on disclosure of Sjostrom, with certain claim limitations disclosed by Olson-646. The subsections below discuss the reasons a POSITA would have combined Sjostrom with Olson-646, followed by disclosures of the combination.

A. OVERVIEW OF EX1010 (“SJOSTROM”)

Sjostrom’s title is “Full Scale Evaluations of Mercury Control Technologies with PRB [Powder River Basin] Coals.” EX1010, 1. Sjostrom identifies power plants that used “activated carbon injection [“ACI”] to improve mercury control.” EX1010, 10-11. In addition to “Sorbent Injection,” Sjostrom teaches adding halogens (“Cl, Br, F, I”) in three locations:

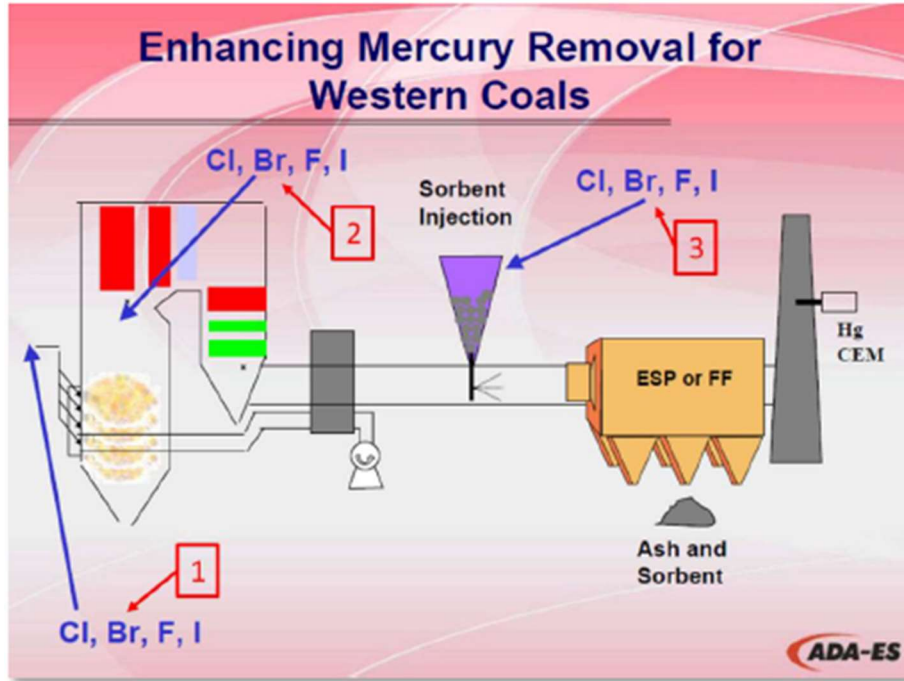


EX1010, 4 (annotations in red). Sjostrom mentions “coal additives” and, as shown at Location 1, teaches adding halogens to pulverized coal entering the boiler. Sjostrom also teaches adding halogens directly into the combustion chamber at Location 2, and teaches adding halogens to sorbent added to the flue gas at Location 3. EX1010, 4, 23, 25; EX1002 ¶¶273-278; EX1094 (O’Keefe) at 246:21-247:6, 249:6-252:9 (PO’s technical expert, describing Locations 1-3 of Sjostrom).

B. OVERVIEW OF THE COMBINATION AND REASONS TO COMBINE

A POSITA would have been motivated to combine Sjostrom with Olson-646, with reasonable expectation of success, because the references are directed towards the same goal (removing mercury from coal-combustion flue gases). Sjostrom

describes adding halogens (Br, Cl, and I) and injecting activated-carbon sorbent (“Sorbent Injection”) to remove mercury in coal-fired flue gas. EX1002 ¶565.



EX1010, 4 (annotations in red). The halogens are used at any/all of three locations. EX1002 ¶¶565-566, 568, 571. To the extent Sjostrom does not identify the specific chemical containing the halogens (e.g., Br) or what quantity to use, Olson-646 provides those implementation details (e.g., what “Br” to use and how much) and supplement the teachings of Sjostrom. Sjostrom identifies where to inject halogens (e.g., Locations 1-3) and describes the need for powdered activated carbon (PAC). Likewise, Olson-646 describes where to inject PAC and what kind of halogen-containing chemicals react with PAC. The combination represents application of a known technique (halogen/halide promotion) to a known device

(activated-carbon sorbent) ready for improvement to yield predictable results (increased mercury removal). EX1002 ¶¶565-572.

To the extent Sjostrom does not expressly state which compounds to use, or their injection rate, Olson-646 teaches that “the halogen/halide promoter is in gaseous or vapor form” and it comprises “gaseous HBr or Br₂.” EX1012 ¶[0066]. A POSITA would have been motivated, with reasonable expectation of success, to add HBr or Br₂ into the combustion chamber of Sjostrom (e.g., Location 2), because it would have been a simple substitution of one known element (“Br” in Sjostrom) for another known element (Br₂ or HBr of Olson-646) to improve a known device (activated-carbon sorbent in Sjostrom and Olson-646) and obtain predictable results (e.g., effective mercury removal). A POSITA would also look to Olson-646 to select an appropriate chemical (e.g., at Location 1 of Sjostrom) that would yield HBr or Br₂ in the mercury-containing gas. EX1012 ¶[0054]. Such selection would have been obvious as a matter of routine implementation. A POSITA would have been motivated to add a bromide compound to the coal, because when it is heated in the furnace, it would react to form the gas-phase promoters called for by Olson-646. EX1002 ¶¶567-568; EX1095 (Olson Dep.), 98:23-100:3, 231:3-9.

The implementation details provided in Olson-646 are simply proposed workable ranges (e.g., halogen:sorbent ratios), which were conventional and known in the art, and would have been selected, or at least tried, as part of routine process

optimization by a POSITA applying the teachings of Sjostrom. EX1002 ¶¶569-572; *Applied Materials*, 692 F.3d at 1297-98.

C. DISCLOSURE AND TEACHINGS OF THE COMBINATIONS

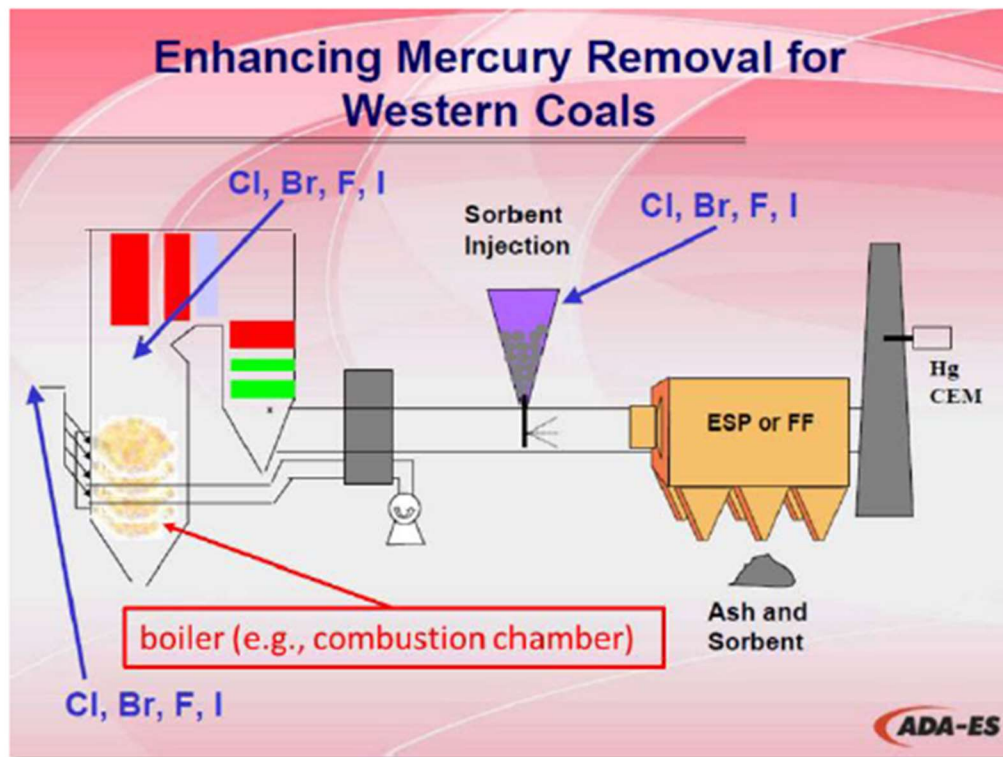
1. Independent Claim 1

a. Element 1(Pre): “A method for separating mercury from a mercury-containing gas, the method comprising”

Sjostrom discloses the preamble: “Full Scale Evaluations of Mercury Control Technologies with PRB Coals.” EX1010, 1. Sjostrom quantifies mercury separation from a mercury-containing gas through graphing “Hg Removal (%)” and “Hg Removal Efficiency (%)” EX1010, 8, 15-17, 20-21; *see* EX1010, 4; EX1002 ¶574.

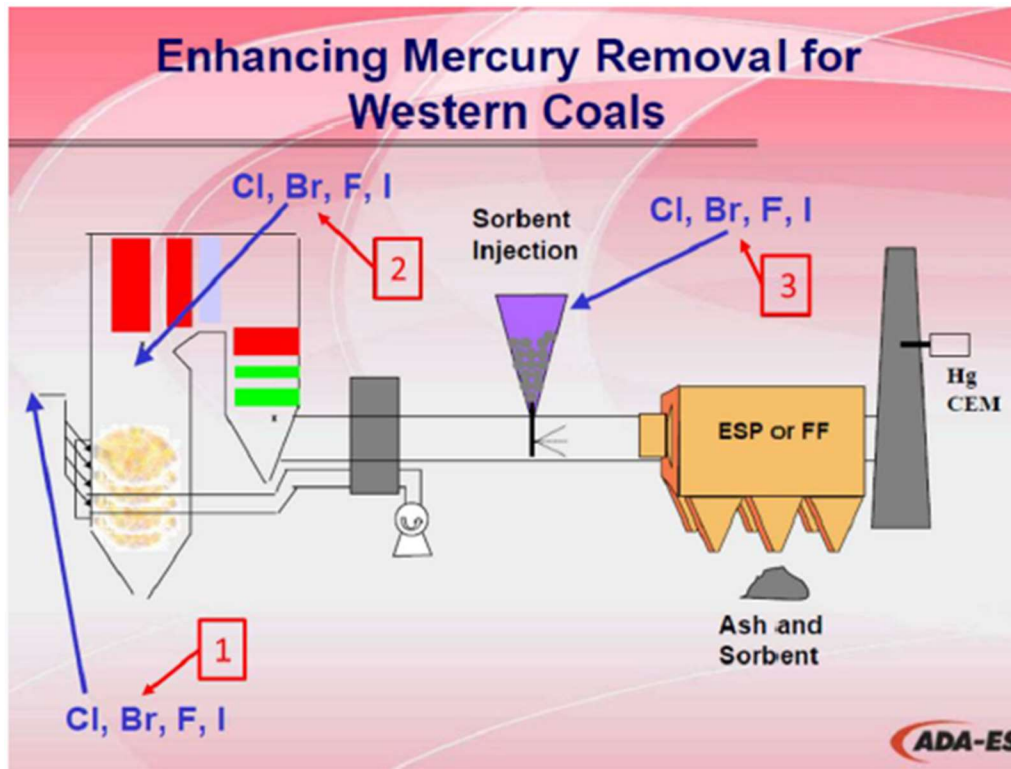
b. Element 1(a): “combusting a mixture of coal and an additive in a combustion chamber, to form the mercury-containing gas, wherein the additive is chosen from halides, halogens, salts thereof, and combinations thereof;”

Sjostrom combusts coal in a coal-fired boiler, also referred to as a coal-fired furnace (e.g., combustion chamber):



EX1010, 4. The red annotations point to a well-known representation of a coal-fired boiler/furnace (combustion chamber). Sjostrom combusts PRB (Powder River Basin) coal to generate mercury in the flue gas. EX1010, 3, 12, 18; EX1002 ¶575.

Sjostrom renders obvious addition of halides, halogens, salts thereof, and combinations thereof to the coal and/or combustion chamber.



EX1010, 4 (annotations in red). Sjostrom adds halogens (“Cl, Br, F, I”) to the combustion chamber at Location 2. A POSITA would understand addition of halogens at Location 1 would be to the coal itself because, in addition to the figure, Sjostrom discloses “coal additives.” EX1010, 23, 25; EX1094 (O’Keefe) at 246:21-247:6, 249:6-252:9 (describing Locations 1-3 of Sjostrom). Even at Location 2 of Sjostrom, it would have been obvious that there would be some mixing between the coal and halogen-containing additives. Thus, whether at Location 1 or Location 2, a mixture of coal and halogen-containing additive is combusted to form a mercury-containing gas. EX1002 ¶576.

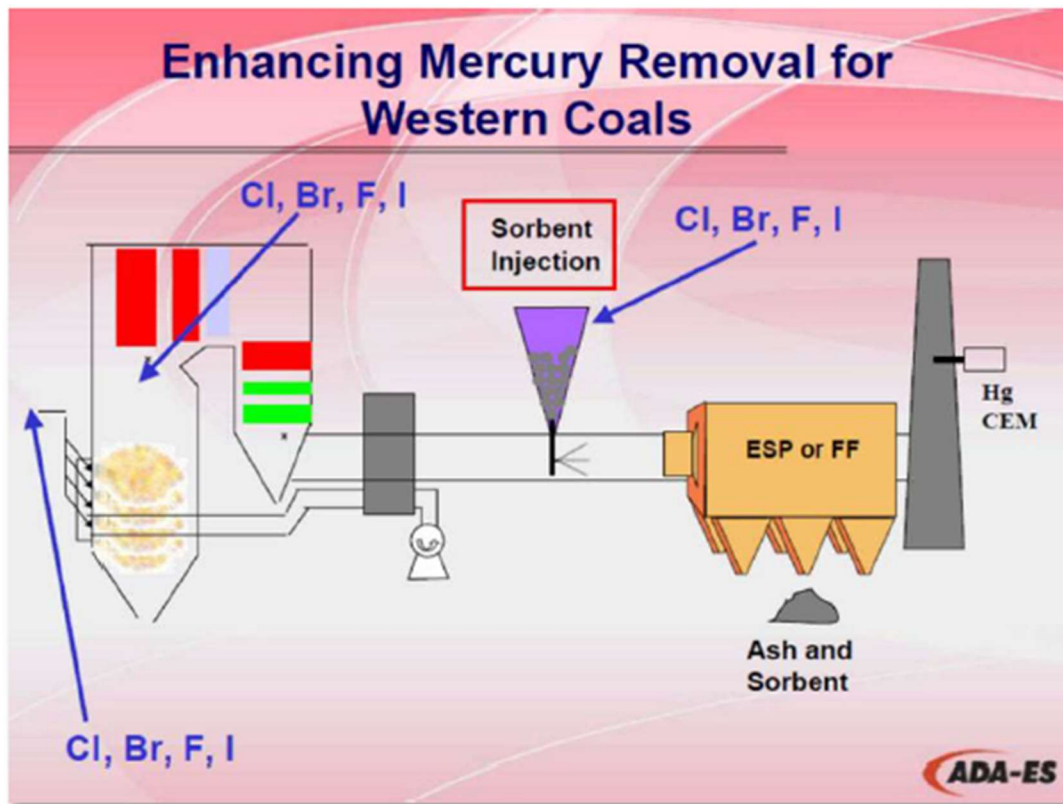
Sjostrom does not identify which specific chemical to use for “Cl, Br, F, I,” but it would have been obvious to use widely available materials, including aqueous solutions of a halide compounds like CaCl_2 and CaBr_2 (for “Cl” and “Br” taught by Sjostrom). Sjostrom adds “KNX (Alstom Power),” an aqueous solution of calcium bromide salt for enhancing mercury control. EX1010, 23; EX1002 ¶577 (discussing EX1106-EX1107).

Olson-646 supplements the teachings of Sjostrom, describing “Br”-containing compounds promoting activated-carbon sorbents. Olson-646 “provides a cost-effective way to capture pollutants by utilizing exceptionally reactive halogen/halide promoted carbon sorbents using a bromide (or other halogen/halide) treatment of the carbon, that capture mercury via mercury-sorbent surface reactions.” EX1012 ¶[0043]. In Olson-646, “the halogen/halide promoter” comprises “gaseous HBr or Br₂.” EX1012 ¶[0066]. A POSITA would have been motivated, with a reasonable expectation of success, to add HBr or Br_2 into the combustion chamber of Sjostrom (e.g., Location 2), because it would have been a simple substitution of one known element (e.g., the “Br” in Sjostrom at the location specified by Sjostrom) for another known element (e.g., HBr or Br_2 of Olson-646) to improve a known device (activated-carbon sorbent in Sjostrom and Olson-646) and obtain predictable results (e.g., mercury removal in Sjostrom and Olson-646). In addition, a POSITA would have been motivated to add an aqueous bromide salt solution to the coal and/or the

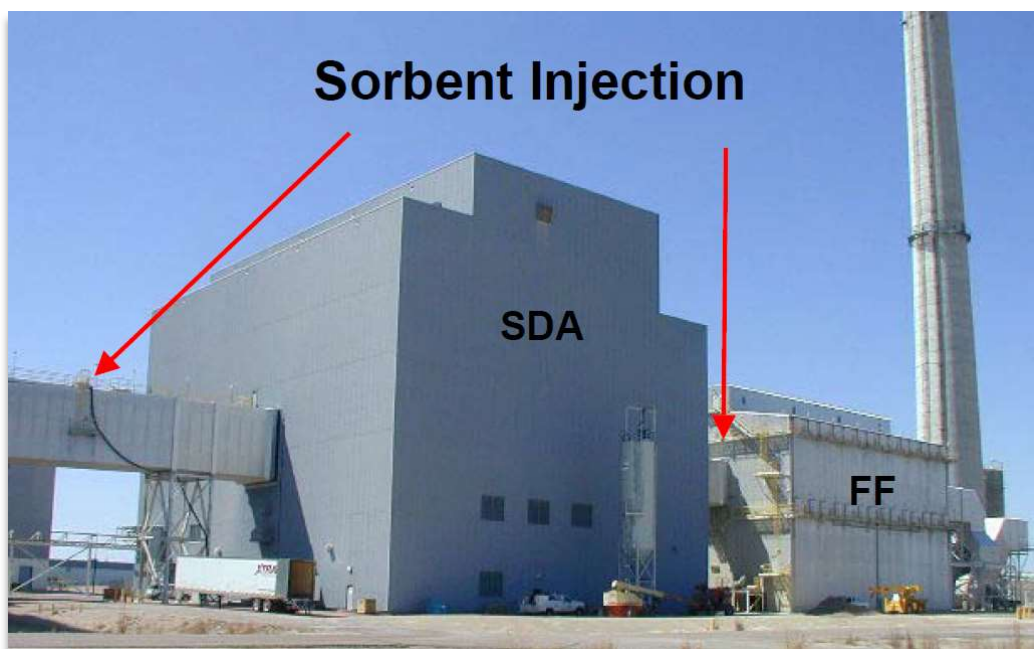
combustion chamber (such as the KNX in Sjostrom), because when heated in the furnace, it would react to form the gas-phase promoters (e.g., HBr and Br₂) called for by Olson-646. EX1002 ¶578; EX1095 (Olson), 98:23-100:3, 231:3-9.

c. Element 1(b): “adding a particulate sorbent material comprising activated carbon into the mercury-containing gas,”

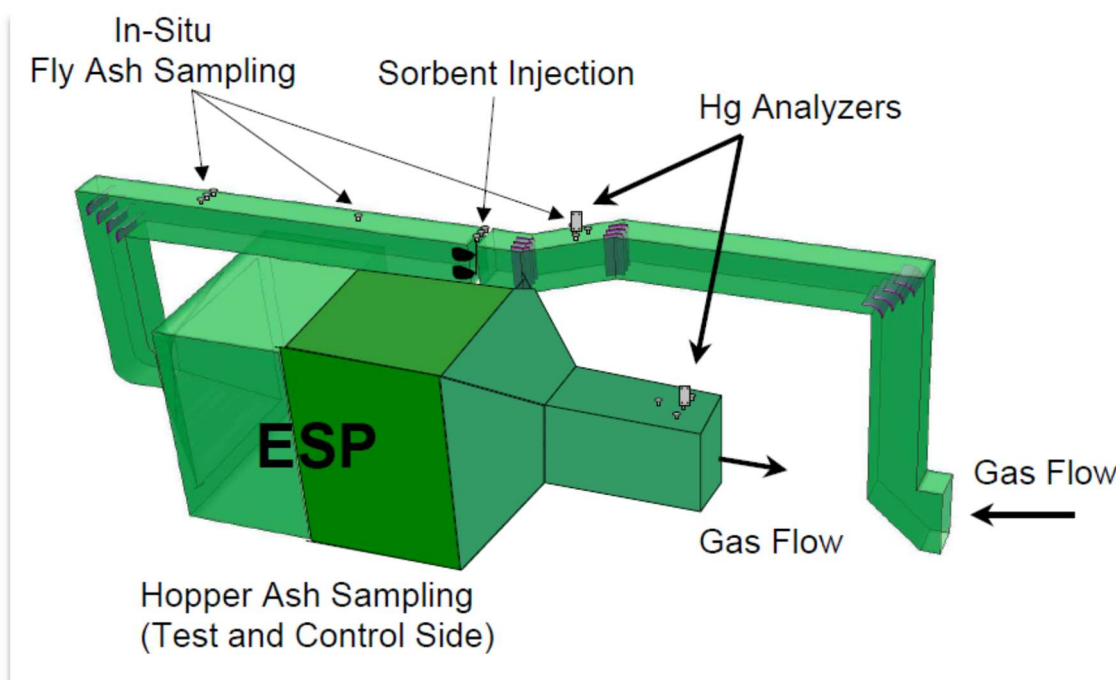
Sjostrom discloses “Sorbent Injection” into the mercury-containing gas downstream of the combustion chamber (e.g., boiler/furnace):



EX1010, 4 (annotations in red). Sjostrom again references “Sorbent Injection”:



EX1010, 13. The “sorbent injection” is into mercury-containing gas (“gas flow”):



EX1010, 19; *see* EX1010, 32. The “sorbent” is “activated carbon injection to improve mercury control,” abbreviated as “ACI.” EX1010, 10-11. The activated

carbon is in particulate form, and the specific brand of activated carbon is “DARCO FGD.” EX1010, 15-16; EX1002 ¶579.

This limitation is further obvious, because Olson-646 describes that activated carbon “is injected into [the] contaminated flue gas stream.” EX1012 ¶¶[0043], [0061]; EX1002 ¶580.

d. Element 1(c): “wherein a weight ratio of the additive added to the coal, added to the combustion chamber, or a combination thereof, to an amount of the sorbent material added to the mercury-containing gas is from about 1:100 to about 30:100;”

This claim is obvious over Sjostrom in view of Olson-646. Olson-646 includes repeated discussion of this ratio of halogen/halide promoter to sorbent: “the promoter is added at from about 1 to about 30 grams per 100 grams of activated carbon.” EX1012 ¶¶[0023], [0027]; *see* claims 3, 17, 37, 47; EX1002 ¶581. Whether that promoter is added to the coal (Location 1) or combustion chamber (Location 2) of Sjostrom, a POSITA would expect that the quantity of halogen-containing promoter in the flue gas (with the 1:100-30:100 ratio disclosed by Olson-646) would equal the halogen-containing promoter applied to the combustion chamber and/or coal, because nearly all the promoter would come from the additive itself (e.g., as opposed to native halogens in the coal) for the Powder River Basin (PRB) (western sub-bituminous) coal in Sjostrom. A POSITA would have also

expected that nearly all of halogens applied to coal or combustion chamber (as in Sjostrom) will work their way through to the flue gas. EX1010, 1, 3; EX1002 ¶¶69, 581.

Claim Element 1(c) is merely an attempt to claim a workable range for combinations of conventional halogens (bromine, chlorine, iodine) being used in a conventional way (to oxidize mercury and promote activated carbon) with a conventional sorbent (activated carbon). Nothing in the '370 Patent specification attributes significance to the claimed range or establishes that the claimed range “achieves unexpected results.” The range presents nothing more than optimization of “result-effective” variables that would have been obvious to a POSITA.⁸ *Applied Materials*, 692 F.3d at 1297-98; *Pfizer*, 94 F.4th at 1347 (“decades-old legal principle that “where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation”); EX1002 ¶582. PO agreed with this analysis, asserting the limitation should be given

⁸ PO’s expert stated that “power plants employing bromine additives and activated carbon would necessarily produce a sorbent that is 1 g to 30 g bromine per 100 g of activated carbon,” and then cited to this analysis for a claim that requires “the mercury-containing gas comprises about 1 g to about 30 g of the element bromine per 100 g of the sorbent. EX1092, 153-154 (claims 4, 29)

“no patentable weight” because the “range presented nothing more than optimization of result-effective variables that would have been obvious to a POSITA.” EX1105, 34-35.

e. Element 1(d): “contacting mercury in the mercury-containing gas with the sorbent material, to form a mercury-sorbent; and”

Norit DARCO and other activated carbons were referred to as “sorbents,” because they “adsorb” mercury in the gas phase. In an adsorption process, adsorbate (e.g., mercury) from a fluid (e.g., flue gas) adheres to the surface of a sorbent (activated carbon) to form a mercury-sorbent composition. EX1002 ¶583.

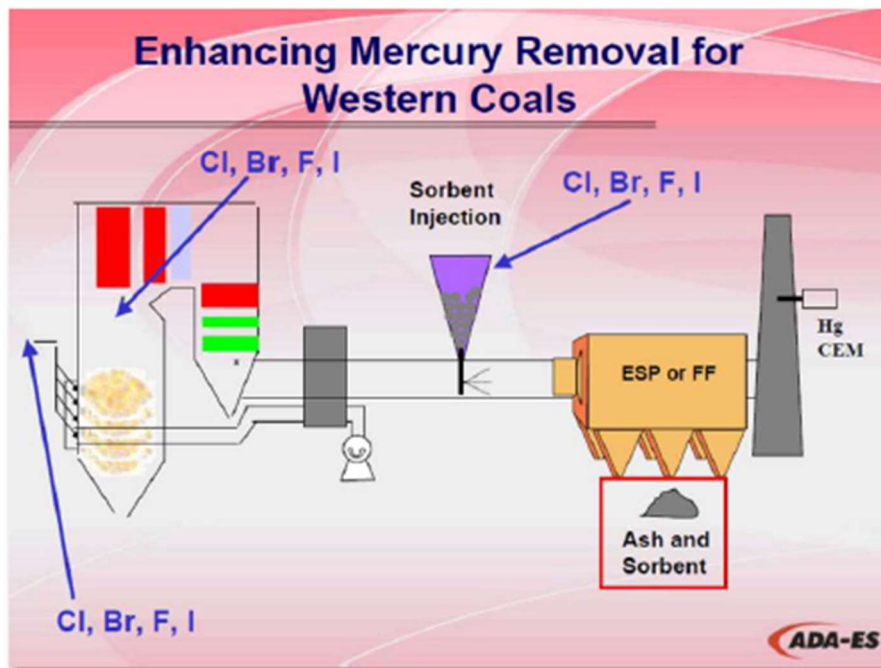
This limitation is further obvious over Olson-646. Activated carbon in the flue gas adsorbs mercury, as it “capture[s] mercury via mercury-sorbent surface reactions.” EX1012 ¶[0043]. A mercury-sorbent composition is shown below:



EX1012, Fig. 2 (annotated). Olson-646 describes “AC mercury binding sites,” where mercury contacts sorbent and forms a mercury-sorbent composition. EX1012 ¶[0128]; EX1002 ¶584.

f. Element 1(e): “separating the mercury-sorbent from the mercury-containing gas.”

Sjostrom discloses separating sorbent contacted with mercury (labeled, “Ash and Sorbent”) from flue gas, using an ESP or FF:



EX1010, 4 (annotations in red). ESPs and FFs were well-known particulate control devices to separate particles (e.g., mercury-sorbent composition) from mercury-containing gas. EX1010, 4; EX1002 ¶¶86-88. As described for Element 1(d), sorbent is contacted with mercury after being introduced into the mercury-containing gas, and thus the “sorbent” separated by the ESP/FF is a mercury-sorbent composition. EX1002 ¶585.

This limitation is further obvious over Olson-646, which discloses sorbent “capture[s] mercury via mercury-sorbent surface reactions.” EX1012 ¶[0043]. That mercury-sorbent composition is separated by a particulate separator (ESP or FF). EX1012 ¶[0059]; EX1002 ¶586.

2. Claims Depending from Claim 1

a. Claim 2: “adding the additive to the coal before combusting the coal.”

This claim is obvious for the reasons discussed above for Element 1(a) regarding halogen-containing ingredients added to the coal, including at Location 1 of Sjostrom. EX1002 ¶587.

a. Claims 3-4:

3: “the additive mixed with the coal is in a liquid.”

4: “the liquid is a hydrocarbon, supercritical carbon dioxide, water, salt solution, or a combination thereof.”

As discussed for Element 1(a), Sjostrom discloses adding “KNX” at Location 1 (mixed with coal upstream of combustion chamber). KNX was an aqueous salt solution of calcium bromide. EX1002 ¶¶588-589 (discussing EX1106-EX1107).

b. Claim 5: “carbocations in the activated carbon of the mercury-sorbent accept electrons from mercury atoms of the mercury-sorbent.”

This claim limitation presents a model of the chemistry proposed to take place when halogen-containing promoters contact activated-carbon sorbent. It is disclosed near-verbatim in Olson-646. EX1012 ¶[0093]; EX1002 ¶590.

c. Claim 6: “the additive is substantially in vapor form in the mercury-containing gas.”

As described for Element 1(a), a POSITA would have found it obvious that the halogen-containing ingredients of Sjostrom would have included halides at Location 1 (e.g., CaBr_2). At combustion temperatures, the aqueous-salt solution vaporizes and leaves the boiler as vapor-phase HBr. EX1095 (Olson Dep.), 98:23-100:3, 231:3-9. Halogens added at Location 2 (to combustion chamber) would have been vaporized at combustion temperatures and would remain in vapor form when contacting the injected sorbent in the mercury-containing flue gas. The boiling point of Br_2 is 58.8°C and HBr is -66.38°C , each well below the temperature of the mercury-containing flue gas.⁹ EX1036, 4-53, 4-65; EX1002 ¶591; EX1092, 154 (cl. 7). The claim is further obvious over Olson-646: “the halogen/halide promoter is in gaseous or vapor form” that comprises “gaseous HBr or Br_2 .” EX1012 ¶[0066]; EX1002 ¶592.

⁹ Sjostrom discloses that activated-carbon sorbent is injected into the mercury-containing gas at 290°F (143°C). EX1010, 15.

d. Claim 7: “the additive is chosen from Cl₂, HCl, sodium chloride, calcium chloride, and a combination thereof.”

As described for Element 1(a), it would have been obvious to use widely available and inexpensive materials, such as calcium chloride (de-icing agent) or sodium chloride (NaCl, table salt) for the “Cl” taught by Sjostrom. As Dr. Niksa explains in the technical background, it was known that chlorides and bromides both are helpful to remediating mercury in that they oxidize mercury. *See, e.g.*, EX1048, 1169; EX1002 ¶¶593; *see also* EX1002 ¶¶ 53-55, 61-64, 109-113, 132-151; *see* EX1062 at 2-3, 10 (“screening tests of several oxidation additives including chloride compounds (e.g., sodium chloride, hydrogen chloride, calcium chloride)”).

It would have been obvious that the weight ratio of Element 1(c) (of additive to sorbent) would still be within “about 1:100 to about 30:100,” at least because this range presents nothing more than optimization of “result-effective” variables that would have been obvious to a POSITA. *Applied Materials*, 692 F.3d at 1297-98; *see Pfizer*, 94 F.4th at 1347; EX1105 (POPR), 34-35; EX1002 ¶594.

e. Claim 8: “the additive is chosen from Br₂, HBr, sodium bromide, calcium bromide, and a combination thereof.”

As described for Element 1(a) and Claims 3-4, Sjostrom teaches using “KNX” for the “Br” additive, which was an aqueous calcium bromide solution. EX1106-

EX1107. And as described for Element 1(a), Olson-646 discloses that the additive can be HBr or Br₂. EX1002 ¶595.

f. Claim 9: “the additive is chosen from PBr₃, SCl₂, and a combination thereof.”

Olson-646 describes that “the halogen or halide promoter ... may preferably comprise ... PBr₃ or SCl₂.” EX1012 ¶[0052]; *see also* ¶¶[0067], [0132]-[0133]. Olson-646 also states that “the promoter is added at from about 1 to about 30 grams per 100 grams of activated carbon.” EX1012 ¶¶[0023], [0027]; *see* claims 3, 17, 37, 47; EX1002 ¶596.

g. Claim 10: “the additive is chosen from I₂, HI, sodium iodide, calcium iodide, potassium iodide, and combinations thereof.”

As described for Element 1(a), Sjostrom describes that “I” (iodine-containing chemicals) can be added at Locations 1 and 2 to mitigate mercury. Olson-646 further motivates a POSITA to apply halogen-containing chemicals containing “I,” because “the halide anions (especially bromide and iodide) were effective in promoting the oxidation by stabilizing the developing positive charge on the mercury in the transition state for oxidation. Based on this model, several innovative, inexpensive, activity-enhancing features have been developed.” EX1012 ¶[0073]; *see* claim 40. Olson-646 further identifies I₂ (“iodine”) and HI (hydrogen iodide) as effective promoters. EX1012 ¶[0067]. Olson-646 then states, “the promoter is added at from

about 1 to about 30 grams per 100 grams of activated carbon.” EX1012 ¶¶[0023], [0027]; *see* claims 3, 17, 37, 47; EX1002 ¶¶597, 53-55, 61-64, 109-113, 132-151; *see* EX1062 at 2-3, 10 (“screening tests of several oxidation additives including ... potassium iodide”).

- h. Claim 11: “the activated carbon is chosen from powdered activated carbon, granular activated carbon, carbon black, carbon fiber, aerogel carbon, pyrolysis char, and combinations thereof.”**

Sjostrom discloses use of “PAC” (Powdered Activated Carbon) sorbents and “DARCO FGD,” a well-known brand of PAC. EX1010, 10, 15-16, 20, 34; EX1002 ¶¶598, 109-111, 132-151.

- i. Claim 12: “adding an alkaline component to the mercury-containing gas, the alkaline component chosen from alkali elements, alkaline earth elements, alkali salts, alkaline earth salts, and combinations thereof.”**

The disclosure in Olson-646 and motivations to use an alkali component are discussed above for Ground 2 (Claim 12). *Supra* §IX.C.2.d; EX1002 ¶¶599-600.

- j. Claim 13: “contacting the sorbent material with a mercury-stabilizing reagent chosen from S, Se, H₂S, SO₂, H₂Se, SeO₂, CS₂, P₂S₅, and combinations thereof.”**

Sjostrom discloses that SO₂ is present in the mercury-containing gas with the sorbent:

Testing at Holcomb Station

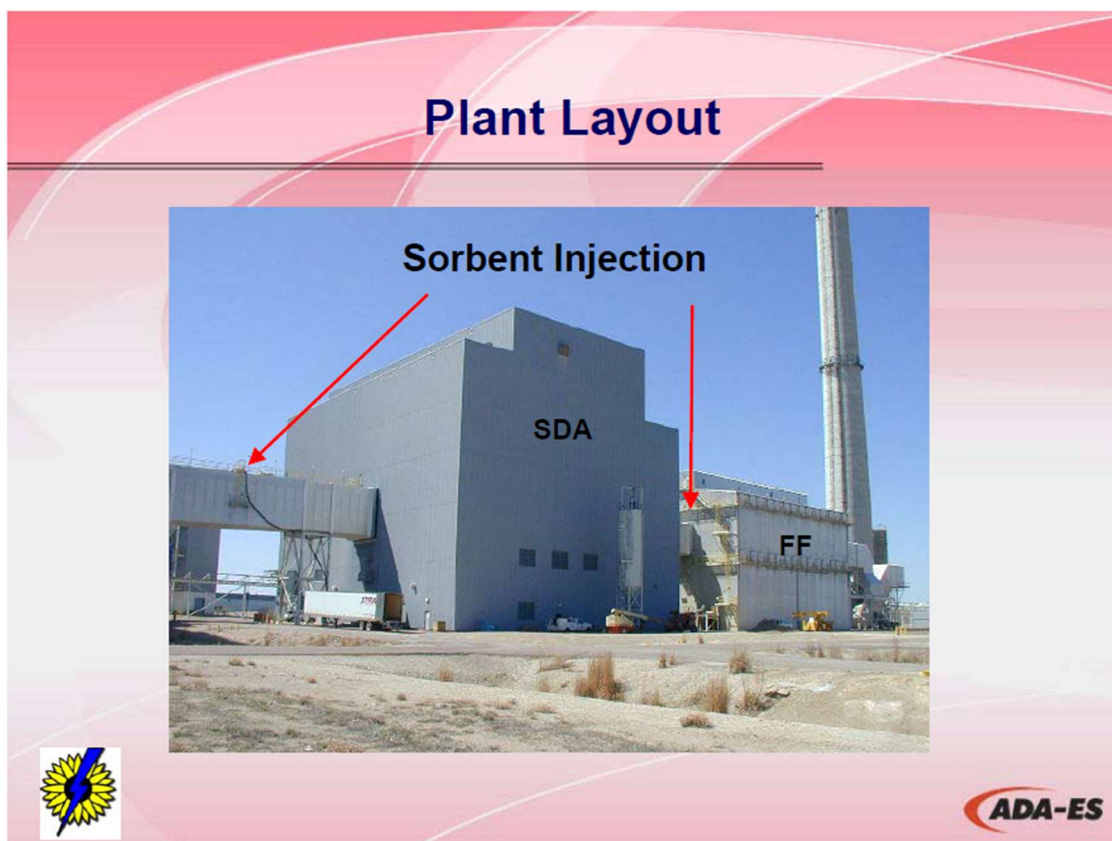
- Unit Capacity
 - 360 MW
- Coal
 - PRB
 - Hg Content:
0.04 – 0.1 ppm-dry
 - Cl Content:
7-35 ppm-dry
- SO₂ Control – SDA
- Particulate Control – FF



DOE Cooperative Agreement DE-FC26-03NT41986



EX1010, 12 (describing “SO₂ Control-SDA”). The SO₂ is formed within the combustion chamber during coal combustion. EX1002 ¶601. Sjostrom confirms in the above graphic that the SO₂ is present in the spray dry adsorber (SDA). The contact with the activated-carbon sorbent (shown in graphic below) is inevitable, regardless of whether the sorbent is injected upstream or downstream of the SDA.



EX1010, 13; EX1002 ¶601.

This claim is also obvious over Olson-646, which discloses this limitation almost verbatim. EX1012 ¶[0017]; *see* ¶¶[0021], [0025], cls. 12, 14, 28-29, 44. A POSITA would have been motivated to add these components “to stabilize” the mercury binding to activated carbon. *Id.* ¶[0074]; EX1002, ¶602.

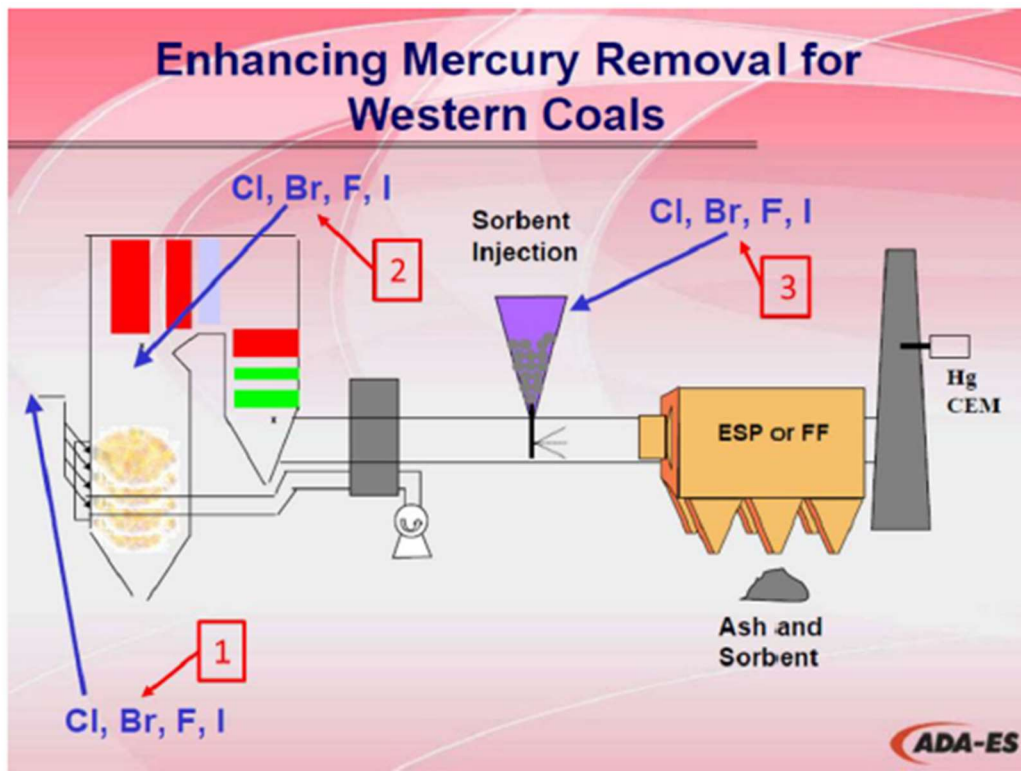
k. Claims 14-16:

14: “contacting the sorbent material with a secondary component chosen from halogens, hydrogen halides, Group V halides, Group VI halides, and combinations thereof.”

15: “the secondary component is chosen from halogens, halide salts, HI, HBr, HCl, and combinations thereof.”

16: “the secondary component is chosen from I₂, HI, and combinations thereof.”

Claims 14-16 are obvious over Sjostrom and Olson-646. Sjostrom teaches injecting halogens in at least three locations, and these halogens include those containing “Cl, Br, F, I.”



EX1010, 4 (annotations in red). In addition to Locations 1-2 (described for Claim 1), halogens added at Location 3 are a secondary component injected into the mercury-containing flue gas. EX1002 ¶¶603, 608, 610.

Olson-646 refers to a “secondary component” and teaches embodiments wherein the “optional secondary component compris[es] a halogen or a hydrohalide,” and wherein it is “selected from the group consisting of Group V halides, Group VI halides, HI, HBr, HCl, and combinations thereof.” EX1012 ¶¶[0011], [0014]-[0015], [0017], [0025], cls. 4-8, 11, 24-27, 38-43. These secondary components are added “such that the reactivity and mercury capacity of the sorbent are enhanced,” by reacting with SO_x to minimize competition with mercury for active binding sites on activated-carbon sorbent. EX1012 ¶¶[0014], [0128]; EX1002 ¶¶604-607, 609-610.

I. Claim 18: “the additive comprises a and b, b and c, a and c, or a, b, and c: a) I⁻ and/or I₂, b) Br⁻ and/or Br₂, c) Cl⁻ and/or Cl₂.”

As discussed above for Element 1(a), Sjostrom teaches adding various halogens, including “Cl, Br, ..., I” to the combustion chamber and/or coal. It would have been obvious to use widely available materials, including aqueous solutions of halide compounds like CaCl₂ and KNX (CaBr₂). A POSITA would have understood that bromine and chlorine compounds in an aqueous solution would dissociate such that the solution contains Br⁻ and Cl⁻ ions, respectively. A POSITA would have

been motivated to add both aqueous solutions of halide compounds as Sjostrom teaches the addition of multiple types of halogens. Nothing in the '370 Patent attributes significance to the addition of multiple types of halogens versus only one type of halogen or establishes that the combination of halogens “interact[s] in an unpredictable or unexpected way” or “achieves unexpected results.” The combination presents nothing more than the combination of “result-effective” variables that would have been obvious to a POSITA. *Applied Materials, Inc.*, 692 F.3d 1297-98 (Fed. Cir. 2012); EX1002 ¶611.¹⁰

3. Independent Claim 17

Claim 17 is nearly identical to Claims 1 and 18, with minor changes, as shown below:

¹⁰ The 1-30% weight ratio would still be maintained when using multiple halogens. *See* EX1105, 34-35 (asserting that the 1-30% ratio should be given “no patentable weight”); *see Pfizer*, 94 F.4th at 1347 (“where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation”).

~~17.~~ A method for separating mercury from a mercury-containing gas, the method comprising:
combusting ~~a mixture of~~ coal ~~and~~ comprising an additive in a combustion chamber, ~~to form the mercury-containing gas,~~ wherein the additive is chosen from halides, halogens, salts thereof, and combinations thereof; ~~18.~~ to form the mercury-containing gas, wherein the additive comprises a and b, b and c, a and c, or a, b, and c:
a) I^- and/or I_2 ,
b) Br^- and/or Br_2 ,
c) Cl^- and/or Cl_2 ;
~~adding a particulate~~ injecting a sorbent material comprising activated carbon into the mercury-containing gas, wherein a weight ratio of the additive added to the coal, added to the combustion chamber, or a combination thereof, to an amount of the sorbent material added to the mercury-containing gas is from about 1:100 to about 30:100;
contacting mercury in the mercury-containing gas with the sorbent material, to form a mercury-sorbent; and
separating the mercury-sorbent from the mercury-containing gas.

Claim 17 is obvious for the reasons described for Claims 1 and 18. EX1002 ¶¶612-618.

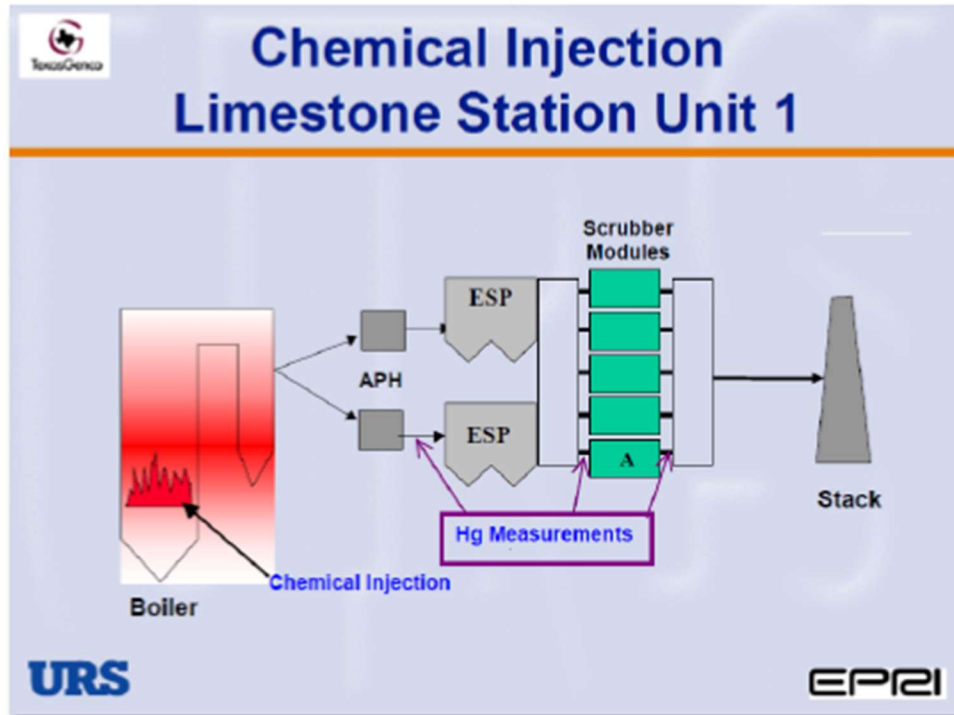
XI. GROUND 4: OBVIOUSNESS OVER SJOSTROM IN VIEW OF OLSON-646, FURTHER IN VIEW OF ECKBERG

Ground 4 asserts obviousness of Claims 1-18 over Sjostrom in view of Olson-646, further in view of Eckberg. EX1002 ¶¶13, 619.

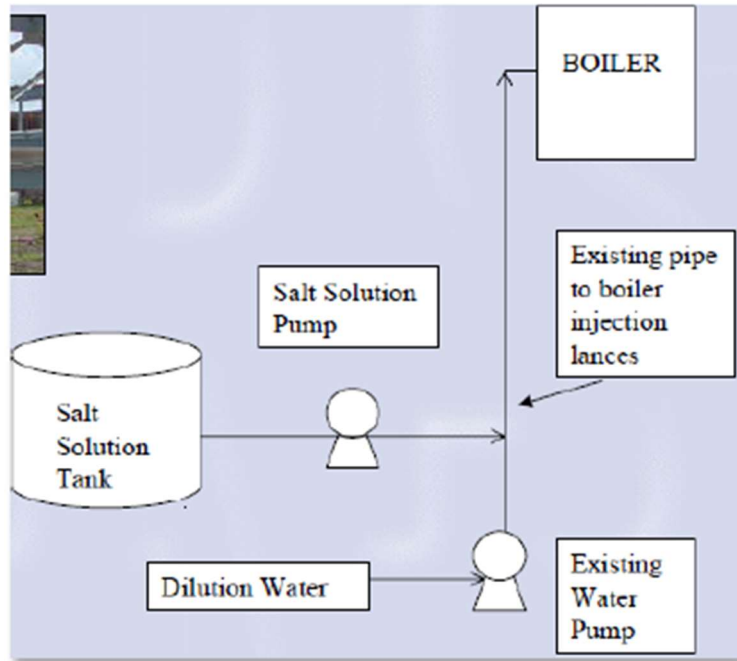
Ground 4 relies on the combination of Sjostrom and Olson-646 (Ground 3), with certain claim limitations also disclosed by Eckberg. The subsections below discuss the reasons a POSITA would have combined Sjostrom and Olson-646 with Eckberg, followed by disclosure of the specific combination.

A. OVERVIEW OF EX1011 (“ECKBERG”)

Eckberg is entitled “Mercury Control Evaluation of Halogen Injection into a Texas Lignite-Fired Boiler.” EX1011, 1. Eckberg describes “Chemical Injection” of halogens into coal-fired boilers to remove mercury:



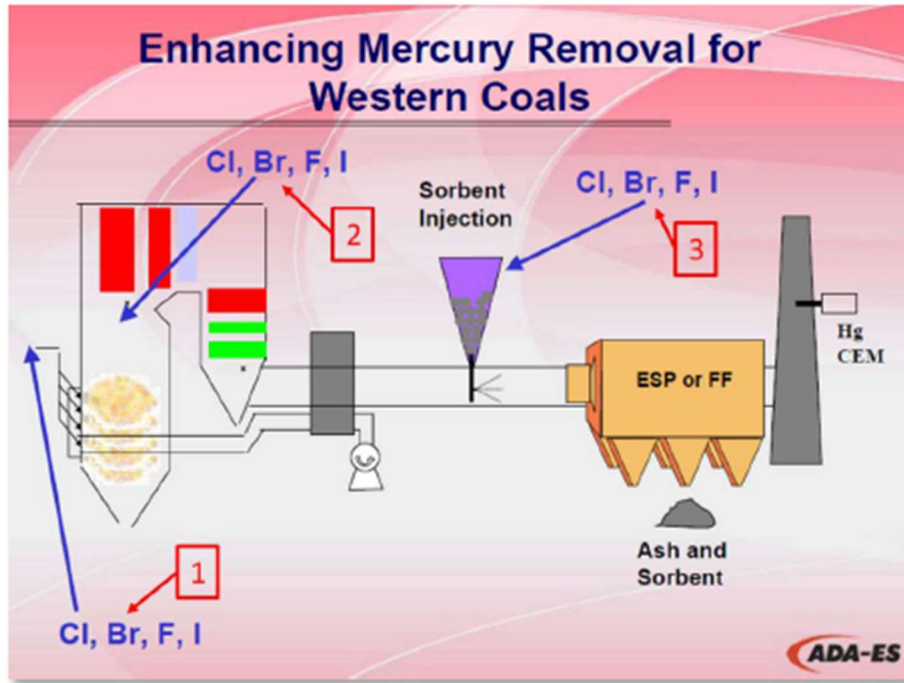
EX1011, 5. Eckberg details equipment used for halogen addition:



EX1011, 8. The “salt solution” was “CaCl₂ (25 wt%)” or calcium bromide, “CaBr₂ (52 wt%).” EX1011, 9; EX1002 ¶¶280-281.

B. OVERVIEW OF THE COMBINATION AND REASONS TO COMBINE

A POSITA would have been motivated to combine Eckberg with the combination of Sjostrom and Olson-646, with reasonable expectation of success, because the references are directed towards the same goal (removing mercury from coal-combustion flue gases) and are directed to using known techniques to improve similar devices. Sjostrom describes adding halogens (including Br, Cl, and I) and injecting activated-carbon sorbent (“Sorbent Injection”) to remove mercury in coal-fired flue gas. EX1002 ¶¶620, 623.



EX1010, 4 (annotations in red). To the extent Sjostrom and Olson-646 do not identify the specific halogen-containing chemical to add to the combustion chamber or coal, Eckberg provide those implementation details and supplement the teachings of Sjostrom. The combination represents application of a known technique (halogen/halide promotion) to a known device (activated-carbon sorbent) ready for improvement to yield predictable results (increased mercury removal). EX1002 ¶¶621, 624-629.

Eckberg describes a similar system as Sjostrom, including injecting halogens into coal-fired boilers for mercury removal. EX1011, 5, 8. Supplementing the teachings of Sjostrom, Eckberg discloses which halogens to use (calcium bromide and calcium chloride). EX1011, 3, 5, 9, 14-15; EX1002 ¶¶624-625.

Further motivation to combine exists because both references were presented consecutively in the same room during the “A3” session at 2005 EUEC.

Tuesday 01/25/2005			
7:30 - 9:30	A3: Mercury - Control Offen, Sjostrom, Eckberg, Landreth, Smith	B3: Corporate Strategies Wintergreen, Nelson, Tanzer, Drexler, Diamant, Jenkins	C3: NSR Harrison, Byers, Hiser, Hoefs, Poffenberger, Traylor

Tuesday, 1/25/2005	
A3 Mercury - Control Tuesday; 7:30-9:30am	
Chairs: George Offen – EPRI Ram Srivastava – NETL	
a. Mercury Control for Coal-fired Power Plants - An Update of Technology Options – George Offen, Ramsay Chang, Paul Chu and Richard Rhudy - EPRI	
b. Full-Scale Evaluations of Mercury Control Technologies with PRB Coals – Sharon Sjostrom, Travis Starns, Jerry Amrhein, and Jean Bustard - ADA ES, Inc.; Wayne Penrod and Corey Lineville - Sunflower Electric Power Corporation; Rich Phillips and Tom Hart - Ameren; Andrew O'Palko - U.S. DOE-NETL; Ramsay Chang, Ph.D. - EPRI	
c. Mercury Control Evaluation of Halogen Injection into a Texas Lignite-Fired Boiler – Craig Eckberg, John Hudspeth, Mike Meyers and Jim Russell - Texas Genco; Katherine Dombrowski and Carl Richardson - URS Corporation; Ramsay Chang - EPRI	

EX1030, 23, 30. Both presentations shared an author (Ramsay Chang) and partner (EPRI). *Id.* A POSITA would have understood the two presentations had related, interoperable teachings. EX1002 ¶622.

A POSITA would have been motivated to apply the teachings of Eckberg to Sjostrom, because it would have been a simple substitution of one known element (“Br” or “Cl” in Sjostrom) for another known element (“CaBr₂” or “CaCl₂” in Eckberg) to obtain predictable results of mercury removal. EX1010, 4; EX1011, 9; EX1002 ¶629. Both references use the same technique (halogen addition) to remove mercury from coal. EX1010, 3-8; EX1011, 2, 6, 9. Both references include similar surrounding equipment (e.g., ESPs) to remove the mercury. EX1010, 4; EX1011,

5. In combining Sjostrom and Olson-646 with Eckberg, no modifications would be needed to the overall process, equipment, operating conditions, or activated-carbon sorbent used in Sjostrom. EX1002 ¶¶627-629.

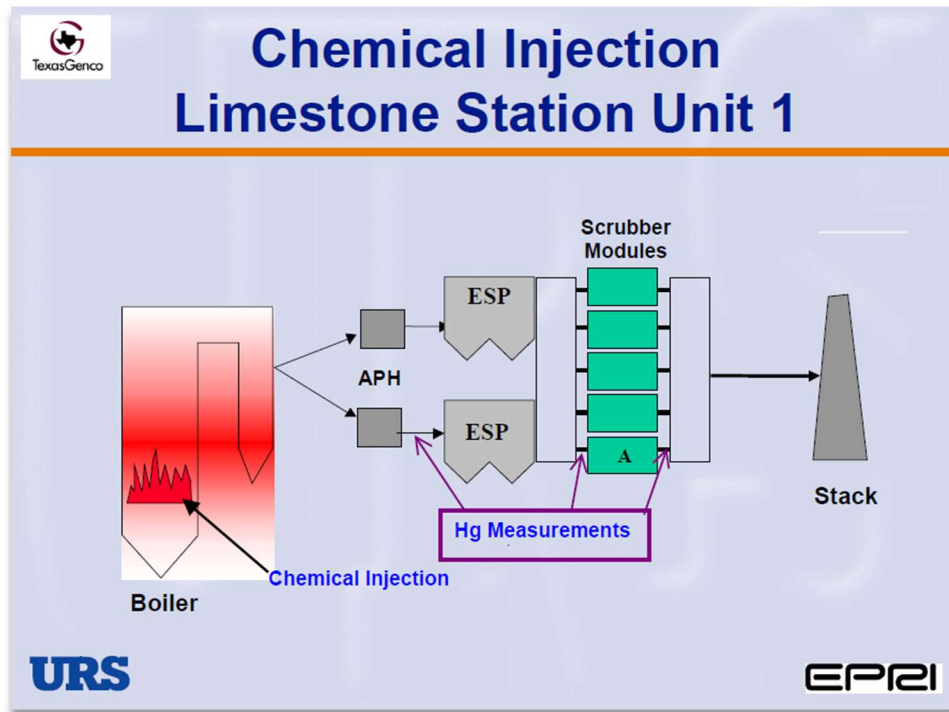
C. DISCLOSURE AND TEACHINGS OF THE COMBINATION

As discussed above, Claims 1-18 are obvious over the combination of Sjostrom and Olson-646 (Ground 3). These claims are also obvious in further view of Eckberg (Ground 4) for the reasons below. Elements and claims not mentioned below are disclosed or rendered obvious for the reasons stated above in Ground 3. EX1002 ¶630.

1. Independent Claim 1

- a. Element 1(a): “combusting a mixture of coal and an additive in a combustion chamber, to form the mercury-containing gas, wherein the additive is chosen from halides, halogens, salts thereof, and combinations thereof;”**

In addition to the reasons described for Ground 3, this limitation is further obvious over Eckberg. Eckberg labels the combustion chamber “boiler.”



EX1011, 5; EX1002 ¶631.

Eckberg discloses “chemical injection” to the boiler from a “salt solution tank” that contains aqueous solutions of calcium bromide solution, “CaBr₂ (52 wt%),” and/or a calcium chloride solution “CaCl₂ (25 wt%).” EX1011, 5, 8-9. A POSITA would have been motivated to supplement the system of Sjostrom (“Br” and “Cl” at Locations 1 and/or 2) with Eckberg (aqueous CaBr₂ and/or CaCl₂ as the “Br” and “Cl”), at least because calcium bromide and calcium chloride were widely obtainable and relatively cheap. A POSITA would have been motivated to add the CaBr₂ and/or CaCl₂ of Eckberg to the coal and combustion chamber because, when heated in the furnace, they would react to form the hydrohalide and molecular-

halogen (e.g., HBr and Br₂) gas-phase promoters called for by Olson-646. EX1002 ¶¶632-633; EX1095 (Olson Dep.), 98:23-100:3, 231:3-9.

2. Claims Depending from Claim 1

a. Claims 3-4:

3: “the additive mixed with the coal is in a liquid.”

4: “the liquid is a hydrocarbon, supercritical carbon dioxide, water, salt solution, or a combination thereof.”

As discussed for Element 1(a) in Ground 3, Sjostrom discloses adding “Br” or “Cl” at Location 1 (mixed with coal upstream of combustion chamber). Eckberg discloses that the form of the halogen-containing chemicals are aqueous solutions of calcium bromide and/or calcium chloride (i.e., salt solutions), which are liquids. EX1011, 5, 8-9; EX1002 ¶¶634-636.

b. Claims 6-8:

6: “the additive is substantially in vapor form in the mercury-containing gas.”

7: “the additive is chosen from Cl_2 , HCl , sodium chloride, calcium chloride, and a combination thereof.”

8: “the additive is chosen from Br_2 , HBr , sodium bromide, calcium bromide, and a combination thereof.”

In addition to the reasons described for Ground 3, these claims are further obvious over Eckberg. Eckberg discloses aqueous salt solutions of calcium chloride (CaCl_2) and/or calcium bromide (CaBr_2). EX1011, 5, 9. At combustion temperatures, these materials form HBr and HCl vapor, respectively, in the mercury-containing gas. EX1011, 9 (“Theoretical Gas Conc.” of HCl and HBr). Eckberg repeatedly refers to concentrations of HBr and HCl vapor in the mercury-containing gas. EX1011, 2, 7, 9, 11, 13-14; EX1002 ¶¶637-640.

c. Claim 18: “the additive comprises a and b, b and c, a and c, or a, b, and c: a) I^- and/or I_2 , b) Br^- and/or Br_2 , c) Cl^- and/or Cl_2 .”

In addition to the reasons described for Claim 18 in Ground 3, Eckberg discloses injection of aqueous solutions of CaBr_2 and/or CaCl_2 . EX1011, 8-9. As discussed above, a POSITA would have been motivated to supplement the system

of Sjostrom (“Cl, Br” at Locations 1 and/or 2) with Eckberg’s aqueous solutions of CaCl_2 and/or CaBr_2 , respectively. EX1002 ¶641.

A POSITA would have understood that calcium bromide and calcium chloride dissociate in aqueous solutions, such that the solution contains Br^- and Cl^- ions, respectively. A POSITA would have been motivated to add aqueous solutions of both halide compounds, as Sjostrom teaches the addition of multiple types of halogens. Nothing in the ’370 Patent attributes significance to the addition of multiple types of halogens versus only one type of halogen or establishes that the combination of halogens “interact[s] in an unpredictable or unexpected way” or “achieves unexpected results.” The combination presents nothing more than the combination of “result-effective” variables that would have been obvious to a POSITA. *Applied Materials*, 692 F.3d at 1297-98. EX1002 ¶641.

3. **Independent Claim 17**

Claim 17 is nearly identical to Claims 1 and 18, with minor changes, as shown below:

~~17.~~ A method for separating mercury from a mercury-containing gas, the method comprising:

combusting ~~a mixture of~~ coal ~~and~~ comprising an additive in a combustion chamber, ~~to form the mercury-containing gas,~~ wherein the additive is chosen from halides, halogens, salts thereof, and combinations thereof; ~~18.~~ to form the mercury-containing gas, wherein the additive comprises a and b, b and c, a and c, or a, b, and c:

a) I^- and/or I_2 ,

b) Br^- and/or Br_2 ,

c) Cl^- and/or Cl_2 ;

~~adding a particulate~~ injecting a sorbent material comprising activated carbon into the mercury-containing gas, wherein a weight ratio of the additive added to the coal, added to the combustion chamber, or a combination thereof, to an amount of the sorbent material added to the mercury-containing gas is from about 1:100 to about 30:100;

contacting mercury in the mercury-containing gas with the sorbent material, to form a mercury-sorbent; and

separating the mercury-sorbent from the mercury-containing gas.

Claim 17 is obvious for the reasons described for Claims 1 and 18 above in

Grounds 3 and 4. EX1002 ¶¶642-648.

4. Other Claims

Claims 2, 5, and 9-16 are obvious for the reasons described above in Ground

3. EX1002 ¶649.

XII. THE BOARD SHOULD NOT DISCRETIONARILY DENY INSTITUTION

The Board should not deny institution under 35 U.S.C. §314(a), because the district-court proceeding has barely begun, and Petitioner WEC is not a party to the district-court proceedings. The MDL Panel consolidated the

Arizona¹¹/Missouri/Iowa actions into multidistrict litigation in the Southern District of Iowa for pretrial proceedings (Dec. 17, 2024). On January 10, 2025, the Iowa court dismissed BHE outright. The Court transferred PacifiCorp to the District of Wyoming and transferred Wisconsin Power & Light to the District of Wisconsin. Those actions were subsequently transferred back to the MDL in the Southern District of Iowa. On March 7, 2025, the MDL issued a Case Management Order, including a “Trial Ready Date” of October 12, 2026. This date is a no-earlier-than date and, in any event, “applies solely to cases originally filed in the United States District Court for the Southern District of Iowa.” EX1104 (MDL Dkt. 60). A Final Written Decision in the present IPR proceeding is expected before the trial ready date in Iowa. Further, for Petitioners PacifiCorp and WPL, trial will be at indeterminate future date, after October 12, 2026.

The Board should not deny institution under 35 U.S.C. §325(d), because the Examiner did not consider Sjostrom (Grounds 3-4), Eckberg (Ground 4), or Baldrey (Grounds 1-2) during prosecution. *See Becton, Dickinson & Co. v. B. Braun Melsungen AG*, IPR2017-01586, Paper 8 at 17-18 (Dec. 15, 2017) (factors (a)-(b) and (d) indicate the same art was not presented previously to the Office). The Examiner did not use any of the references (including Olson-646) in a substantive

¹¹ The Arizona action since settled.

rejection. *Id.* at 17-18 (factors (a)-(d)). Each reference is dated after the earliest provisional from which the '370 Patent purports to claim priority, and Examiners do not make findings of priority as a matter of course during prosecution. M.P.E.P. §201.08.

Furthermore, Sjostrom, Eckberg, and Olson-646 were previously presented to the Board in IPR2020-00832, challenging U.S. Patent No. 10,343,114, in the same family and sharing most claim limitations with the '370 Patent. The Board found in its Institution Decision that "Petitioner's arguments and evidence are sufficient to show a reasonable likelihood Petitioner would prevail in proving unpatentability of claims" and never reached a final written decision due to settlement. EX1026, 56, 61. Sjostrom and Olson-646 were also presented in IPR2020-00928 for the '147 Patent, a parent to the '370 Patent. The Board found that each qualified as prior art and granted institution. *NRG Energy*, IPR2020-00928, 2020 WL 7074473.

XIII. CONCLUSION

Petitioners request that IPR of the '370 Patent be instituted, and the Challenged Claims be cancelled.

Respectfully submitted,

March 24, 2025

Date

/s/Brian Oaks

Brian W. Oaks (Reg. No. 44,981)

McDermott Will & Emery LLP

300 Colorado Street, Suite 2200

Austin, TX 78701

Tel: 512-726-2574

Email: boaks@mwe.com

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 13,958 words which is no more than 14,000 words and therefore complies with the type-volume limitations of 37 C.F.R. § 42.24(a). The word count was calculated by starting with Microsoft Word's total document word count and subtracting the words for the Cover Page, Table of Contents, Table of Authorities, Table of Exhibits, Table of Challenged Claims, Mandatory Notices, Certificate of Compliance, and Certificate of Service.

Dated: March 24, 2025

/s/Brian Oaks

Brian W. Oaks (Reg. No. 44,981)
McDermott Will & Emery LLP
300 Colorado Street, Suite 2200
Austin, TX 78701
Tel: 512-726-2574
Email: boaks@mwe.com

LEAD ATTORNEY FOR PETITIONERS

CERTIFICATE OF SERVICE

In accordance with 37 C.F.R. §§ 42.6(e) and 42.105, the undersigned certifies that on the 24th day of March, 2025, a complete and entire copy of the PETITION FOR *INTER PARTES* REVIEW (“petition”), Power of Attorney and related Exhibits were served on Patent Owner at the correspondence address of record for the subject patent,

SCHWEGMAN LUNDBERG & WOESSNER, P.A.
P.O. BOX 2938
MINNEAPOLIS MN 55402

via Express Mail or by means at least as fast and reliable as Express Mail.

Additionally, a courtesy copy was served via electronic mail on the Patent Owner’s counsel at the following email address:

CALDWELL CASSADY CURRY PC
2121 N Pearl Street, Suite 1200
Dallas, Texas 75201

Bradley W. Caldwell (Texas Bar No. 24040630)
bcaldwell@caldwelcc.com

Justin T. Nemunaitis (Texas Bar No. 24065815)
jnemunaitis@caldwelcc.com

Dated: March 24, 2025

/s/Brian W. Oaks

Brian W. Oaks (Reg. No. 44,981)
McDermott Will & Emery LLP
300 Colorado Street, Suite 2200
Austin, TX 78701
Tel: 512-726-2574
Email: boaks@mwe.com

LEAD ATTORNEY FOR PETITIONERS