

**UNITED STATES PATENT AND TRADEMARK OFFICE**

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**BEFORE THE PATENT TRIAL AND APPEAL BOARD**

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TOPSOE, INC.,  
Petitioner

v.

L'AIR LIQUIDE, SOCIÉTÉ ANONYME POUR L'ETUDE ET  
L'EXPLOITATION DES PROCÉDÉS GEORGES CLAUDE,  
Patent Owner

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U.S. Patent No. 11,673,805

Filed: August 11, 2021

Issued: June 13, 2023

Inventors: Schmidt, *et al.*

TITLE: PROCESS AND PLANT FOR PREPARATION OF HYDROGEN AND  
SEPARATION OF CARBON DIOXIDE

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*Inter Partes* Review No. IPR2025-01174

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**PETITIONER'S RESPONSE TO PATENT OWNER'S REQUEST FOR  
DISCRETIONARY DENIAL OF INSTITUTION**

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**Cases**

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37 C.F.R. § 42.24 .....8

### EXHIBITS CITED

Exhibit	Description
1001	U.S. Patent No. 11,673,805 to Schmidt et al. (“the ’805 patent”)
1002	File History of U.S. Patent No. 11,673,805
1003	Declaration of Prof. Dr. Harald Klein
1004	Curriculum Vitae of Prof. Dr. Harald Klein
1005	RESERVED
1006	Martin <i>et al.</i> , (2019) “Progress Update on the Allam Cycle: Commercialization of NET Power and the NET Power Demonstration Facility” " by Scott Martin, et al as presented at the 14th Greenhouse Gas Control Technologies Conference (October 21st – 25th, 2018). Available at SSRN: <a href="https://ssrn.com/abstract=3366370">https://ssrn.com/abstract=3366370</a> uploaded and downloadable April 11, 2019 (“Martin”)
1007	RESERVED
1008	RESERVED
1009	RESERVED
1010	Cotton, B. (2019) “Clean Hydrogen. Part 1: Hydrogen from Natural Gas Through Cost Effective CO <sub>2</sub> Capture”, dated March 15, 2019, The Chemical Engineer website, available from <a href="https://www.thechemicalengineer.com/features/clean-hydrogen-part-1-hydrogen-from-natural-gas-through-cost-effective-co2-capture/">https://www.thechemicalengineer.com/features/clean-hydrogen-part-1-hydrogen-from-natural-gas-through-cost-effective-co2-capture/</a> , for download, Published by Institution of Chemical Engineers (Rugby, UK) (“Cotton”)

<b>Exhibit</b>	<b>Description</b>
1011	Patwardhan et al. (2013) “Optimised hydrogen production by steam reforming: part 2”; Digital Refining article 1000841, dated PTQ Q3 2013, available for download from <a href="http://www.digitalrefining.com/article/1000841">http://www.digitalrefining.com/article/1000841</a> (“Patwardhan”)
1012	Elsevier Signed Declaration (SSR posting) for Martin et al. EX1006
1013	SSRN Cover for Martin et al. EX1006
1014	U.S. Patent Publication No. 2009/0298957 to Gauthier et al. (“Gauthier”)
1015	U.S. Patent Publication No. 2019/0135626 to Rafati et al. (“Rafati”)
1016	Appl, M. (1997) Ammonia Methanol Hydrogen Carbon Monoxide, Modern Production Technologies, A Review; published by Nitrogen-The Journal of the World Nitrogen and Methanol Industries, an imprint of British Sulphur Publishing, a division of CRU Publishing Ltd. (London, England) (“Appl”)
1017	Aasberg-Petersen et al. (2011) “Natural gas to synthesis gas – Catalysts and catalytic processes,” J. Natural Gas Science and Engineering, 3:423-459 (“Aasberg-Petersen”)
1018	Technology Handbook (Air Liquide, Engineering and Construction. Ed.) February 2018, version 2, available for download at <a href="https://www.scribd.com/document/386431469/Air-Liquide-Technology-Handbook-March-2018">https://www.scribd.com/document/386431469/Air-Liquide-Technology-Handbook-March-2018</a> , 108 pages (“Technology Handbook”)
1019	Riquarts et al. (1985) “Gas separation using pressure swing absorption plants,” in Linde Reports on Science and Technology, No. 40, (LindeAktiengesellschaft), ISSN:0942-5268 (“Riquarts”)

<b>Exhibit</b>	<b>Description</b>
1020	Xu et al. (2014) “An Improved CO <sub>2</sub> Separation and Purification System Based on Cryogenic Separation and Distillation Theory,” <i>Energies</i> (ISSN 1996-1073), 7, 3484-3502; MDPI (Basel, CH) doi:10.3390/en7053484 (“Xu”)
1021	Keshavarz et al. (2019) “Cryogenic CO <sub>2</sub> Capture,” in <i>Sustainable Agriculture Reviews</i> 38, (Inamuddin et al., Eds.), ISBN 978-3-030-29337-6 (eBook), Springer Nature Switzerland AG (“Keshavarz”)
1022	RESERVED
1023	RESERVED
1024	U.S. Patent Application No. 2012/0291484 to Terrien et al. (“Terrien”)
1025	Munford Declaration
1026	K. Aasberg-Petersen et al. (2004) “Synthesis gas production for FT synthesis,” Chapter 4 in <i>Studies in Surface Science and Catalysis</i> , vol 152, pages 258-405 (“Aasberg-Petersen II”)
1027	J. R. Rostrup-Nielsen (1993) “Production of Synthesis Gas,” <i>Catalysis Today</i> , volume 18, pages 305-324
1028	J. R. Rostrup-Nielsen (2002) “Syngas in perspective,” <i>Catalysis Today</i> , volume 71, pages 243-247
1029	RESERVED
1030	RESERVED

## I. INTRODUCTION

Institution of both of Topsoe’s petitions is essential to ensure a full and fair review of the distinct technical configurations claimed in the ’805 patent. The patent’s claim structure covers both series and parallel reformer configurations within a single element, requiring different prior art and arguments for each configuration. These petitions are not duplicative; they are complementary. Instituting both petitions promotes efficiency and fairness by allowing consolidated proceedings, coordinated discovery, and a single hearing, while ensuring that all claim configurations are properly addressed. Denying the second petition would risk piecemeal litigation, undermine the AIA’s objectives, and unfairly limit Topsoe’s ability to challenge the patent’s full scope.

The present “parallel configuration” petition (IPR2025-01174) and the co-pending “series configuration” petition (IPR2025-01173) should both proceed on the merits. The ’805 patent is newly issued, has never been asserted in litigation, and is not the subject of any other PTAB proceedings. No other discretionary factors are present, and Patent Owner does not contend otherwise. Instead, Patent Owner relies solely on a non-existent “good cause” threshold<sup>1</sup> (Patent Owner’s

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<sup>1</sup> A proposed amendment to 37 C.F.R. § 42.108 to add a good cause threshold has not been adopted. *See* 89 Fed. Reg. 28693 (Apr. 19, 2024).

RDD at 1) and the fact that the “parallel configuration” petition was ranked second. Patent Owner offers no substantive reason to deny institution of this petition, arguing only that two petitions are unnecessary. If, *arguendo*, the Director were to find multiple petitions unwarranted, Topsoe respectfully reiterates its request that the first-ranked petition (IPR2025-01173) proceed.<sup>2</sup> (Paper 3).

## II. MULTIPLE PETITIONS ARE APPROPRIATE

Patent Owner points to the Consolidated Trial Practice Guide (“CTPG”) for listing only two examples as to when multiple petitions may be needed (RDD at 1), but ignores from its own cited case that “the express reasons stated in the Trial Practice Guide for supporting multiple petitions are not the only reasons available to a petitioner.” *Fitbit, Inc. v. Koninklijke Phillips N.V.*, IPR2020-00772, Paper 14 at 25-26 (P.T.A.B. Oct. 19, 2020). As shown in the table below, the two petitions are not duplicative but instead address distinct technical configurations and rely on different primary references and grounds. This distinction is critical to ensure a full and fair review of the patent’s claim scope:

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<sup>2</sup> Patent Owner has also requested discretionary denial of Petitioner’s first petition (IPR2025-01173) under 35 U.S.C. § 325(d), to which Petitioner is responding separately. If the Director denies the first-ranked petition, Patent Owner’s multiple-petition arguments here become moot, and this IPR should proceed accordingly.

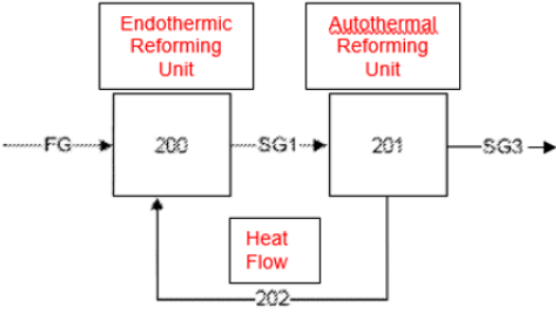
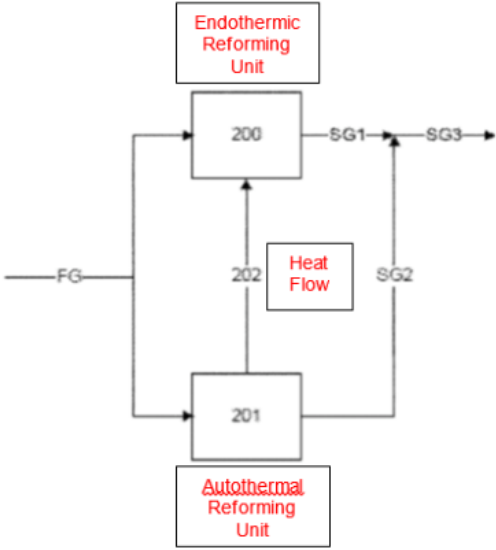
Petition No.	Claims Challenged	Configuration Addressed	References	Grounds
IPR2025-01173	1-6, 11, 12	Series	Reinertsen, Rytter, Darde, Terrien	Anticipation, Obviousness
IPR2025-01174	1-6, 11, 12	Parallel	Martin, Rafati, Gauthier, Terrien	Obviousness

This case thus presents the type of “rare circumstances” contemplated by the CTPG and PTAB precedent, where the claim structure and technical subject matter require materially different prior art and arguments to address the full scope of the claims. This is evident in at least four ways: 1) Patent Owner’s choice to claim dual configurations in a single element; 2) the complexity and number of elements in the claims; 3) the likelihood of Patent Owner amending the claims; and 4) the potential priority challenge to prior art. As explained below, there is insufficient space for Petitioner to adequately challenge the full scope of the claims in a single petition. Instituting both petitions will not unduly burden the Board or the parties; to the contrary, it will promote efficiency by allowing for consolidated proceedings, coordinated discovery, and a single hearing, while ensuring that all claim configurations are fully and fairly addressed.

**a. Patent Owner Chose to Claim Dual Configurations in a Single Element**

As described in Petitioner’s ranking statement (Paper 3), claim 1 of the ’805 patent includes a central element that is written in the alternative to cover two very

different configurations. The Petition distinguishes these configurations more fully, and explains how they require two different sets of figures and explanation in the '805 patent:

Pet., 7 (Series Configuration)	Pet., 8 (Parallel Configuration)
 <p data-bbox="375 1108 630 1136">Fig. 3, excerpt, annotated</p> <p data-bbox="228 1188 797 1224">See also, EX1001, Fig.3, 12:65-13:60.</p>	 <p data-bbox="1015 1098 1312 1125">Fig. 2, excerpt, annotated</p> <p data-bbox="846 1188 1419 1224">See also, EX1001, Fig. 2, 11:14-12:64</p>

Regardless of Patent Owner’s reasons for drafting these distinct configurations into a single claim, this choice necessitates more than one set of prior art references and arguments to demonstrate the anticipation and/or obviousness of each claimed configuration.

In a very similar situation, the Board allowed dual petitions to move forward when the Patent Owner had claimed a disjunctive limitation of “a portion of the flexible conduit is sandwiched between the seal and the sealing surface **or between**

the seal and the surface of the opening.” *AliveCor, Inc. v. Apple Inc.*, IPR2023-00949, Paper 8 at 28 (P.T.A.B. Jan. 9, 2024) (emphasis in original) (quoting petition). The Board recognized that these claims “recite specific alternatives necessitating different analysis.” *Id.* at 27. When combined with the absence of a patent owner stipulation as to which alternative sealing configuration would be asserted in litigation, the Board was persuaded that multiple petitions were appropriate to address the full scope of the claims. *Id.* at 28-29. The Board held that it was reasonable for Petitioner to explain and describe “where each limitation and alternative” in the claims was disclosed or taught by the prior art, and to provide evidence why a POSA would have found such limitations to be obvious. *Id.*

The same reasoning applies here. Patent Owner’s claims disjunctively combine two distinct configurations in a central element, with each configuration necessitating a different analysis. Patent Owner has not provided a stipulation or covenant regarding enforcement. In pursuit of its business interests and seeking predictability with respect to business planning, Petitioner must therefore challenge all alternative configurations of claims 1-6, 11 and 12 of the ’805 patent, particularly the series and parallel reformer configurations, that affect those interests and planning.

Notably, the two sets of references presented in the “series configuration” and “parallel configuration” Petitions use different language and levels of detail for their respective teachings of the two alternative configurations. Martin (EX1006), for example, is a conference paper and is the primary reference for the present parallel configuration Petition, describing the parallel configuration in a materially different manner than the primary references in the series configuration Petition, *i.e.*, Reinertsen (EX1005) and Rytter (EX1009), which are patent documents disclosing the series configuration. Thus, “the case for obviousness presented in the two petitions is materially different with wholly different strengths and weaknesses.” *Weber, Inc. v. Provisur Techs., Inc.*, IPR2019-01465, Paper 10 at 10 (P.T.A.B. Feb. 20, 2020) (instituting dual petitions).

**b. The Complexity and Number of Claim Elements Favors Merits Consideration**

Patent Owner focuses only on the number of claims at issue, but disregards that the '805 patent claims are complex in both their structure and subject matter. As described above, the particular manner in which Patent Owner drafted the claims makes them unnecessarily cumbersome. Claim 1, for example, is a method containing at least 16 steps and sub-steps or qualifications, involving complex chemical processes using autothermal reforming, endothermic reforming, and cryogenic carbon dioxide separation. *See, e.g.*, Petition at viii-ix. This level of technical and structural complexity distinguishes this case from the “vast majority

of cases” cited by Patent Owner and indeed presents a “rare circumstance” where multiple petitions are warranted. CTPG at 59. For example, *Apple Inc. v. Koss Corp.*, IPR2021-00679, Paper 14 (P.T.A.B. Oct. 12, 2021), cited by Patent Owner (RDD at 3), dealt with straightforward claims on the physical design of headphones where there was “nothing unusual in the complexity of the [] patent’s claims or the technology of the challenged patent and prior art.” *Id.* at 12. In contrast, here Petitioner explains why two petitions are necessary due to claim structure and complexity, regardless of the number of claims at issue.

**c. Patent Owner Is Likely to Seek to Amend the Claims**

A key risk in this case stems directly from the way Patent Owner drafted claim 1 to cover two distinct, mutually exclusive configurations. Because the claim is written in the alternative, Patent Owner could easily narrow the claim by simply deleting one configuration through a motion to amend. For example, if only the “series configuration” petition (IPR2025-01173) is instituted, Patent Owner could amend claim 1 to remove the series configuration, leaving only the “parallel configuration” at issue. This amendment would require nothing more than striking a few words from the claim language.

This creates a significant risk of prejudice to Petitioner Topsoe. If only one petition is instituted, Patent Owner could strategically amend the claims to focus on the configuration not addressed in the instituted petition, depriving Topsoe of a

full and fair opportunity to challenge the full scope of the claims as originally issued. While Topsoe could attempt to raise unpatentability arguments in its opposition to the motion to amend, it would be severely constrained by the 25-page limit imposed by 37 C.F.R. § 42.24—far less than the 14,000 words permitted for a petition. This limitation would prevent Topsoe from fully presenting prior art, technical analysis, and legal arguments, and would restrict its ability to introduce new grounds of unpatentability or develop a comprehensive case against the amended claims.

Allowing only one petition to proceed would thus create a procedural loophole, enabling Patent Owner to insulate the remaining claim scope from full challenge and undermining both fairness and the integrity of the IPR process. In this unique situation—where it is clear how Patent Owner could amend the claims in two alternative and mutually exclusive ways—fairness and efficiency demand that Petitioner be permitted to fully address both configurations through institution of both petitions.

**d. There Is a Potential Priority Challenge to Prior Art**

The CTPG explicitly lists a priority date dispute as a circumstance favoring multiple petitions, and this case presents such a potential dispute—though Patent Owner has not acknowledged it. Specifically, Reinertsen’s status as prior art in the series configuration IPR2025-01173 petition depends on the disclosure of foreign

priority documents, which Petitioner and its expert referenced through parallel citations. Reinertsen is a U.S. patent publication of a U.S. National Phase Application (No. 17/905,448) based on PCT/EP2021/054441, filed February 23, 2021, which claims priority to two British applications filed March 6, 2020, and July 2, 2020. Petitioner contends Reinertsen's priority applications disclose the relevant subject matter, and that Reinertsen's effective filing date is, at the latest, July 2, 2020, and thus prior to the critical date of the '805 patent (August 11, 2020). But Reinertsen's availability as prior art relies on the disclosure of these priority applications, and Patent Owner has not indicated whether it intends to challenge Reinertsen's status as prior art. If it does, this would provide another reason to consider the additional grounds in the series configuration petition (IPR2025-01173) that are based on references without potential priority challenges (e.g., Rytter, a PCT publication (WO2019/162236) published on August 29, 2019 based on an application filed February 18, 2019). This further justifies the need for multiple petitions.

**e. One Petition Would Not Suffice**

Patent Owner does not argue that the "series configuration" (IPR2025-01173) and "parallel configuration" (IPR2025-01174) petitions are redundant, because they are not. Rather, they are complementary, as evidenced by the asserted grounds and distinct prior art sets (as shown in the Comparison of Petitions table

above). There is minimal overlap in the prior art applied in the two petitions—only one reference, Terrien, is used in both petitions, and only with respect to certain dependent claim features. The primary and secondary references are otherwise entirely unrelated between the two petitions. In other words, “the differences in these base pairs [of references] are sufficiently material to warrant separate consideration during an *inter partes* review.” *SolarEdge Techs. Ltd. v. SMA Solar Tech. AG*, IPR2019-01224, Paper 10, 10 (P.T.A.B. Jan. 23, 2020) (instituting multiple petitions when grounds “are based on different references and approaches, and do not overlap in any meaningful way.”).

Nevertheless, Patent Owner suggests that Petitioner could have included grounds directed to both the series and parallel configurations in a single petition. But this is plainly infeasible and ignores the practical constraints imposed by the 14,000-word limit. The amount of background and analysis needed to present grounds directed to both configurations, along with the distinct prior art and technical explanations, would push a single petition well over the 14,000-word limit. For example, even with the concise language and arguments in the Petition, the prior art description and analysis sections for just Grounds 1 and 2 of the present “parallel configuration” petition (IPR2025-01174) uses 7,287 words, while the prior art description and analysis sections for Grounds 1 and 2 of the “series configuration” petition (IPR2025-01173) uses 6,658 words. Combining these

grounds and non-cumulative reference descriptions into a single petition would use over 13,900 of the 14,000-word limit, leaving virtually no room for the entire remainder of the petition, including analysis of dependent claims not included in Grounds 1 and 2, claim construction, and other required sections. Therefore, Patent Owner's argument that Topsoe could have presented its "best" grounds in a single petition is not feasible given the claim structure and the need to address both configurations fully.

Additionally, Patent Owner implies throughout its brief that it was Petitioner's burden to address the need for two petitions in the petitions themselves. This is incorrect. Petitioner followed the process outlined by the Office, which states: "A petitioner should raise any discretionary issues in its opposition to a patent owner's discretionary denial brief, **including issues relating to 35 U.S.C. § 325(d), parallel proceedings, parallel petitions, serial petitions, and any other matter bearing on the Director's discretion to institute. The petition should not address discretionary issues.**" (Interim Director Discretionary Process, § III.A, emphasis added.)

Patent Owner also claims that Grounds 2 and 3 of the "series configuration" petition, based respectively on Reinertsen and Rytter, are "cumulative," implying that space could have been conserved by dropping one of the grounds to make room for the "parallel configuration" grounds from the present Petition. Patent

Owner's RDD at 4. But as described above, even removing, *e.g.*, Ground 3 from the "series configuration" petition, would not leave sufficient space for adequate argument on the parallel configuration. Moreover, Reinertsen and Rytter are *not* cumulative. For example, Rytter provides disclosure not found in Reinertsen that further establishes a motivation to combine a dual reformer series configuration with a process configuration including hydrogen separation using PSA provided upstream of carbon dioxide separation, such as shown in Darde. *See, e.g.*, IPR2025-01173, EX1009 at 15:20-16:16, Table 1 (showing the benefits achieved using dual reforming (GHR + ATR) in a series configuration). Rytter also acknowledges process benefits achieved by, *e.g.*, implementing the heat exchange in the disclosed dual reformer series configuration including its use with subsequent water gas shift (WGS) (*Id.*, at 10:30-35).

**f. Instituting Both Petitions Does Not Significantly Increase the Board's Burden**

The benefits of instituting both petitions outweigh any minimally incremental increased burden from doing so. The technology, background, and subject matter are generally the same between the two petitions, allowing for uniform analysis with respect to the cited prior art as they pertain to all of the '805 patent claims process steps, other than the disjunctive step (c). The Board and the parties can thus obtain significant efficiencies by holding a single oral hearing and consolidating depositions and other discovery in both proceedings. Instituting both

petitions promotes efficiency by streamlining the review process, whereas denying one petition could force potential piecemeal litigation or serial IPRs, which is less efficient and contrary to the AIA's goals.

### III. CONCLUSION

Topsoe's two petitions are necessary to address the full scope of the '805 patent's disjunctive claim structure, which expressly covers two mutually exclusive reformer configurations. This is the type of "rare circumstance" contemplated by the CTPG and PTAB precedent, where materially different prior art and analyses are required to meet the claims as drafted. *AliveCor* confirms that alternative claim configurations can justify multiple petitions; *Weber* and *SolarEdge* likewise recognize that materially different reference sets and approaches warrant separate consideration. Instituting both petitions serves, rather than burdens, the Board's efficiency and fairness goals by allowing for consolidated proceedings, coordinated discovery, and a single hearing, while ensuring that all claim configurations are adjudicated on a complete record. Denying the second petition would risk potential piecemeal litigation and frustrate the AIA's objective of an efficient, comprehensive review.

Because the '805 patent claims encompass two mutually exclusive configurations taught in different art, this case is one with "circumstances in which more than one petition may be necessary." The Board's patentability analysis will

benefit from the distinct prior art and tailored technical showings in each petition, providing a fair, comprehensive, and efficient review of all claim configurations. Discretionary denial is not appropriate, and the Petition should be referred to the Board for consideration on the merits.

Respectfully submitted,

The logo for Leydig, featuring the word "Leydig" in a bold, sans-serif font. The letter "i" in "Leydig" has a small blue star above it.

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Date: October 9, 2025

**CERTIFICATE OF SERVICE**

Pursuant to 37 C.F.R. § 42.6(e), I certify that on this 9th day of October, 2025, a true and correct copy of the foregoing **PETITIONER’S RESPONSE TO PATENT OWNER’S REQUEST FOR DISCRETIONARY DENIAL OF INSTITUTION** was served by electronic mail on Patent Owner’s lead and backup counsel at the following email addresses:

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