

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

PROFRAC HOLDING CORPORATION
and
U.S. WELL SERVICES, LLC,
Petitioners,

v.

HALLIBURTON ENERGY SERVICES, INC.,
Patent Owner.

Case PGR2023-00023
Patent No. 11,373,058

Mail Stop PATENT BOARD
Patent Trial and Appeal Board
U.S. Patent and Trademark Office
P.O. Box 1450
Alexandria, Virginia 22313-1450
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PATENT OWNER'S RESPONSE

UNDER 37 C.F.R. § 42.220

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I. INTRODUCTION

Halliburton Energy Services, Inc. (“Patent Owner”) respectfully submits this Response to the Petition for Post-Grant Review (Paper 2, “Petition”) of U.S. Patent No. 11,373,058 (the “’058 Patent”) filed by Petitioners ProFrac Holding Corporation and U.S. Well Services, LLC (“Petitioners”). The Petition’s grounds challenge claims 1-20 (the “Challenged Claims”) of the ’058 Patent based on alleged subject matter ineligibility (Ground 5) and obviousness (Grounds 1-4). The Petition’s grounds are deficient and should be rejected by the Board.

First, Ground 5 fails because the Challenged Claims are directed to eligible subject matter. The Challenged Claims recite improved methods and systems for controlling an electrical fracturing pump that enable the selection of a representative system model that more accurately reflects the well to which it is deployed. This, in turn, improves the process of controlling an electrical fracturing pump during fracturing operations to achieve subsurface conditions that enhance the productivity of a well. The Petition’s assertion that the claims are directed to an abstract idea with no inventive concept lack merit. The Petition oversimplifies the claims, relying on an articulation of an alleged abstract idea that is overbroad, untethered to the claim language, and ignores the specific requirements of the claims.

Second, Grounds 1-4 are deficient because Petitioners have not shown that the Challenged Claims would have been obvious. The Petition fails to show that the

various combinations of cited references render obvious a number of claim limitations, which is fatal to Petitioners' obviousness grounds.

Petitioners therefore have not shown by a preponderance of the evidence that claims 1-20 are unpatentable. Accordingly, the Board should uphold the validity of the Challenged Claims.

II. OVERVIEW OF THE '058 PATENT

A. The '058 Patent

The '058 Patent, entitled "System and Method for Treatment Optimization," was issued by the USPTO on June 28, 2022. The '058 Patent relates to fracturing operations in the oil and gas industry and, in particular, discloses "techniques for optimizing well treatments using representative system models selected according to formation responses to stimuli indicated by sensor data." EX1001, 2:12–15; EX2013, ¶¶37-44. The patent explains that a representative system model may be used to, for example, determine pump settings of an electric fracturing pump. EX1001, 1:19–23. One problem with prior approaches that involved manually selecting the representative system model based only on observed sensor data is that "the representative system model may be a static construct and may not accurately reflect the well to which it has been deployed." *Id.*, 1:21–26. The techniques described and claimed in the '058 Patent address this problem by generating a sequence of stimuli for application to a well environment in order to produce a

response from the formation. *Id.*, 7:12–22. Sensor data in response to the generated sequence of stimuli can then be received from sensors deployed throughout the well (*e.g.*, surface sensors, downhole sensors, wireline sensors, etc.). *Id.* The sequence of stimuli and response combination “can be mapped to respective system models maintained in an accessible data store.” *Id.*, 3:44–49. The representative system model is then used to “control fracturing operations,” such as the settings on an electrical fracturing pump. *Id.*, 4:8–12, 8:45–49; EX2013, ¶40.

Figure 1B, reproduced below, illustrates a “diagrammatic view of a surface electric frac pump and environment,” according to various embodiments. EX1001, 1:46–48. Figure 1B depicts a “wellbore 155” that “extends from the surface 160 of the earth through the formation 165 formed by a drilling device from a previous drilling operation[.]” *Id.*, 5:37–42. “A plurality of sensors 162 may be provided along the length of the wellbore to detect temperature, pressure, strain, vibration, or flow rate.” *Id.*, 5:46–48. Pump equipment 172 (*e.g.*, electrical pumps) are used to pump a treatment fluid (*e.g.*, a combination of a carrier fluid and a proppant) through a line 192 into the entrance 185 of the wellbore 155 via fracturing tree 194. *See id.*, 5:52–66; EX2013, ¶41.

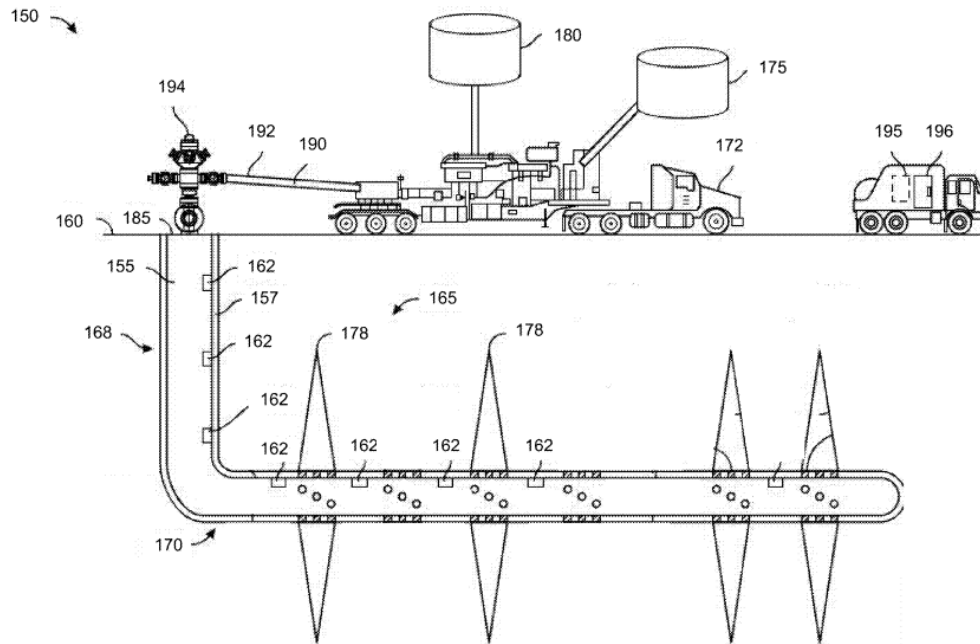


FIG. 1B

EX1001, Fig. 1B.

Figure 3 illustrates “a block diagram of an operating environment 300 in which a treatment optimization system 302 may be deployed.” *Id.*, 7:1–3. The treatment optimization system 302 is communicatively coupled to a model store 304, an electric frac pump system 306, and well sensors 310 in well environment 308. *Id.*, 7:15–17. Treatment optimization system 302 sends commands to electric frac pump system 306 (*e.g.*, to adjust settings such as pressure levels, flow rates, composition and/or presence of proppant, diverter, or other chemicals within a pumped fluid) and receives sensor data values from sensors 310. *Id.*, 7:22–33; EX2013, ¶42.

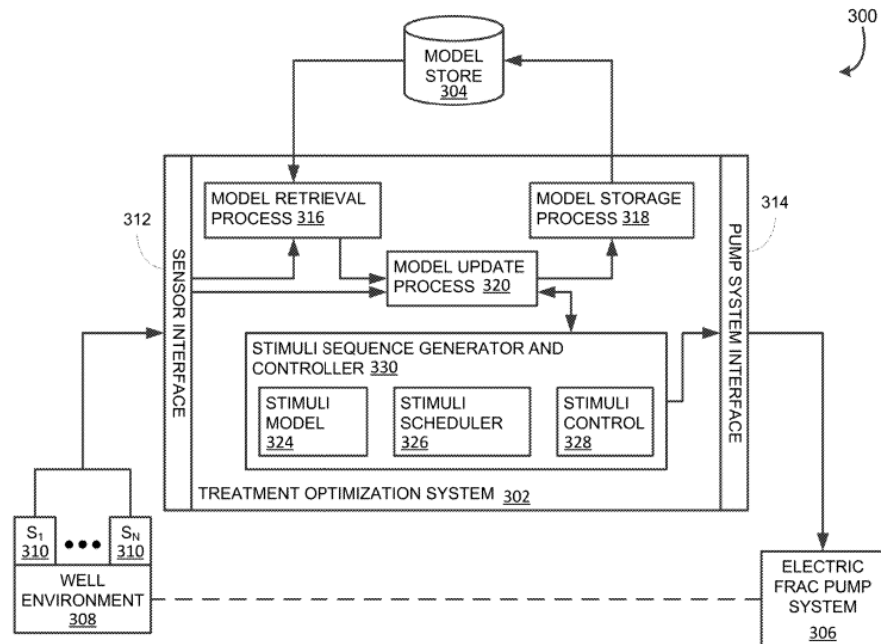


FIG. 3

EX1001, Fig. 3. The system includes a stimuli sequence generator and controller that generates “a sequence of stimuli which are provided as commands to electric frac pump system 306” that is used to “produce a response, and resulting sensor data from sensors 310, from well environment 308.” *Id.*, 7:52–57.

The techniques for optimizing well treatments described and claimed in the ’058 Patent, which select a representative system model based on the sequence of stimuli and formation response data, advantageously provide for selection of a representative system model that more accurately reflects the well to which it has been deployed. EX2013, ¶44.

B. Prosecution History of the ’058 Patent

The application leading to the ’058 Patent claims earliest priority to U.S.

Patent Application No. 16/573,448 filed on September 17, 2019. EX1001, Cover. After a “thorough” prior art search (*see* EX1002, 24, 33–34, 44–63), the Examiner allowed the claims because:

The cited references do not disclose generating a sequence of stimuli for application to a well environment, the sequence of stimuli comprising one or more of particulate concentrations, chemical concentrations, or a pump rate control, selecting a representative system model based on the received formation response data from downhole or surface sensors and sequence of stimuli, and controlling an electric fracturing pump based on the representative system model.

EX1002, 24. The notice of allowance identified “prior art made of record” and noted for each identified reference: “No selection of a model based on the claimed response data and sequence of stimuli, not controlling of an electrical fracturing pump based upon the selected model.” EX1002, 25-27; EX2013, ¶¶45-46. The ’058 Patent issued on June 28, 2022. EX1001, Cover.

C. Level of Ordinary Skill in the Art

For purposes of this Response, Patent Owner applies Petitioners’ articulation of the level of skill in the art. Petition, 23-24; EX2013, ¶¶47-48.

III. CLAIM CONSTRUCTION

In a post-grant review proceeding, claims are construed “in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary

skill in the art and the prosecution history pertaining to the patent.” 37 C.F.R. § 42.200(b). Petitioners “do not believe claim construction” is required and proposed construing all claim terms according to their “common and ordinary meaning.” Petition, 25. Patent Owner applies plain and ordinary meaning for the purposes of this Response.

IV. GROUND 5 FAILS BECAUSE CLAIMS 1-20 ARE DIRECTED TO PATENT-ELIGIBLE SUBJECT MATTER

The Challenged Claims recite an improved technique for controlling an electrical fracturing pump used for fracturing a well. EX2013, ¶¶38-39, 44, 136-139. The claimed technique enables selection of a representative system model that more accurately reflects the well to which it is deployed and thereby provides for more effective control of the electrical fracturing pump. *Id.*, ¶¶44, 136-139. The Petition’s arguments alleging that the Challenged Claims are directed to an abstract idea and do not recite an inventive concept lack merit.

Petitioners contend that independent claim 1 is representative of claims 9 and 16 for purposes of eligibility. Petition, 87. For purposes of this Response, Patent Owner agrees.¹ Patent Owner’s arguments regarding claim 1 are thus equally applicable to claims 9 and 16. Claim 1 is directed to eligible subject matter, as are

¹ Patent Owner does not concede that claim 1 is representative of dependent claims 2-8, 10-15, and 17-20.

the other claims of the '058 Patent.

A. Legal Standard

Section 101 of the Patent Act defines the subject matter eligible for patent protection. 35 U.S.C. § 101. The Supreme Court has “held that this provision contains an important implicit exception: Laws of nature, natural phenomena, and abstract ideas are not patentable.” *Alice Corp. Pty. Ltd. v. CLS Bank Int’l.*, 573 U.S. 208, 216 (2014) (quoting *Association for Molecular Pathology v. Myriad Genetics, Inc.*, 569 U.S. 576, 589 (2013)). The Board, however, must “tread carefully” in construing the three limited exceptions to patentability because “at some level, ‘all inventions . . . embody, use, reflect, rest upon, or apply laws of nature, natural phenomena, or abstract ideas.’” *Alice*, 573 U.S. at 217 (quoting *Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 566 U.S. 66, 71 (2012)).

In *Alice* and *Mayo*, the Supreme Court laid out a two-step framework for assessing eligibility. Step one asks whether the claims are directed to a judicial exception, such as an abstract idea. *See Alice*, 573 U.S. at 217. If not, the claims are eligible. *Id.* If the claims are directed to an abstract idea, however, step two determines whether the claims recite an “inventive concept.” *Id.* at 217–18.

At step one, the claims must be “considered in their entirety to ascertain whether their character as a whole is directed to excluded subject matter.” *McRO, Inc. v. Bandai Namco Games Am. Inc.*, 837 F.3d 1299, 1312 (Fed. Cir. 2016)

(citations omitted). This involves examining the patent’s “‘claimed advance’ to determine whether the claims are directed to an abstract idea.” *Finjan, Inc. v. Blue Coat Sys., Inc.*, 879 F.3d 1299, 1303 (Fed. Cir. 2018) (citation omitted).

Step two considers “the elements of each claim both individually and ‘as an ordered combination’ to determine whether the additional elements ‘transform the nature of the claim’ into a patent eligible application.” *Berkheimer v. HP Inc.*, 881 F.3d 1360, 1367 (Fed. Cir. 2018) (citations omitted). A claim recites an inventive concept “when the claim limitations ‘involve more than performance of well-understood, routine, [and] conventional activities previously known to the industry.’” *Id.* Whether an element or combination of elements “is well-understood, routine and conventional to a skilled artisan in the relevant field is a question of fact.” *Id.* at 1368. This inquiry “goes beyond what was simply known in the prior art” and “[t]he mere fact that something is disclosed in a piece of prior art . . . does not mean it was well-understood, routine, and conventional.” *Id.* at 1369.

The USPTO has issued subject matter eligibility guidance, now incorporated into the Manual of Patent Examination Procedure (“MPEP”), that explains how Office personnel should evaluate claims for patent subject matter eligibility under 35 U.S.C. § 101 (the “Guidance”). “All USPTO personnel are, as a matter of internal agency management, expected to follow the guidance.” *KioSoft Techs., LLC v. PayRange Inc.*, PGR2022-00035, Paper 7 at 23–24 (P.T.A.B. Dec. 6, 2022). The

MPEP sets forth a two-part test. *See* MPEP § 2106(III). Step 1 confirms that the claim falls within one of the four statutory categories of invention. *See id.* Step 2, a two-part test, embodies the Supreme Court’s *Alice/Mayo* test. *See id.*

B. Guidance Step 1

Step 1 asks: “Is the claim to a process, machine, manufacture or composition of matter?” MPEP § 2106.03(II). Claim 1 recites “[a] computer-implemented method for controlling electrical fracturing equipment for fracturing a well[.]” EX1001, cl. 1. Claim 1 is therefore directed to a patent-eligible “process.” *See* MPEP § 2106(I). “Petitioners do not contest the challenged 058 patent claims fall within one or more of the four statutory categories.” Petition, 93 n.7.²

C. Guidance Step 2A / *Alice* Inquiry

Step 2 of the Guidance “is the Supreme Court’s *Alice/Mayo* test.” MPEP § 2106(III). This is a “two-part test to identify claims that are directed to a judicial exception (Step 2A) and to then evaluate if additional elements of the claim provide an inventive concept (Step 2B) (also called ‘significantly more’ than the recited judicial exception).” *Id.* Step 2A “is a two-prong inquiry.” MPEP § 2106.04(II)(A).

² Claim 9 recites “[a] system for controlling electrical fracturing equipment for fracturing a well.” EX1001, cl. 9. Claim 16 recites “[a] non-transitory computer readable medium[.]” *Id.*, cl. 16.

Prong One asks whether a claim recites a judicial exception. *Id.* If not, the claim is eligible. If so, Prong Two considers whether the judicial exception is integrated into a practical application. *Id.* If so, the claim is eligible.

The Board need go no further than Step 2A to resolve Petitioners' subject matter eligibility challenge. Claim 1 does not recite, and is not directed to, an abstract idea, let alone the abstract idea identified in the Petition, which is overbroad and untethered to the specific elements of the claims. That ends the inquiry at Prong One. Even if Claim 1 did recite the alleged abstract idea of selecting a plan for a desired result based on information received in response to one or more inquiries—which it plainly does not—the claim integrates that alleged abstract idea into a practical application. Accordingly, Claim 1 is eligible.

1. Guidance Step 2A, Prong 1

Claim 1 does not recite the Petition's alleged abstract idea (*i.e.*, it does not set forth or describe the alleged abstract idea) and therefore "cannot be directed to a judicial exception." *See* MPEP § 2106.04(II)(A)(1). Contrary to Petitioners' argument, the '058 Patent's claims are not an attempt to patent the alleged abstract concept of selecting a plan for a desired result based on information received in response to one or more inquiries. Petition, 87. The subject matter of claim 1 is much narrower and covers a specific, improved "method for controlling electrical fracturing equipment for fracturing a well" that is patent eligible. EX1001, 11:54–

56; *see also Adasa Inc. v. Avery Dennison Corp.*, 55 F.4th 900, 908 (Fed. Cir. 2022), *cert. denied*, No. 22-822, 2023 WL 3696138 (U.S. May 30, 2023) (“If the focus of the claim is a specific and concrete technological advance, for example an improvement to a technological process or in the underlying operation of a machine, our inquiry ends and the claim is eligible.”).

a) The claimed advance of the ’058 Patent.

Determining what a patent claim is directed to involves “looking to the specification to understand ‘the problem facing the inventor’ and, ultimately, what the patent describes as the invention.” *ChargePoint, Inc. v. SemaConnect, Inc.*, 920 F.3d 759, 767 (Fed. Cir. 2019); *see also Packet Intel. LLC v. NetScout Sys., Inc.*, 965 F.3d 1299, 1309 (Fed. Cir. 2020) (the analysis “consider[s] the claim as a whole” and “read in light of the specification”); *Finjan*, 879 F.3d at 1303 (step one involves examining the patent’s “claimed advance”). Here, the claim language—viewed in light of the specification—confirms that the claimed advance of the ’058 Patent is an improved approach for controlling an electrical fracturing pump that enables the selection of a representative system model that more accurately reflects the well to which it is applied, thereby improving fracturing operations. EX2013, ¶¶44, 136-139. This is achieved by taking into account both a generated sequence of stimuli applied to a well, and formation response data indicating how the well responds to the sequence of stimuli, when selecting a representative system model to use for

controlling an electrical fracturing pump. *Id.*, ¶139.

By way of background, hydraulic fracturing is a stimulation treatment often performed on oil and gas wells in low-permeability reservoirs to restore or enhance the productivity of a well. EX2009, 3; EX2010, 3. During hydraulic fracturing, “[s]pecially engineered fluids are pumped at high pressure and rate into the reservoir interval to be treated, causing a vertical fracture to open.” EX2009, 3. Proppant, such as grains of sand, is mixed with the treatment fluid to keep the fracture open when the treatment is complete. *Id.* This process “creates high-conductivity communication with a large area of formation” (*id.*) that “create[s] a highly conductive flow path between the reservoir and the wellbore.” EX2010, 3. This allows the flow of the desired gas or oil to the well, and eventually, to the surface for collection. *See* EX1008, [0004].

Claim 1 of the ’058 Patent recites a “method for controlling electrical fracturing equipment used for fracturing a well” and, in particular, an improved method for controlling an electrical fracturing pump using a representative system model. EX1001, cl. 1. During fracturing operations, electric fracturing pumps can be controlled to generate specific subsurface conditions at a well. EX1001, 3:34-37; *see also* EX2014, 37:2-18. The subsurface conditions achieved (e.g., the fracturing pattern) depend on how the fracturing pump is controlled. EX2014, 37:19-38:20; *see also id.*, 40:18-41:3 (“So will the operation of the pump have an effect on

whether desirable fractures will be formed in place? The answer is yes.”). According to Petitioner’s expert, Dr. Nikolaou, “that’s why people want to design the fracturing operation in a way that makes sense because depending on how you use the pump, you will get different outcomes downhole.” EX2014, 38:6-10. In the context of hydraulic fracturing, a POSITA would understand that it is desirable to achieve subsurface conditions that enhance the productivity of a well. EX2014, 42:10-17; *see also id.*, 32:20-35:3 (Dr. Nikolaou explaining why it is desirable to enhance the productivity of a well); EX2013, ¶139.

A representative system model is one of the tools that an engineer can use to create desirable subsurface conditions to enhance the productivity of a well. EX2014, 43:5-16 (“A representative system model is definitely one of the tools that an engineer can use to create subsurface conditions for good fracturing, yes.”). According to Petitioners’ expert, a representative system model “is a set of equations that basically describe what will happen to a system,” for example, in response to “external inputs” (e.g., fracturing operations). EX2014, 19:18-20:12. However, “there is variability from well to well” and different wells respond differently to fracturing operations. EX2014, 43:17-44:1. In other words, if you were to operate the fracturing pumps at two different wells in the same manner, “you may not get exactly the same outcomes.” EX2014, 44:2-22. This can result in differences in productivity (e.g., depending on how different the wells are). EX2014, 44:23-45:8.

The specification of the '058 Patent recognized that one problem with using a representative system model to control pump settings in hydraulic fracturing is that “the representative system model may be a static construct and may not accurately reflect the well to which it has been deployed.” EX1001, 1:23–26; EX2013, ¶136. This is problematic because, as Dr. Nikolaou confirms, it is desirable to have a representative system model that accurately reflects the well to which it is applied. EX2014, 22:1-23:6; EX2013, ¶136. The '058 Patent solves this problem by “provid[ing] techniques for optimizing well treatments using representative system models selected according to formation responses to stimuli indicated by sensor data.” EX1001, 2:12–16.

The disclosed technique involves generating a sequence of stimuli in a treatment well that is applied to a well environment tooled with one or more sensors. *Id.*, 2:16–19; 8:26–28. For example, “[a] given stimulus of the sequence of stimuli can be achieved by adjusting surface pressure values, flow rates, particulate composition (e.g., proppants, diverters, etc.), and/or chemical composition (e.g., friction reducers, surfactants, viscosifiers, etc.).” *Id.*, 2:25–30; *see also id.*, 3:26-31, 8:12-21.

“Sensor data in response to the generated sequence of stimuli can then be received from sensors deployed throughout the well[.]” *Id.*, 2:19–22. The sensor data is “indicative of formation responses,” which allows “formation responses to

the sequence of stimuli” to be “determined from the resulting sensor data.” *Id.*, 2:61–64; *see also id.*, 7:47–61 (describing how the generated sequence of stimuli is used to produce a response, and resulting sensor data, from the well environment). The response variables (e.g., responsive sensor data values) and respective stimuli (e.g., experimental data) can be used to select a representative system model. *Id.*, 3:44–47; *see also id.*, 2:38–41 (“The responsive sensor data may be used to select a pre-defined representative system model for stage and/or well treatment schedules (e.g., treatment sequences, compositions, etc.).”). “For example, stimuli and response combination can be mapped to respective system models maintained in an accessible data store.” *Id.*, 3:47–49.

Selecting the representative system model based on **both** the sequence of stimuli applied to the well **and** the formation response data advantageously enables the selection of a more accurate representative system model, thereby improving fracturing operations conducted based on the selected representative system model. EX2013, ¶139. Dr. Nikolaou’s testimony confirms this:

Q. Is it fair to say that knowing how a given well responds to stimuli allows you to better understand how to generate desirable subsurface conditions during fracturing?

A. It’s fair to say that having data from the response of a well to stimuli can help you build a better model that captures the effect of these stimuli on the things that are measured. A model in the sense that we discussed a few minutes ago of making a mathematical connection

between the data.

Q. And building a better model may allow you to generate more desirable subsurface conditions during fracturing?

A. The conditions you build with a better model are not going to be worse than the conditions you would build with a worse model, that's absolutely correct. How different they would be depends.

Q. They may be better?

A. They may be better.

EX2014, 46:12-47:11 (objections to form omitted). The representative system model may then be used to "control fracturing operations[.]" EX1001, 4:8-12. For example, "settings [*e.g.*, pressure, flow rate, and/or chemical composition of a pumped fluid] on an electric frac pump are controlled based on the selected representative system model." *Id.*, 8:45-49.

The disclosed technique for optimizing well treatments using representative system models is captured in claim 1, which recites:

1. A computer implemented method for controlling electrical fracturing equipment for fracturing a well, the method comprising:

generating a sequence of stimuli for application to a well environment, the sequence of stimuli comprising one or more of particulate concentrations, chemical concentrations, or a pump rate control;

receiving formation response data comprising data from one or more downhole sensors or surface sensors;

selecting a representative system model based on the received

formation response data and sequence of stimuli; and
controlling an electrical fracturing pump based on the
representative system model.

EX1001, cl. 1. By generating a sequence of stimuli, receiving formation response data to the stimuli applied to the well, and selecting a representative model based on **both** the sequence of stimuli **and** formation response data to the stimuli, the technique described and claimed in the '058 Patent advantageously enables the selection of a representative system model that more accurately reflects the well to which it is deployed. EX2013, ¶139. This is one of the '058 Patent's claimed advances, and these aspects of the claims enable more effective control of electric fracturing pumps, thereby improving the fracturing process. *Id.*

b) The Board should reject Petitioners' eligibility challenge because the Petition's identification of the alleged abstract idea is overbroad and untethered to the claim language.

The Petition's eligibility challenge should be rejected because the Petition's articulation of the alleged abstract idea is overbroad, untethered to the claim language, and disregards claim elements that the specification makes clear are important to the claimed advance. As detailed above, part of the claimed advance in claim 1 of the '058 Patent is enabling the selection of a more accurate representative system model to use for controlling electrical fracturing pumps. This is achieved by taking into account both the sequence of stimuli applied to the well

environment and formation response data to that sequence of stimuli when selecting a representative system model. The alleged abstract idea identified in the Petition, however, has nothing to do with hydraulic fracturing and nothing to do with the control of electrical fracturing pumps. Rather, the Petition improperly oversimplifies claim 1, arguing that it is directed to the alleged abstract idea of selecting a plan for a desired result based on information received in response to one or more inquiries. Petition, 87. Petitioners' argument is deficient and should be rejected.

The Board's Institution Decision recognized that "Petitioner could have provided a characterization of the abstract idea that more closely aligns with the wording of the identified claim limitations[.]" Paper 9 ("Decision"), 20. But Petitioners did not, and their overbroad characterization of the alleged abstract idea is fatal to their eligibility challenge. Respectfully, the Board should reconsider its preliminary determination in the Institution Decision that "Petitioner's position that the claim is *directed to* an abstract idea is not undermined by Petitioner having characterized the abstract idea to which the claim is *directed to* at a level of abstraction higher than claim limitations it has identified as reciting an abstract idea." Decision, 20. That is because such a determination conflicts with established Federal Circuit precedent. *See, e.g., Enfish, LLC v. Microsoft Corp.*, 822 F.3d 1327, 1337 (Fed. Cir. 2016) ("[D]escribing the claims at such a high level of abstraction

and untethered from the language of the claims all but ensures that the exceptions to § 101 swallow the rule.”).

The Federal Circuit has repeatedly cautioned that courts “‘must be careful to avoid oversimplifying the claims’ by looking at them generally and failing to account for the specific requirements of the claims.” *McRO*, 837 F.3d at 1313. “The ‘directed to’ inquiry, therefore, cannot simply ask whether the claims *involve* a patent-ineligible concept, because essentially every routinely patent-eligible claim involving physical products and actions *involves* a law of nature and/or natural phenomenon—after all, they take place in the physical world.” *Enfish*, 822 F.3d at 1335. Rather, “[t]he Step 1 ‘directed to’ analysis called for by [the Federal Circuit’s] cases depends on an accurate characterization of what the claims require and of what the patent asserts to be the claimed advance.” *TecSec, Inc. v. Adobe Inc.*, 978 F.3d 1278, 1294 (Fed. Cir. 2020).

The Federal Circuit—and the Board—have repeatedly rejected eligibility challenges similar to Petitioners’ that relied upon articulations of alleged abstract ideas that were untethered to the claim language and failed to accurately capture what the patent asserts to be the claimed advance. In *TecSec*, for example, the Federal Circuit found that the district court correctly **rejected** an eligibility challenge because the alleged abstract idea was a “materially inaccurate” characterization of the two representative claims because it “disregard[ed] elements of the claims at

issue that the specification makes clear are important parts of the claimed advance[.]” 978 F.3d at 1294-1296 (“To disregard those express claim elements is to proceed at ‘a high level of abstraction’ that is ‘untethered from the claim language’ and that ‘overgeneraliz[es] the claim.’”). And in another case, the Federal Circuit **rejected** the district court’s holding that a claim was directed to an abstract idea because the district court’s formulation of the abstract idea was a “high-level description” of aspects of the claimed technology generally, “fail[ed] to mention” key aspects of the claims and was therefore “untethered to the invention as claimed.” *Mentone Sols. LLC v. Digi Int’l Inc.*, No. 2021-1202, 2021 WL 5291802, at *6 (Fed. Cir. Nov. 15, 2021). The Board has reached similar conclusions. *See, e.g., Gain Capital Holdings, Inc. v. Oanda Corp.*, CBM2020-00022, Paper 10 at 26 (P.T.A.B. Mar. 18, 2021) (“Prior Board decisions in post-grant proceedings have found § 101 arguments deficient in similar circumstances where the petitioner asserted an over-generalized abstract idea and fails to sufficiently tie that alleged idea to the language of the claims.”); *Yahoo! Inc. v. AlmondNet, Inc.*, CBM2017-00046, Paper 8 at 17 (P.T.A.B. Oct. 16, 2017) (denying institution where petitioner’s asserted abstract idea over-generalized the claims, as the petitioner failed to explain how multiple concepts recited in the claims are embodied in the petitioner’s alleged abstract idea).

Thus, while the Board correctly noted in the Institution Decision that “[a]n abstract idea can generally be described at different levels of abstraction,” that alone

is not a license to oversimplify the claims and ignore their specific requirements or the claimed advance. Decision, 20 (quoting *Apple, Inc. v. Ameranth, Inc.*, 842 F.3d 1229, 1240 (Fed. Cir. 2016)).³ Rather, characterizing a claim as being directed to an abstract idea is appropriate only where “the abstract idea tracks the claim language and accurately captures what the patent asserts to be the ‘focus of the claimed advance over the prior art.’” *Solutran, Inc. v. Elavon, Inc.*, 931 F.3d 1161, 1168 (Fed. Cir. 2019). Here, Petitioners’ alleged abstract idea—selecting a plan for a desired result based on information received in response to one or more inquiries—meets neither requirement. Petition, 87.

The alleged abstract idea identified in the Petition does not track the claim language. It has nothing to do with fracturing and nothing to do with the control of electrical fracturing equipment. Indeed, the alleged abstract idea identified in the Petition fails to account for any of the specific requirements of the method for controlling electrical fracturing equipment for fracturing a well recited in claim 1. And claim 1 lacks any recitation of selecting a plan for a desired result based on information received in response to one or more inquiries.

³ *Apple* did not purport to overrule Federal Circuit precedent prohibiting oversimplifying the claims by looking at them generally and failing to account for the specific requirements of the claims.

The Petition’s purported examples of how the alleged abstract idea “has been employed for years in multiple environments”—including, allegedly, allergy skin tests and wireless messaging—demonstrate that the alleged abstract idea is over-generalized and not sufficiently tied to the language of the claims. Petition, 87-88. Petitioners’ expert, Dr. Nikolaou, conceded that “an allergy skin test is not in the scope of Claim 1” and that he “cannot see the immediate relevance” of wireless messaging “within the scope of Claim 1.” EX2014, 68:20-69:20. Thus, Petitioners’ suggestion that the method for controlling electrical hydraulic fracturing equipment for fracturing a well in claim 1 is “directed to” the same alleged abstract concept underlying an allergy skin test or the use of probe messages in a wireless communication system is not credible.

The Petition’s alleged abstract idea also fails to accurately characterize, let alone capture, the ’058 Patent’s claimed advance. The Petition characterizes “the ‘focus of the claimed advance’ [as] the automated selection of the system model and controlling the pump based on the system model[.]” Petition, 92 n.6. Notably, Petitioners cite nothing in the specification of the ’058 Patent, the claims, or Dr. Nikolaou’s declaration to support this statement. Just as in *TecSec*, Petitioners’ articulation of the claimed advance overlooks important aspects of the ’058 Patent’s disclosure and claim 1. As detailed above, the inventors recognized that one problem with using a representative system model to control electrical fracturing pumps is

that the representative system model “may be a static construct and may not accurately reflect the well to which it has been deployed.” EX1001, 1:23-26. The inventors also recognized that well treatments using representative system models can be optimized by selecting the representative system model based on a particular sequence of stimuli applied to the well, and the formation response data produced by that sequence of stimuli. *See, e.g., id.*, 3:44-49. Thus, the claimed advance goes beyond mere “automated selection of the system model and controlling the pump based on the system model” as proposed by Petitioners. Petition, 92, n.6. The claims capture this aspect of the ’058 Patent’s advance over the prior art. *See, e.g.,* EX1001, 11:63-65 (“selecting a representative system model based on the received formation response data **and** sequence of stimuli”) (emphasis added), 12:46-48, 13:25-27. Petitioners’ alleged abstract idea does not.

The Petition’s alleged abstract idea—selecting a plan for a desired result based on information received in response to one or more inquiries—entirely omits this aspect of the claimed advance, most likely in an attempt to tie the alleged abstract idea to the description in the ’058 Patent’s Background section and prop up the Petition’s flimsy narrative that the claims merely automate a known process. Petition, 87, 5; *see also id.* at 83 (alleging that “the claims merely automate a method that was . . . previously performed manually”), 90. The Board has already rejected that proposition. Decision, 23 n.4 (“We agree with Patent Owner that the

Background does not support the position that claim 1 merely automates a method that was entirely known to be performed manually.”). Moreover, the improved technique claimed goes beyond mere automation, and the Petition’s abstract idea fails to account for the part of the claimed advance involving selecting the representative system model based on the formation response data (Petitioner’s alleged “information received ... in response to one or more inquiries”) **and the sequence of stimuli**, which has no counterpart in Petitioner’s alleged abstract idea. EX2013, ¶¶136-139. Accordingly, the Board should follow the Federal Circuit’s guidance in *TecSec* and reject Petitioners’ eligibility challenge because the alleged abstract idea “disregard[s] elements of the claims at issue that the specification makes clear are important parts of the claimed advance in the combination of elements.” *TecSec*, 978 F.3d at 1294.

c) The Petition’s contention that claim 1 merely automates a manual process mischaracterizes the ’058 Patent.

The Petition’s repeated mischaracterizations of the Background section of the ’058 Patent further highlight the deficiencies in its § 101 arguments. Petition, 83. The Petition alleges that “the claims merely automate a method that was – as the ’058 patent itself confirms – previously performed manually.” *Id.*; *see also id.* at 90 (alleging that the ’058 Patent’s claims merely use “computers to automate a process that the ’058 Patent **admits** was typically performed by technicians”). Yet again, the

Petition’s arguments depend on ignoring important aspects of the claimed invention.

At most, the Background section of the ’058 Patent acknowledges that “typically, settings [for electric frac pumps] are performed manually based on manually appraised information retrieved from the downhole environment” and that, when a representative system model is used, it is “typically manually selected by a technician based on observed sensor data.” EX1001, 1:11–26. It does not follow that the method of claim 1 merely automates a method previously performed manually as alleged in the Petition. For example, nothing in the Background section suggests that it was known to generate a sequence of stimuli for application to a well environment in order to obtain formation response data and then select a representative system model to use for controlling an electrical fracturing pump based on the received formation response data ***and sequence of stimuli***. *Id.*, 1:11–26. Accordingly, the Petition’s contention that “the ’058 patent itself confirms” that the claims merely automate a method that was previously performed manually lacks merit. Petition, 83.

d) The ’058 Patent’s claims are not directed to an abstract mental process.

The Petition’s assertion that “[t]he ’058 patent claims also fail *Alice* step one because they are effectively directed to mental processes” lacks merit. Petition, 91. The MPEP explains that the “mental processes” grouping of abstract ideas includes “concepts performed in the human mind (including an observation, evaluation,

judgment, opinion)[.]” MPEP § 2106.04(a). The claimed technique for controlling electrical fracturing equipment for fracturing a well is a far cry from an abstract mental process. The Petition fails to support its assertions otherwise.

The Petition does not allege that “generating a sequence of stimuli for application to a well environment” as claimed can be performed in the human mind. At most, the Petition alludes to two of the four claimed steps involving “selecting a system model based on the received sensor data and then controlling the settings on the pump” as actions that “can be and were done by humans.” Petition, 91. The Petition, however, fails to show how the mere fact that some steps have previously been performed manually renders the claim as a whole directed to an abstract mental process. Notably, controlling the settings on an electrical fracturing pump is not something that can be performed in the human mind.

Furthermore, the Petition’s argument highlights that Petitioners are looking at claim elements in isolation, and not considering the claim “as a whole” for purposes of the eligibility analysis. *See McRO*, 837 F.3d at 1312 (the claims must be “considered in their entirety to ascertain whether ***their character as a whole*** is directed to excluded subject matter”). The portions of the claim that Petitioners identify as alleged abstract mental processes are inextricably tied to steps that involve physically stimulating a given formation in the Earth using a sequence of stimuli in order to determine how the formation responds to the sequence of stimuli.

Thus, considered as a whole, claim 1 of the '058 Patent is nothing like the “mental process of ‘a search algorithm for identifying people who may be eligible for SSDI benefits they are not receiving’” addressed in *In re Killian*, 45 F.4th 1373, 1379 (Fed. Cir. 2022) relied upon by the Petition. Petition, 91.

Accordingly, for the reasons set forth above, claim 1 does not recite or describe the abstract idea set forth in the Petition and therefore is eligible at Guidance Step 2A, Prong 1. To the extent claim 1 is deemed to “recite or describe” an abstract idea at Step 2A, Prong 1, however, the claims are nevertheless patent-eligible at Step 2A, Prong 2, because the claims integrate the alleged abstract idea into a practical application.

2. Guidance Step 2A, Prong 2

Claim 1 is not “directed to” the Petition’s alleged abstract idea—selecting a plan for a desired result based on information received in response to one or more inquiries—because claim 1 recites additional elements beyond the alleged abstract idea that integrate the alleged abstract idea into a practical application. MPEP § 2106.04(II)(A)(2).

“A claim that integrates a judicial exception into a practical application will apply, rely on, or use the judicial exception in a manner that imposes ***a meaningful limit on the judicial exception***[.]” MPEP § 2106.04(d) (emphases added). Examples include “[a]n improvement in the functioning of a computer, or an

improvement to other technology or technical field” and “[a]pplying or using the judicial exception in some other meaningful way[.]” MPEP § 2106.04(d)(I). Claim 1 is eligible because it recites additional elements that confine the claim to a specific solution that improves the process for selecting a representative system model for controlling electrical fracturing pumps, thereby improving fracturing operations. EX2014, 46:12-47:13.

As discussed above, the Petition’s alleged abstract idea is overbroad, untethered to the actual requirements of the claim, and fails to capture the ’058 Patent’s claimed advance. *Supra*, §IV.C.1.b. Accordingly, the “additional elements” of claim 1 considered at Step 2A, Prong Two include the specific claimed steps—generating a sequence of stimuli for application to a well environment, the sequence of stimuli comprising one or more of particulate concentrations, chemical concentrations, or a pump rate control; receiving formation response data comprising data from one or more downhole sensors or surface sensors; selecting a representative system model based on the received formation response data and sequence of stimuli; and controlling an electrical fracturing pump based on the representative system model. EX1001, 11:57-67. To the extent claim 1 involves the alleged abstract idea of “selecting a plan for a desired result based on information received in response to one or more inquiries” (Petition, 87), these limitations of claim 1, considered as a whole, use the alleged judicial exception in a manner that

imposes a meaningful limit. MPEP § 2106.04(d).

The Petition itself demonstrates that claim 1 applies the alleged judicial exception in a way that imposes a meaningful limit on the alleged abstract idea of selecting a plan for a desired result based on information received in response to one or more inquiries. MPEP § 2106.04(d). Petitioners argue that the alleged abstract idea “has been employed for years in multiple environments,” such as allergy skin tests and wireless communication systems. Petition, 87–88. To the extent allergy skin tests, wireless messaging communication systems, and the method for controlling electrical fracturing equipment for fracturing a well in claim 1 each involves the same alleged abstract idea, the additional elements of claim 1 meaningfully limit the alleged abstract idea such that the claim is more than a drafting effort designed to monopolize the judicial exception. *See McRO*, 837 F.3d at 1315 (“The concern underlying the exceptions to § 101 is not tangibility, but preemption.”). There is no concern that claim 1 is going to “monopolize” Petitioners’ alleged abstract idea. It cannot be credibly asserted that the improved method for controlling electrical fracturing equipment in claim 1 would read on, let alone preempt, the techniques for allergy skin tests and wireless messaging communication systems described in the Petition. *See, e.g., EX2014*, 68:20-69:5 (Petitioners’ expert, Dr. Nikolaou, testifying that “an allergy skin test is not in the scope of Claim 1” and he “cannot see the immediate relevance” of wireless

messaging “within the scope of Claim 1”). The additional limitations in claim 1 “prevent preemption of all processes for” selecting a plan for a desired result based on information received in response to one or more inquiries. *McRo*, 837 F.3d at 1315.

Furthermore, to the extent claim 1 involves the alleged abstract idea at all, it applies it “in a process specifically designed to achieve an improved technological result in conventional industry practice” and is therefore “not directed to an abstract idea.” *Id.*, 1316; *see also* MPEP § 2106.04(d)(1) (“One way to demonstrate such integration is when the claimed invention improves the functioning of a computer ***or improves another technology or technical field.***”) (emphases added).⁴ As detailed above in the discussion of the ’058 Patent’s claimed advance (*supra*, §IV.C.1.a), the ’058 Patent recognized that one problem with using a representative system model to control electrical fracturing pumps is that the “representative system model may

⁴ The Petition’s conclusory, two-sentence Step 2A, Prong 2 analysis argues that the claims do not integrate the abstract idea into a practical application because “the claims do not reflect an ‘improvement in the functioning of a computer[.]’” Petition, 93 n.7. Petitioners’ argument overlooks that improving the functioning of a computer is just one of many ways in which a claim can integrate an alleged abstract idea into a practical application. *See* MPEP § 2106.04(d).

be a static construct and may not accurately reflect the well to which it has been deployed.” EX1001, 1:23-26. The claimed approach enables the selection of a representative system model that more accurately reflects the well to which it is applied, enabling more effective control of the pump and thereby improving fracturing operations. *Supra*, §IV.C.1.a. This is achieved by taking into account both the generated sequence of stimuli applied to the well, and formation response data indicating how the well responds to the sequence of stimuli, when selecting a representative system model to use for controlling an electrical fracturing pump. EX2013, ¶139.

The testimony of Petitioners’ expert, Dr. Nikolaou, supports the conclusion that claim 1, considered as a whole and in light of the specification, improves fracturing operations. EX2014, 46:12-47:11, 22:1-23:6. Dr. Nikolaou confirms that, in fracturing operations, it is desirable to have a representative system model that accurately reflects the well to which it is being applied, and that using a more accurate representative system model to control a fracturing pump improves the ability to create the subsurface conditions (e.g., fracturing pattern) needed to enhance production from the well. EX2014, 46:12-47:11, 22:1-23:6, 37:2-38:20, 40:18-41:3, 42:10-17. By applying a sequence of stimuli to the actual well, and selecting a representative system model based on the specific sequence of stimuli and the formation’s response to that specific sequence of stimuli, the approach recited in

claim 1 does just that. EX2013, ¶¶136-139; EX2014, 46:12-47:13 (Dr. Nikolaou admitting that “having data from the response of a well to stimuli can help build a better model that captures the effect of these stimuli on the things that are measured” and the subsurface conditions you can achieve with a better model “may be better” than those with a worse model). At least because the claimed method improves upon conventional fracturing operations, claim 1 integrates the alleged abstract idea into a practical application.

Furthermore, to the extent the steps of “receiving formation response data comprising data from one or more downhole sensors or surface sensors” and “selecting a representative system model based on the received formation response data and sequence of stimuli” are deemed to recite mental processes, the additional element of “controlling an electrical fracturing pump based on the representative system model” integrates them into a practical application. This is confirmed by Example 45 in Appendix 1 to the October 2019 Update: Subject Matter Eligibility *Life Sciences & Data Processing Examples*. EX2008, 23–24. In Example 45, the independent claim related to a controller for an injection molding apparatus and recited steps of “calculate an extent of curing completion of polyurethane in the mold” and “determine the extent that the polyurethane is cured as a percentage,” which were identified as falling into the “mental process” group of abstract ideas. EX2008, 20-22. While claim 1 in Example 45 was deemed ineligible, dependent

claim 2 added an additional limitation that rendered the claim eligible. *Id.*, 23.

Specifically, claim 2 in Example 45 further recited that the controller is configured to “send control signals to the injection molding apparatus once the polyurethane has reached a target percentage, the control signals instructing the apparatus to open the mold and eject the molded polyurethane from the mold.” *Id.*, 20. The USPTO Guidance indicates that claim 2 “does not merely link the judicial exceptions to a technical field, but instead adds a meaningful limitation in that it employs the information provided by the judicial exception (the calculated percentage of the extent of cure) to control the operation of the injection molding apparatus.” *Id.*, 24. The controlling step in claim 1 of the ’058 Patent similarly adds a meaningful limitation because it employs the information provided by the alleged judicial exception (the selected representative system model) to “control[] an electrical fracturing pump based on the representative system model” and thereby achieve more favorable subsurface conditions for fracturing operations. EX1001, 11:66–67.

Contrary to the Board’s preliminary finding, the controlling step does not merely “link the judicial exception to a technical field.” Decision, 26. A POSITA would recognize that the controlling step, considered in combination with the other claim limitations, reflects the technical advantages described in the specification to address the problem of representative system models failing to “accurately reflect

the well to which it has been deployed.” EX1001, 1:23–26. And the specification makes clear what the controlling step may entail. EX1001, 8:45-49 (“settings on an electric frac pump are controlled based on the selected representative system model” such as “pressure, flow rate, chemical (e.g., proppant, diverter, etc.) composition of a pumped fluid”). The claim, as a whole, is focused on a particular solution to a problem in hydraulic fracturing, and that is reflected in every aspect of the claims. This is not a case where an abstract idea like hedging risk is limited to a particular field of use (e.g., commodities and energy markets) as was the case in *Bilski v. Kappos*, 561 U.S. 593, 612 (2010). Rather, claim 1 is more akin to the eligible claim in *Diamond v. Diehr* that involved an “industrial process for the molding of rubber products” because hydraulic fracturing is an industrial process and controlling the electrical fracturing pump based on a representative system model as claimed generates subsurface conditions (e.g., fracture patterns) for enhancing the productivity of a well. 450 U.S. 175, 192-193 (1981). Accordingly, claim 1 integrates the alleged abstract idea into a practical application and is therefore eligible.

a) Claim 1 integrates the alleged abstract idea into a practical application even if some of the claim elements were known in the art.

In the Institution Decision’s Step 2A, Prong 2 analysis, the Board preliminarily rejected Patent Owner’s argument that claim 1 integrates the alleged

abstract idea into a practical application because, in the Board’s view, “claim 1 seems to cover steps that are conventional, or at least known, as taught by the Background of the ’058 patent and/or Pankaj.” Decision, 25. The Board should reconsider this preliminary determination, however, because whether claim elements are conventional (or known) is not a consideration in determining whether the claim integrates the alleged abstract idea into a practical application at Step 2A, Prong 2. *See* MPEP §2106.04(d)(I).

In particular, “Step 2A ***specifically excludes*** consideration of whether the additional elements represent well-understood, routine, conventional activity.” *Id.* (emphasis added). Thus, a proper Prong Two analysis requires giving “weight to all additional elements, whether or not they are conventional.” *Id.* Specifically, “the limitations containing the judicial exception as well as the additional elements in the claim besides the judicial exception ***need to be evaluated together*** to determine whether the claim integrates the judicial exception into a practical application.” MPEP §2106.04(d)(III) (emphases added). Indeed, the MPEP makes clear that “[a]dditional elements that represent well-understood, routine, conventional activity may integrate a recited judicial exception into a practical application.” MPEP §2106.04(d)(I). Thus, even if the Board were correct that claim 1 covers steps that were known, which Patent Owner does not concede, claim 1 still integrates the alleged abstract idea into a practical application for the reasons above.

b) Claim 1 is analogous to other claims found eligible.

The improved “method for controlling electrical fracturing equipment used for fracturing a well” recited in claim 1 is analogous to other claims found eligible at *Alice* step one because they were not directed an abstract idea. EX1001, cl. 1. For example, in *EcoServices, LLC v. Certified Aviation Services, LLC*, the Federal Circuit affirmed the district court’s finding that a claim related to a system for automatically controlling a washing procedure for jet engines was not directed to an abstract idea at *Alice* step one. 830 Fed. App’x. 634, 636 (Fed. Cir. 2020). The claim at issue recited:

1. A system for washing turbine engines comprising:
 - a washing unit for providing a washing liquid to the turbine engines;
 - an information detector configured to gather information related to engine type; and
 - a control unit configured to accept the information related to engine type from the information detector and to determine a washing program to be used as a function of the information relating to engine type from a set of preprogrammed washing programs, and further configured to regulate the washing unit according to washing parameters associated with the washing program used.

Id. The Federal Circuit held that the claim was directed to “an improved system for washing jet engines” and rejected the argument that the claim is “directed to ‘a result or effect that itself is the abstract idea’ of, e.g., automated jet engine washing.” *Id.*

at 642. Claim 1 of the '058 Patent is closely analogous to the claim at issue in *EcoServices*. The claimed “electrical fracturing pump” is analogous to the washing unit in *EcoServices*, and the claimed steps of generating a sequence of stimuli and receiving formation response data about how the well responds to the stimuli are analogous to the information detector configured to gather information related to engine type. Claim 1 of the '058 Patent “selects a representative system model based on the received formation response data and sequence of stimuli,” which is analogous to the control unit in *EcoServices* determining a washing program to be used as a function of the information relating to engine type from a set of preprogrammed washing programs. Finally, the step of “controlling an electrical fracturing pump based on the representative system model” closely mirrors the functionality of *EcoServices*’ control unit configured to regulate the washing unit according to washing parameters associated with the washing program.

Similar to how the claim at issue in *EcoServices* was directed to an improved system for washing jet engines, claim 1 of the '058 Patent provides an improvement to fracturing operations by providing improved control of electrical fracturing pumps. *Id.* at 643; *supra*, §IV.C.1.a. Notably, in *EcoServices* the Federal Circuit rejected substantially the same argument that Petitioners’ advance here (i.e., that claim 1 is ineligible because it “merely automate[s] a method that was . . . previously performed manually.”). Petition, 83. Specifically, the Federal Circuit recognized

that just because “the claimed system achieves automation of a task previously performed by humans . . . does not mean the claimed system is necessarily directed to an abstract idea.” 830 Fed. App’x. at 643; *see also id.* at 644 (“automation alone is not necessarily abstract”). Thus, for analogous reasons to those in *EcoServices*, claim 1 is not directed to an abstract idea and is therefore eligible at *Alice* step one.

Claim 1 is also analogous to the claims found eligible in *Diamond v. Diehr*, 450 U.S. 175 (1981). In *Diehr*, the Supreme Court confirmed the eligibility of patent claims directed to a process of curing synthetic rubber that used a computer to repeatedly calculate cure time based on sensor data (*i.e.*, temperature measurements) and signal a device to open a press when the actual time that has elapsed equals the recalculated cure time. *Id.* at 178–79, 187. The court explained that the claims describe “a step-by-step method for accomplishing such, beginning with the loading of a mold with raw, uncured rubber and ending with the eventual opening of the press at the conclusion of the cure.” *Id.* at 184; *see also Alice*, 573 U.S. at 223 (“[T]he claims in *Diehr* were patent eligible because they improved an existing technological process[.]”). Like the physical and chemical process for molding precision synthetic rubber products in *Diehr*, the method of claim 1 begins with physically stimulating the well by “generating a sequence of stimuli for application to a well environment” in order to elicit “formation response data” to allow for selecting a representative system model based on the formation response data **and**

sequence of stimuli. EX1001, cl. 1. And like the claims in *Diehr*, the process ends with “controlling an electrical fracturing pump” based on the selected representative system model in order to create favorable subsurface conditions (e.g., fracture pattern) for enhancing the productivity of a well. *Id.* “[I]ndustrial processes such as this are the types which have historically been eligible to receive the protection of our patent laws.” *Diehr*, 450 U.S. at 184.

Other cases considering claims related to oilfield operations confirm that claim 1 is eligible. For instance, claim 1 is analogous to claims found eligible in *Canrig Drilling Tech. Ltd. v. Trinidad Drilling L.P.*, 2015 WL 5458576 (S.D. Tex. Sept. 17, 2015). One eligible claim in *Canrig* recited:

1. A drill string drive comprising:
 - a motor adapted to rotate a drill string;
 - a sensor adapted to detect a rotational position of said drill string at the surface, wherein the sensor is at the surface; and
 - a computer receiving the rotational position from said sensor, said computer transmitting control signals to said motor, said computer programmed to control said motor to advance said drill string to a predetermined angle.

EX2015, 6:9-18. The court rejected the defendant’s arguments that the claim was an attempt to “patent the abstract concept of rotation” and found the claim eligible at *Alice* step one because “[t]he claims in Canrig’s patents address specific challenges in directional drilling through a concrete process for controlling the

rotation of the long drill strings to and between predetermined angles.” *Canrig Drilling Tech.*, 2015 WL 5458576, at *4.

Like the eligible claim in *Canrig*, claim 1 of the ’058 Patent is not an attempt to patent the allegedly abstract concept of selecting a plan for a desired result based on information received in response to one or more inquiries. Rather, claim 1 addresses a specific challenge in hydraulic fracturing—the use of a representative system model that does not accurately reflect the well to which it is applied—through a concrete process that involves stimulating a well using a sequence of stimuli, obtaining formation response data to the sequence of stimuli, selecting a representative system model based on the sequence of stimuli and the formation response data, and using the selected representative system model to control an electrical fracturing pump. EX1001, 11:54-67. Similar to the claim at issue in *Canrig*, claim 1 addresses specific challenges in hydraulic fracturing “through a concrete process for controlling” an electrical fracturing pump and does “not ‘risk disproportionately tying up the use of the underlying idea’ of” selecting a plan for a desired result based on information received in response to one or more inquiries. *Canrig Drilling Tech.*, 2015 WL 5458576 at *4 (quoting *Alice*, 573 U.S. at 217).

Claim 1 is also analogous to a claim found eligible in *Nabors Drilling Techs. USA Inc. v. Helmerich & Payne Int’l Drilling Co.*, 631 F.Supp.3d 404 (N.D. Tex. Sept. 28, 2022). The claim at issue in *Nabors Drilling Techs.* recited:

A method of using a quill to steer a hydraulic motor when elongating a wellbore in a direction having a horizontal component, wherein the quill and the hydraulic motor are coupled to opposing ends of a drill string, the method comprising:

monitoring an actual toolface orientation of a tool driven by the hydraulic motor by monitoring a plurality of drilling operation parameters each indicative of a difference between the actual toolface orientation and a desired toolface orientation; and

adjusting a position of the quill by an amount that is dependent upon each of the plurality of the monitored drilling operation parameters.

Id. at 416-417. The court rejected the argument that the claim is directed to the abstract idea of “adjusting a device . . . based on monitored parameters” and concluded that the claim is focused on “an improvement in the physical realm, namely an improved method for steering a hydraulic motor using a quill.” *Id.* at 417. The court noted that the patent at issue described how prior art approaches were often inaccurate and disclosed an improved method for steering that involved parameters that “previously have not been used for automatic toolface orientation.” *Id.* at 417-418.

Similarly, the '058 Patent describes how representative system models selected manually based solely on observed sensor data were inaccurate and discloses selecting a representative system model for controlling an electrical fracturing pump based on a sequence of stimuli applied to the well and formation

response data to the sequence of stimuli, which had not previously been used to select a representative system model. *Supra*, §IV.C.1.a; *see also Thales Visionix Inc. v. United States*, 850 F.3d 1343 (Fed. Cir. 2017) (claims using sensor data in an “non-conventional manner” to achieve more accurate results not directed to an abstract idea). Thus, like the claim in *Nabors*, claim 1 of the ’058 Patent is eligible because it is directed to “an improvement in the physical realm,” namely an improved method for controlling an electrical fracturing pump during fracturing operations. *Nabors*, 631 F.Supp.3d at 417.

c) The ’058 Patent’s claims are distinguishable from those at issue in *Automation Middleware Solutions*.

In the Institution Decision, the Board “encourage[d] the parties to consider any similarity between the claims here and the claims involved in *Automation Middleware Solutions, Inc. v. Invensys Systems, Inc.*, 737 Fed. Appx. 1005 (Fed. Cir. 2018).” Decision, 21. The claims of the ’058 Patent are distinguishable from the claims at issue in that case. *See Automation Middleware Solutions, Inc. v. Invensys Sys., Inc.*, No. 2:15-cv-00898-RWS, 2017 WL 11573945 (E.D. Tex. Mar. 31, 2017 (hereinafter “AMS”).⁵ The patents at issue in *AMS* related to “interface software that

⁵ The case cited in the Institution Decision is an affirmance pursuant to Fed. Cir. R. 36. Accordingly, Patent Owner discusses the underlying district court opinion in *AMS*.

facilitates the creation of hardware independent motion control software.” *AMS*, 2017 WL 11573945 at *1. The claims were found to be “directed to the abstract idea of ‘a middle translating layer’” that “does not improve the functioning of a computer.” *Id.* at *9. Instead of focusing on motion control devices, the claims in *AMS* merely required “translating” inputs from an application program’s language into one or more drivers’ programming language. *Id.*

Claim 1 of the ’058 Patent is not analogous to the ineligible claims in *AMS*. None of the elements of claim 1’s method for controlling electrical fracturing equipment can be fairly characterized as similar to the middleware layer in *AMS*. Far from merely translating commands from one software language into another, claim 1 recites a concrete solution geared toward improving how electrical fracturing pumps are controlled during fracturing operations. *Supra*, §IV.C.1.a. Unlike *AMS*, Claim 1 accomplishes this using steps that occur in the physical world (not just software), including stimulating a well with a specific sequence of stimuli, obtaining formation response data responsive to the sequence of stimuli, and then using both to select a more accurate representative system model to use to control an electrical fracturing pump during fracturing operations. *Id.* Thus, the claims here are more closely analogous to those discussed above and should be found eligible. *Supra*, §IV.C.2.b.

d) The Petition relies on inapposite cases.

The Petition's reliance on cases such as *TDE Petroleum Data Sols., Inc. v. AKN Enter. Inc.*, 657 F. App'x 991, 992 (Fed. Cir. 2016) and *FairWarning IP, LLC v. Iatric Sys.*, 839 F.3d 1089, 1092 (Fed. Cir. 2016) is misplaced. Petition, 88–89; *see also* Decision, 21 (“We agree with Patent Owner that *TDE Petroleum Data Solutions* and *FairWarning* are not a perfect fit.”).

The Petition primarily relies on *TDE Petroleum* because it is allegedly “in the same field as the ’058 patent claims and closely matches claim 1 thereof.” Petition, 89. Even a cursory review of the Federal Circuit’s decision, however, reveals that the claims at issue in *TDE Petroleum* do not “closely match[]” claim 1 of the ’058 Patent as alleged. The claim at issue in *TDE Petroleum* involved only “the most ordinary of steps in data analysis.” 657 Fed. App’x. at 993. The claim at issue in *TDE Petroleum* recited:

1. An automated method for determining the state of a well operation, comprising:
 - storing a plurality of states for a well operation;
 - receiving mechanical and hydraulic data reported for the well operation from a plurality of systems; and
 - determining that at least some of the data is valid by comparing the at least some of the data to at least one limit, the at least one limit indicative of a threshold at which the at least some of the data do not accurately represent the mechanical or hydraulic condition purportedly

represented by the at least some of the data; and
when at least some of the data are valid, based on the mechanical
and hydraulic data, automatically selecting one of the states as the state
of the well operation.

Id. at 992. The Federal Circuit recognized that this claim merely involves “collecting information” and “analyzing it.” *Id.* at 993. In contrast, claim 1 of the ’058 Patent recites *significantly more* than collecting and analyzing data, including the steps of “generating a sequence of stimuli for application to a well environment,” “selecting a representative system model based on the received formation response data and sequence of stimuli; and controlling an electrical fracturing pump based on the representative system model.” EX1001, cl. 1.

FairWarning is equally inapposite. *FairWarning* dealt with claims directed “to the concept of analyzing records of human activity to detect suspicious behavior,” which is far afield from the method for controlling electrical fracturing equipment for fracturing a well recited in claim 1 of the ’058 Patent. *FairWarning*, 839 F.3d at 1093. The *FairWarning* claims were found to be directed to the abstract idea of “collecting and analyzing information to detect misuse and notifying a user when misuse is detected.” *Id.* at 1094. Unlike *FairWarning*, where the “focus” of the claims was “on certain independently abstract ideas that use computers as tools,” *Id.* at 1095, claim 1 of the ’058 Patent improves upon the process of controlling electrical fracturing pumps for fracturing a well by applying a sequence of stimuli

to the actual well and selecting a representative model for controlling the fracturing pump based on **both** the sequence of stimuli and formation response data. EX1001, cl. 1; *supra*, §IV.C.1.a. This enables the selection of a representative system model that accurately reflects the well to which it is deployed and thereby improves the fracturing process by enabling more effective control of the pump.

The Petition's attempt to analogize claim 1 of the '058 Patent to the claim at issue in *FairWarning* is unavailing. Petition, 89–90. First, the Petition identifies no analog in *FairWarning* to the claimed step of “generating a sequence of stimuli for application to a well environment.” Second, the Petition's suggestion that “the '058 ‘model’ is akin to the *FairWarning* ‘rule,’ the ‘sensor data’ is akin to the audit log data, and controlling the pump is akin to providing a notification of misuse” is underdeveloped and conclusory. Petition, 89–90. The Petition's comparison oversimplifies the '058 Patent claims and fails to take into account the claim as a whole. Considered as whole, claim 1 is directed to an improved method for controlling electrical fracturing equipment for fracturing a well that takes into account a geological formation's response to a specific sequence of stimuli in order to select a more accurate representative system model to use for controlling an electrical fracturing pump. EX1001, cl. 1. The subject matter of claim 1 is nothing like the method claimed in *FairWarning*, which merely involved applying a generated rule to audit log data and, if an event has occurred, storing the event and

providing a notification that it occurred. *FairWarning*, 839 F.3d at 1092.

e) The Board should reject Petitioner’s eligibility challenge because the Petition failed to meet its burden as to Step 2A, Prong 2.

The Petition fails to conduct a proper Step 2A, Prong 2 analysis. Petition, 93 n.7. At most, the Petition includes a footnote that alleges in conclusory fashion that “the 058 patent claims do not integrate the alleged abstract idea into a practical application” because the claims allegedly “do not reflect ‘an improvement in the functioning of a computer[.]’” *Id.* As discussed above, however, improving the functioning of a computer is not the only way an alleged abstract idea can be integrated into a practical application. *Supra*, §IV.C.2. By failing to even address whether the claims integrate the alleged abstract idea of selecting a plan for a desired result based on information received in response to one or more inquiries into a practical application in any other way, Petitioners have not met their burden to show that the claims do not integrate the alleged abstract idea into a practical application.

Moreover, Petitioners’ *Alice* step one analysis demonstrates that Petitioners are looking at the claim elements individually, instead of considering them as a whole as required. *See* MPEP §2106.04(d)(III). For example, the Petition argues that “the ‘focus of the claimed advance’ is the automated selection of the system model and controlling the pump based on the system model” and that the “steps of applying a sequence of stimuli and receiving sensor data in response do not change

this, because it cannot be disputed that these steps were conventional in the industry.” Petition, 92. But a proper Step 2A, Prong Two analysis requires “giving weight to all additional elements, whether or not they are conventional” and, as part of that analysis, “the limitations containing the judicial exception as well as the additional elements in the claim besides the judicial exception need to be evaluated together to determine whether the claim integrates the judicial exception into a practical application.” MPEP §§ 2106.04(d)(I), 2106.04(d)(III). For the reasons explained above, a proper Step 2A, Prong Two analysis demonstrates that the claims integrate the alleged abstract idea into a practical application. By failing to take into account all additional elements of the claims, including those that Petitioners allege were conventional, Petitioners cannot have met their burden. *See Supercell Oy v. GREE, Inc.*, PGR2018-00061, Paper 27 at 25 (P.T.A.B. Oct. 15, 2019) (petitioner failed to carry its burden under Prong Two by failing to address all of the additional elements).

D. Guidance Step 2B / Alice Inquiry

Because claim 1 integrates the alleged abstract idea into a practical application, the Board need not reach Step 2B. Regardless, the additional elements of claim 1—individually and as an ordered combination—constitute inventive concepts. EX2013, ¶¶140-144. A claim recites an inventive concept “when the claim limitations ‘involve more than performance of well-understood, routine, [and]

conventional activities previously known to the industry.” *Berkheimer*, 881 F.3d at 1367.

1. The independent claims recite inventive concepts and the Petition fails to show otherwise.

Claim 1 recites the unconventional steps of “generating a sequence of stimuli for application to a well environment, the sequence of stimuli comprising one or more of particulate concentrations, chemical concentrations, or a pump rate control;” “receiving formation response data comprising data from one or more downhole sensors or surface sensors;” and “selecting a representative system model based on [] received formation response data **and sequence of stimuli**” that is used to control an electrical fracturing pump. EX1001, cl. 1 (emphases added); EX2013, ¶140. To be clear, these aspects of the claim are “additional elements” that must be considered at *Alice* step two. As the Board recognized in the Institution Decision, “[t]he Petition does not characterize ‘[t]he claimed steps of applying a sequence of stimuli and receiving sensor data’ as part of the abstract idea[.]” Decision, 21 (citing Petition, 92 n.6). And the Petition’s articulation of the alleged abstract idea fails to account for the requirement of claim 1 that the representative system model be selected “based on the received formation response data **and sequence of stimuli**[.]” *Supra*, §IV.C.1.b.

These elements—considered individually and as an ordered combination with the step of “controlling an electrical fracturing pump based on the representative

system model”—constitute inventive concepts. As previously discussed, by first stimulating the well with a specific sequence of stimuli, and then selecting a representative system model based on formation response data produced in response to the sequence of stimuli ***and the sequence of stimuli itself***, the claimed process improves fracturing operations by enabling the selection of a more accurate representative system model to use for controlling an electrical fracturing pump. *Supra*, §IV.C.1.a; EX2013, ¶¶136-140. Using a representative system model that more accurately reflects the well to which it is applied, in turn, results in improved control of the electrical fracturing pump to generate subsurface conditions (e.g., fracture patterns) that are favorable for enhancing the productivity of the well. *Supra*, §IV.C.1.a; EX2013, ¶139. The Petition fails to meet its burden to show that these steps represent well-understood, routine, conventional activity and do not constitute an inventive concept. EX2013, ¶¶140-144.

First, the Petition fails to support its assertion that “[s]timulating a well using ‘one or more of particulate concentrations, chemical concentrations, or pump rate control’” as claimed “was a well-known technique used to determine and simulate well performance.” Petition, 94. The Petition, and Dr. Nikolaou, purport to identify two references that allegedly demonstrate that generating a sequence of stimuli as claimed was well known. Petition, 94 (relying upon *Pankaj* (EX1005) and *Gottumukkala* (EX1014)); EX1003, ¶193. The Petition’s contention that *Pankaj*

“discloses sending sequence of stimuli” fails for the reasons discussed below with respect to Petitioners’ Ground 1. Petition, 94; *Infra*, §V.A.1; EX2013, ¶¶63-69.

Petitioners’ reliance on Gottumukkala is misplaced. Petitioners’ arguments based on Gottumukkala again ignore the specific requirements of the claim, which recites a sequence of stimuli comprising one or more of particulate concentrations, chemical concentrations, or a pump rate control. EX1001, cl. 1. The cited portions of Gottumukkala, however, do not disclose generating any such sequence of stimuli. EX2013, ¶¶141-142. Petitioners and Dr. Nikolaou allege that Gottumukkala teaches this aspect of the claims because it purportedly discloses “determining ‘pressure transient **responses** to continuous zonal rate **changes instigated by the actuation** of flow control valves.” Petition, 94 (citing EX1014, ¶0029); EX1003, ¶193. As an initial matter, Petitioners and Dr. Nikolaou do not explain how this disclosure in Gottumukkala teaches that the flow control valves are actuated according to a predetermined generated sequence as required by the claims. Petition, 94; EX1003, ¶193; EX1014, ¶¶0029, 0031; EX2013, ¶¶141-142.

Moreover, the technique described in the relied-upon portions of Gottumukkala has nothing to do with particulate concentrations, chemical concentrations, or a pump rate control as required by the claims. EX2013, ¶142. There is no mention of particulate concentrations or chemical concentrations in the relied-upon portions of Gottumukkala. EX1014, ¶¶0029, 0031. To the extent

Petitioners contend that Gottumukkala discloses a sequence of stimuli comprising pump rate control, that is incorrect. EX2013, ¶142. The flow rate described in Gottumukkala is not the same thing as the claimed pump rate control. *Id.* As confirmed by Dr. Nikolaou, *Gottumukkala*'s flow control valves control fluid flows and fluid flow rates between different well zones of a lateral bore. EX2014, 71:1-13; EX2013, ¶142. Actuating flow control valves to control fluid flow rates is different from pump rate control, which refers to controlling the rate at which the pump is operating. EX2013, ¶142. Thus, while pump rate can influence fluid flow rate, the manipulation of flow control valves in the wellbore does not impact the pump rate. *Id.*

The cited portion of Gottumukkala does not disclose generating a sequence of stimuli comprising pump rate control. *Id.* Indeed, when asked about pump rate control in the context of Gottumukkala's disclosure, Dr. Nikolaou responded, "I don't see a pump here in Figure 1" and explained that Gottumukkala's disclosure concerns "valves that are adjusted to control flow rate." EX2014, 71:14-72:4. Indeed, Gottumukkala never mentions a pump anywhere in its disclosure. *See generally* EX1014. Accordingly, Petitioners have not met their burden to show that generating a sequence of stimuli as claimed was well-understood, routine, or

conventional at the time of the invention.⁶ EX2013, ¶144.

Second, Petitioners’ have introduced **no evidence** that it was well understood, routine, or conventional activity in the hydraulic fracturing industry to select a representative system model to use for controlling an electrical fracturing pump based on **both** a particular sequence of stimuli applied to the well **and** the formation response data to the sequence of stimuli. *Id.*, ¶143. As discussed previously, this aspect of the claims improves fracturing operations by enabling the selection of a representative system model that more accurately represents the well to which it is to be applied. *Supra*, §IV.C.1.a. Petitioners do not even address this aspect of the claims in the Petition’s *Alice* step two analysis, despite the fact that this part of the ’058 Patent’s claimed advance is not captured in the Petition’s articulation of the abstract idea. Petition, 93-98; *Supra*, §IV.C.1.b. In fact, when Petitioners’ do mention the selecting step, they entirely omit this part of the ’058 Patent’s claimed advance. See Petition, 98 (characterizing the claimed steps as “apply stimuli, receive data in response, select a model based on the data, and use the model to control the

⁶ Even if the Board finds that *Pankaj* teaches generating a sequence of stimuli as claimed, Petitioners’ still have not met their burden because “[t]he mere fact that something is disclosed in a piece of prior art . . . does not mean it was well-understood, routine, and conventional.” *Berkheimer*, 881 F.3d at 1369.

pump” with no mention of selecting the representative system model also based on the sequence of stimuli). A proper Step 2B analysis, however, “considers all claim elements.” MPEP § 2106.05; *see also Intermix Media, LLC v. Bally Gaming, Inc.*, CBM2015-00154, Paper 10 at 7–8 (P.T.A.B. Jan. 20, 2016) (“Petitioner’s failure to do a full analysis under *Alice* constitutes a breach of 37 C.F.R. § 42.304(b)(4), as well as 35 U.S.C. § 322(a)(3), which requires identifying the grounds ‘with particularity.’”).

At most, then, the Petition purports to map *Pankaj* to this claim element. Petition, 45-48. As shown herein, however, *Pankaj* does not teach selecting a representative system model based on the received formation response data and sequence of stimuli as claimed. *Infra*, §V.A.2. And even if it did, “[t]he mere fact that something is disclosed in a piece of prior art . . . does not mean it was well-understood, routine, and conventional.” *Berkheimer*, 881 F.3d at 1369. Accordingly, Petitioners have not shown that this aspect of the ’058 Patent’s claimed advance was well-understood, routine, or conventional and therefore have not met their burden to show that Claim 1 lacks an inventive concept.

2. The dependent claims recite additional inventive concepts.

The Petition fails to meet its burden to show that the dependent claims do not recite an inventive concept. EX2013, ¶¶145-148.

Claims 2, 10, 17. The Petition fails to show that it was well-understood,

routine, or conventional to retrieve a representative system model from a data store based on the received formation response data as claimed. Petition, 99; EX2013, ¶146. The Petition focuses on the claimed “data store” but fails to account for how the data store is used in the claim. *Id.*; see also *KioSoft Techs. LLC v. PayRange Inc.*, PGR2021-00093, Paper 38 at 46 (P.T.A.B. Dec. 14, 2022) (“We agree that Petitioner has not explained, for example, how the recited *use* of an accelerometer (as opposed to merely the accelerometer itself) was conventional and is not indicative of an innovative concept. We determine that Petitioner fails to articulate adequately and with particularity why dependent claim 7 is patent ineligible under § 101.”).

The Petition cites Rashid (EX1018) as alleged support for the proposition that “data stores for storing well models were well-known in the art.” Petition, 99 (citing EX1018, Fig. 6, ¶0067); see also EX1003, ¶193 (p.109) (Dr. Nikolaou relying on same disclosure in Rashid). The cited portion of Rashid, however, merely describes “a set of well models 626 and network model 628 stored locally in mass storage 610 and/or accessible remotely from a remote server 618.” EX1018, ¶0067. As confirmed by Dr. Nikolaou, the relied-upon portion of Rashid does not teach how models are retrieved, let alone that they are retrieved based on formation response data. EX2014, 72:5-75:7 (Dr. Nikolaou explaining that Rashid doesn’t “give details, but they just say – the model is stored and then retrieved. So I don’t see anything

more specific than that there.”); EX2013, ¶146.

Claims 4, 12, 19. Petitioners also have not shown that it was well-understood, routine, or conventional at the time of the invention of the '058 Patent to “determin[e] one of a linear or a non-linear relationship between the sequence of stimuli and the received formation response data” and “updat[e] the one of the linear or the non-linear relationship based on multiple iterations of the generated sequence of stimuli” as claimed. The Petition concedes that this aspect of the claims improves fracturing options “because a POSITA would understand that if the relationship is not regularly updated the data and model will quickly be outdated and unreliable.” Petition, 101. As discussed herein, the Petition fails to show that the *Pankaj-Payne* combination in Ground 1 teaches Claim 4. *Infra*, §V.A.6; EX2013, ¶¶108-122, 147. Ground 5 relies on *Husen* (EX1013) to purportedly show that “modeling is routinely updated,” but again, Petitioners’ analysis oversimplifies the claim. Petition, 101. The Petition and the cited testimony of Dr. Nikolaou (EX1003, ¶¶192-193) provide no explanation whatsoever regarding how *Husen*’s disclosure that “the model is modified” during “a reiterative loop” teaches updating the one of the linear or non-linear relationship based on multiple iterations of the generated sequence of stimuli as claimed. Petition, 101-102; EX2013, ¶147.

Claims 5 and 13. Petitioners fail to prove that it was well understood, routine, or conventional to use the data from the one or more downhole sensors or surface

sensors “to determine changes in flow distribution in response to a diverter drop” and use “the changes in flow distribution” “to determine the representative system model” as claimed. Petition, 102-103; EX2013, ¶148. Indeed, the Petition does not allege that any single reference teaches this aspect of the claims. Rather, the Petition’s step two analysis purports to combine the teachings of two references, *Pankaj* and *Dawson* (EX1024), to arrive at this claim element. Petition, 102-103. The fact that Petitioners had to combine two references to purportedly show disclosure of this claim element undermines the Petition’s assertion that the subject matter of these claims was even known, let alone well-known, routine, and conventional. EX2013, ¶148.

For at least the foregoing reasons, Petitioners have not shown that Claims 2, 4, 5, 10, 12, 13, 17 and 19 do not recite an inventive concept.

V. THE PETITION FAILS TO SHOW THAT THE CHALLENGED CLAIMS ARE RENDERED OBVIOUS BY GROUNDS 1-4

A. Ground 1 Fails Because the *Pankaj-Payne* Combination Does not Render Claims 1–4, 6–7, 9–12, 14, and 16–19 Unpatentable

To show that the challenged claims are obvious, the Petition must establish that all claim elements are present in the cited art. *See Personal Web Techs., LLC v. Apple, Inc.*, 848 F.3d 987, 993 (Fed. Cir. 2017) (reversing obviousness determination for failing to explain how the cited art “disclose all of the elements recited in the challenged claims”). Ground 1 fails because the *Pankaj-Payne* combination fails to

disclose or render obvious every element of the Challenged Claims.

1. The *Pankaj-Payne* combination does not disclose or render obvious Limitations [1A], [9A], and [16A]

The *Pankaj-Payne* combination does not disclose the generation of a sequence of stimuli for application to a well environment. EX1001, cls. 1, 9, & 16. Claim 1 requires, in part, “generating a sequence of stimuli for application to a well environment, the sequence of stimuli comprising one or more of particulate concentrations, chemical concentrations, or a pump rate control.” *Id.*, cl. 1. Claims 9 and 16 require similar limitations. *See id.*, cls. 9 & 16.

As noted above, the parties propose that each claim term be afforded its plain and ordinary meaning. *See supra*, §III. Consistent with the requirements of independent claims 1, 9, and 16, the '058 Patent describes that “stimuli may be ***modified over a span of time*** as part of a ***sequence of stimuli***.” EX1001, 3:26–31. The '058 Patent also provides that “[s]timuli control 328 may execute the generate stimuli sequence by generating respective commands, based on the ***scheduled sequence***, to provide to pump system interface 314.” EX1001, 8:12–21.

The discussion of a ***sequence of stimuli*** in the '058 Patent is consistent with an ordinary meaning of the term “sequence.” For example, the *New Oxford American Dictionary* definition of “sequence” is “a ***particular order*** in which related events, movements, or things follow each other.” EX2011 (*Sequence*, NEW OXFORD AMERICAN DICTIONARY (3d ed. 2010) (emphasis added)); *see also* EX2012

(*Sequence*, AMERICAN HERITAGE DICTIONARY OF THE ENGLISH LANGUAGE (5th ed. 2016) (“A following of one thing after another; succession.”)); *see also* EX2014, 66:15-68:2.

The Petition relies solely on *Pankaj* for disclosure of limitation [1A]. Petition, 40-42. When addressing this limitation, the Petition refers to step 1172 of Figure 11 of *Pankaj* and its related description which discloses “stimulating the formation around each wellbore (e.g., perforating, injecting).” EX1005, [0097]. The Petition states that “[a] POSITA would understand ‘perforating’ and ‘injecting’ refer to fracturing treatment processes” and quotes various portions of *Pankaj* related to pumping and injection of stimulation fluids. Petition, 41–42. The Petition then provides a conclusory statement that:

A POSITA would understand these teachings in *Pankaj* to disclose applying a sequence of stimuli to the well (“stimulate the formation”) by adjusting one or more properties of the fracturing fluid such as the volume of fluid and/or concentration of proppant (“adjusting the material being injected”) or its pumping rate (“the way it is injected”).
Id. at 42.

In response to arguments in Patent Owner’s preliminary response that the Petition fails to discuss or demonstrate how *Pankaj* discloses generation of a sequence of stimuli for application to a well environment, the Institution Decision references the sentence in the ’058 Patent stating that “stimuli may be modified over

a span of time as part of a sequence of stimuli” and determines that *Pankaj’s* disclosure of manipulating injection “teaches, or least suggests, modifying stimuli over a span of time, i.e., ‘a sequence of stimuli,’ consistent with the disclosure of the ’058 patent.” Decision, 10-11; *see also* Paper 6 (“POPR”), 51-55. The Board should reconsider its preliminary determination.

Limitation [1A] requires ***generating a sequence*** of stimuli ***for application*** to a well environment. *See* EX1001, cl. 1. The plain reading of this limitation requires that a ***sequence*** of stimuli be generated ***before it is applied*** to a well environment. EX2013, ¶66. This is consistent with the specification. In the sentence immediately following the statement noted by the Institution Decision that “stimuli may be modified over a span of time as part of a sequence of stimuli,” the ’058 Patent states:

For example, concentrations of particulates and/or chemicals can be periodically varied ***in predetermined patterns over time*** to induce various formation responses detectable via deployed sensors.

EX1001, 3:31-34; EX2013, ¶¶64-66. The patent’s statement that the concentrations of particulates or chemicals can be varied in ***predetermined*** patterns over time is consistent with the claim language requiring that the sequence of stimuli must first be generated before the sequence is applied to a well environment. *Id.*, ¶67. And also consistent with this, when describing the apparatus used to execute the method of claim 1, the specification discloses: “[s]timuli scheduler 326 may generate a stimuli sequence based on the stimuli determined by stimuli model 324. Stimuli

control 328 may execute the generate stimuli sequence by generating respective commands, based on the scheduled sequence, to provide to pump system interface 314.” EX1001, 8:16-21.

As noted above, the Petition’s discussion of limitation [1A] does not explain how *Pankaj* discloses generating a sequence of stimuli for application to a well environment, nor does *Pankaj* disclose the limitation. The Institution Decision relies on the disclosure in *Pankaj* that “[i]n particular, injection may be manipulated by adjusting the material being injected and/or the way it is injected to achieve the fractures which draws fluid from formations into the wellbore and up to the surface.” Decision, 10-11 (citing EX1005, [0061]). But a POSITA would understand that this disclosure in *Pankaj* at best relates to starting the fracturing process and making adjustments based on how the fracturing process is proceeding as opposed to generating a sequence of stimuli for subsequent application. EX2013, ¶69. It discusses manipulating by “adjusting” the material being injected and/or the way it is injected, steps that are taken during a fracturing process or while the fracturing process is being conducted. Moreover, the *Pankaj* disclosure specifically states material “being injected” and the way it “is injected” as opposed to “to be injected.” The claim language of the ’058 Patent, however, is consistent with “to be injected” (*i.e.*, “for application to a well environment”). *Id.* Petitioner’s expert agreed when asked about this sentence in his deposition. See EX2014, 62:12-64:7. There is thus

no disclosure in *Pankaj* of **generating a sequence** of stimuli **for application** to a well environment.

Despite the Petition's assertion that *Pankaj* "discloses" applying a sequence of stimuli to the well, in the very next and last sentence of the section addressing limitation [1A], the Petition states "[t]hus, a POSITA would understand that Pankaj discloses **(or renders obvious)**" the limitation. Petition, 42 (emphasis added). It is not clear from this cursory statement what portion of the limitation, if any, the Petition is contending is not disclosed but rendered obvious by *Pankaj*. Regardless, this conclusory statement cannot support an obviousness assertion. Even if it is assumed that *Pankaj* discloses stimuli for a fracturing application, the Petition provides no explanation or analysis and does not even attempt to show an "articulated reasoning with some rational underpinning to support the legal conclusion of obviousness" with respect to **generation of a sequence for application** to a well environment. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007) (quoting *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)).

For at least the foregoing reasons, the *Pankaj-Payne* combination fails to disclose or render obvious "generating a sequence of stimuli for application to a well environment" as required in limitation [1A].

2. The *Pankaj-Payne* combination does not disclose or render obvious Limitations [1C], [9C], and [16C]

a) The combination does not disclose or render obvious “selecting” a representative system model

The *Pankaj-Payne* combination does not disclose or render obvious selecting a representative system model as claimed. EX1001, cls. 1, 9, & 16. Limitation [1C] requires “selecting a representative system model based on the received formation response data and sequence of stimuli.” *Id.*, cl. 1. Claims 9 and 16 require similar limitations. *See id.*, cls. 9 & 16.

The Petition references *Pankaj*’s disclosure at step 1178 of Figure 11 of “integrating the updated mechanical earth model by integrating the fracture parameters for all of the wellbores into the updated earth model of the reservoir simulator.” Petition, 48 (citing EX1005, [0126]). The Petition then alleges “this teaches the updated mechanical earth model is selected . . . based on both the wellsite data . . . and fracture parameters/stimulating step.” Petition, 48.

First, the Petition provides no explanation or analysis as to how “integrating” parameters into an “updated earth model” teaches “selecting” the model. Dr. Nikolaou’s declaration does not help as it merely parrots what is in the Petition. EX1003, ¶ 93. Where an expert’s declaration “merely repeats, *verbatim*, the conclusory assertion for which it is offered to support” without citing “any additional supporting evidence or provid[ing] any technical reasoning to

support [their] statement[,]” then the declaration “adds little to the conclusory assertion for which it is offered to support, and is entitled to little weight.” *Xerox Corp. v. Bytemark, Inc.*, IPR2022-00624, Paper 9 at 15 (P.T.A.B. Aug. 24, 2022) (precedential) (citations omitted).

Second, there is no “selection” of a representative system model in *Pankaj*. **Selecting** a model requires **choosing** a model **out of a number or group** of models. For example, a dictionary definition of “select” is “to choose (as by fitness or excellence) from a number or group.” EX2016, 4; *see also* EX2017, 4 (select: “[t]o take as a choice from among several”); EX2013, ¶73. This is consistent with the use of the term in the ’058 Patent specification, which also distinguishes “selecting” a model from “defining” or “constructing” a model:

Response variables (e.g., responsive sensor data values) and respective stimuli (e.g., experimental data) can be used to **select, define, and/or construct a representative system model**. For example, stimuli and response combination **can be mapped to respective system models maintained in an accessible data store**. In some examples, a partial model can be generated based on stimuli and response combinations in order to **select a pre-constructed representative system model most similar to** the partial model.

EX1001, 3:44-52; EX2013, ¶73. The specification also describes a model store 304 that stores representative system models available for selection: “[t]reatment optimization system 302 includes a model retrieval process 316 for retrieving

representative systems models from model store 304.” EX1001, 7:47-61. *Pankaj*, on the other hand, does not teach any process whereby a representative system model is **selected** or chosen out of a number or group of models. EX2013, ¶73. Merely integrating parameters into a single updated earth model does not teach the required “selecting.” *Id.*

b) The combination does not disclose or render obvious selecting a representative system model “based on the received formation response data and sequence of stimuli”

The *Pankaj-Payne* combination also does not disclose or render obvious selecting a representative system model ***based on the received formation response data and sequence of stimuli***. EX1001, cls. 1, 9, & 16. For this aspect of the limitation, the Petition suggests that *Pankaj*’s “wellsite data” is the claimed received formation response data and *Pankaj*’s “fracture parameters/stimulating step” is the claimed sequence of stimuli to allege that *Pankaj*’s updated mechanical earth model is selected “based on both the wellsite data . . . and fracture parameters/stimulating step.” Petition, 48. Notwithstanding the fact that *Pankaj* does not disclose generating a sequence of stimuli as discussed above in Section V.A.1 or “selecting” any representative system model as discussed above in Section V.A.2, even the “selecting” alleged in the Petition is not based on received formation response data ***and*** sequence of stimuli.

This limitation requires the selection process to have knowledge of both the

formation response data and the sequence of stimuli in order to select the representative system model. EX2013, ¶78. Having knowledge of both the inputs to the system (*i.e.*, sequence of stimuli) and the outputs of the system (*i.e.*, formation response data) allows the method to select a representative system model that is more representative of the actual system conditions. *Id.*. But there is no teaching in *Pankaj* that even suggests the alleged selecting is based on both sets of data (*i.e.*, formation response data and sequence of stimuli). *Id.*.

When attempting to map “fracture parameters and stimulation step” to the claimed sequence of stimuli for the selecting limitation, the Petition references *Pankaj*’s statement that “the hydraulic fracture geometry and the fracture parameters, such as conductivity, pressure in fractures, temperature, may be modeled from the wellsite data collection.” EX1005, [0105]. But the “fracture parameters” referenced here are explicitly downhole conditions (*e.g.*, conductivity, pressure in fractures, temperature) and ***are not a sequence of stimuli***. EX2013, ¶79. This is particularly evident when one recalls that it is *Pankaj*’s disclosure of manipulating injection that allegedly teaches the sequence of stimuli. *Supra*, §V.A.1. Moreover, the cited portion of *Pankaj* (paragraph [0105]) does not even relate to selecting a representative system model but instead relates to using UFM simulation techniques to calculate the physical characteristic of the fractures – fracture geometry and downhole fracture parameters. EX2013, ¶79.

Thus, the *Pankaj-Payne* combination does not disclose or render obvious ***selecting*** a representative system model, let alone doing so ***based on the received formation response data and sequence of stimuli***.

3. The *Pankaj-Payne* Combination does not disclose or render obvious Limitations [1D], [9D], and [16D]

The *Pankaj-Payne* combination does not disclose or render obvious controlling an electrical fracturing pump based on the representative system model. EX1001, cls. 1, 9, & 16. The Petition relies on *Pankaj* for this limitation except for an “electrical” pump. Petition, 49. The Petition points to step 1182 of Figure 11. *Id.*, 50-51. But neither step 1182 nor its related description discloses ***controlling a fracturing pump***, let alone doing so based on a representative system model. EX2013, ¶¶ 80-88. Petitioner’s expert acknowledged this in his deposition:

Q. Dr. Nikolaou, I believe you testified earlier that step 1182 of Figure 11 of *Pankaj* related to production operations as opposed to controlling a fracturing pump, is that right?

A. That is correct, yes.

EX2014, 56:17-22; 54:16-55:22. Dr. Nikolaou confirmed his testimony when later questioned by Petitioner’s counsel:

Q. Earlier today counsel asked you whether step 1182 of Figure 11 of *Pankaj* related to the production operations as opposed to controlling a fracturing pump, is that right?

And you responded: That is correct.

Is that consistent with your declaration?

A. Yes.

* * *

Q. During step 1182, ***are there changes to how a fracturing pump is controlled?***

A. Oh, ***in step 1182, the fracturing pump is no longer at play*** because fracturing as already been completed. It has already been performed. And 1182 refers to performing production operations.

EX2014, 82:21-84:24.

The Petition references portions of paragraphs [0105], [0140], and [0141] of *Pankaj* that the method 1100 may also involve “performing fracture and/or production operations 1182” and the “method performing 1182 may involve performing fracture and/or production operations at one or more of the wellbores of the wellsite based on the integrated wellsite parameters.” Petition, 50-51. The Petition concludes that a POSITA would have recognized that a fracturing pump is controlled via “updated fracture parameters using the model.” Petition, 51. But at most these sections of *Pankaj* teach changing the *design* of the fracturing treatment, not the *control* of the pump. EX2013, ¶¶ 83-84. In other words, *Pankaj* may teach a POSITA *what* you are targeting (*i.e.*, pressure, flowrate, fluid composition, etc.) but not *how* the various components, including the pump, are controlled. There are no teachings in *Pankaj* regarding how to control the pump. *Id.* None of these portions in *Pankaj*, however, discloses ***controlling a fracturing pump***, let alone based on a representative system model. *Id.* As Petitioner’s expert confirmed, there

is no disclosure with respect to *Pankaj* step 1182 of *controlling a fracturing pump* based on a representative system model.

4. The *Pankaj-Payne* combination does not disclose or render obvious dependent claims 2-4, 6-7, 10-12, 14, or 17-19

Claims 2-4, 6-7, 10-12, 14, and 17-19 depend from one of independent claims 1, 9, and 16. As shown above, the *Pankaj-Payne* combination fails to disclose, teach, or suggest every element of independent claims 1, 9, and 16. Accordingly, dependent claims 2-4, 6-7, 10-12, 14, and 17-19 are also patentable. The *Pankaj-Payne* combination fails to disclose or render obvious claims 2, 4, 10, 12, 17, and 19 for the additional reasons set forth below.

5. The *Pankaj-Payne* combination does not disclose or render obvious Claims 2, 10, and 17

The *Pankaj-Payne* combination does not disclose or render obvious the limitations of claims 2, 10, and 17. EX2013, ¶¶ 99-104. Claim 2 recites wherein the representative system model is retrieved from a data store based on the received formation response data. EX1001, cl. 2; *see also id.*, cls. 10 & 17.

The Petition alleges that a POSITA would have understood that *Pankaj*'s updated mechanical earth model is “stored in and retrieved from memory and selected based on both the wellsite data and generated fracture parameters.” Petition, 53. To support this statement the Petition cites to a portion of *Pankaj* stating that a wellsite may include a mechanical earth model (MEM) which “may be a model that

is provided, or may be calculated from the other wellsite data.” *Id.*, 53 (citing EX1005, [0099]). But as noted above, with respect to limitation 1[C] the Petition alleges that it is the “updated mechanical earth model” that is selected based integrating fracture parameters at step 1178 of *Pankaj*. *See supra*, V.A.2. The Petition fails to explain how par. [0099] of *Pankaj* and its disclosure that an existing MEM may be “provided” relates in any way to *Pankaj*’s disclosure at step 1178 of an updated model, let alone how providing an existing MEM teaches that the updated mechanical earth model in step 1178 is retrieved from a data store based on the received formation response data. EX2013, ¶102.

The Petition also references a portion of *Pankaj* generally describing “computer facilities for receiving, storing, processing, and/or analyzing data from the operation.” Petition, 53 (citing EX1005, [0037]). But there is no support or explanation as to how this teaches retrieving a representative system model from a data store based on the receiving formation response data. EX2013, ¶103. There is also no support for the same conclusory statement in Dr. Nikolaou’s declaration. *Id.*. The Petition seems to allege that since there are computer facilities in *Pankaj*, a POSITA would understand that there is disclosure of the limitations of claim 2. But claim 2 requires more than just a computer – it requires retrieving the representative system model based on the received formation response data. EX2013, ¶104. Neither *Pankaj* nor *Payne* disclose this limitation.

6. The *Pankaj-Payne* combination does not disclose or render obvious Claims 4, 12, and 19

The *Pankaj-Payne* combination does not disclose or render obvious the limitations of Claims 4, 12, and 19. EX2013, ¶¶108-22. Claim 4 recites:

wherein selecting the representative system model further comprises:
determining one of a linear or a non-linear relationship between the
sequence of stimuli and received formation response data; and
updating the one of the linear or the non-linear relationship based on
multiple iterations of the generated sequence of stimuli.

EX1001, cl. 4; *see also id.*, cls. 12 & 19. The Petition alleges that these limitations “are disclosed” by *Pankaj*. Petition, 57.

For “determining one of a linear or a non-linear relationship between the sequence of stimuli and received formation response data,” the Petition references equations (1)–(5) discussed in paragraphs [0106]–[0110] of *Pankaj* and alleges that they represent a linear relationship between the sequence of stimuli and received formation response data. Petition, 57–58. The Petition also references *Pankaj*’s disclosure that combining equations (1)–(5) and discretizing the fracture network into small elements may lead to a nonlinear system of equations in terms of fluid pressure p in each element. *Id.*, 58 (citing EX1005, [0111]).

First, however, the Petition does not explain the basis for its allegation that equations (1)–(5) “are linear equations.” They are not linear equations. EX2013, ¶¶ 112-14. A linear equation is “an equation (= a mathematical statement) with a

result that, when it is put on a graph, forms a straight line.” *Id.*, ¶113. A linear equation would have the form:

$$a_1x_1 + a_2x_2 + \cdots a_nx_n + C = 0$$

Where

$a_1, a_2, \dots a_n, C$ are coefficients comprised of real numbers

$x_1, x_2, \dots x_n$ are variables or unknowns

Id. Equation (1) is a partial differential equation (PDE) relating flow rate *inside* the fracture to the dimensions of the fracture. *Id.*, ¶114. Equation (2) is another partial differential equation describing laminar flow *inside* the fracture. *Id.* Equation (3) is a definition of one of the terms in equation (2) and is an integral equation specifically addressing laminar flow *inside* the fracture. *Id.* Equation (4) is not a true equation, but a relationship showing that the width *inside* the fracture is a function of (can be determined using) the height of the fracture, its location and depth. *Id.* Equation (5) is an integral equation representing a volume balance of the fluid *inside* the fracture. *Id.* Each of these equations address fluid conditions inside the fracture and do not involve, as Dr. Nikolaou alleges, flowrate at the output of the pump, at the beginning or the wellsite, or at some other location potentially related to the sequence of stimuli. EX2013, ¶115.

With respect to non-linear, the Petition cites a sentence in *Pankaj* that states that “[c]ombining the equations and discretizing the fracture network into small

elements may lead to a nonlinear system of equations in terms of fluid pressure p in each element ... which may be solved by using a damped Newton-Raphson method.” Petition, 58; EX1005, [0111]. The Petition alleges this provides disclosure of a non-linear relationship between fracture parameters and modeled wellsite data but does not provide any support or explanation for this allegation other than a cite to the expert declaration which merely copies the paragraph from the Petition. EX1003, ¶111.

Second, irrespective of whether equations (1)-(5) are linear equations or whether there is the disclosure of a non-linear relationship, the Petition fails to show how *Pankaj* discloses **determining** one of a linear or a non-linear relationship between the sequence of stimuli and the received formation response data, let alone making such a determination as part of the selection of the representative system model. *Pankaj* states that the equations may be used to simulate propagation of a complex fracture network. EX1005, [0106]. But the Petition does not explain how they are used to **determine** one of a linear or non-linear relationship as required. The Petition in fact appears to ignore the “determining” requirement as it is never mentioned outside of quoting the claim language. Petition, 57-58.

Third, there is no disclosure in *Pankaj* of any relationship (whether linear or non-linear) between formation response data and the sequence of stimuli as required. EX2013, ¶118. Equations (1)-(5) do not represent any relationship (let alone a linear

one) between formation response data and the sequence of stimuli. *Id.* For its mapping for this claim, the Petition suggests “fracture parameters” are the sequence of stimuli. Petition, 57. But as discussed above with respect to limitation 1[C], the “fracture parameters” referenced in the Petition are explicitly downhole conditions (*e.g.*, conductivity, pressure in fractures, temperature) and are not the sequence of stimuli. *Supra*, §V.A.2. Moreover, instead of showing a relationship between the sequence of stimuli applied to the well and the received formation data, equations (1)-(5) show the relationship between the wellsite data (alleged by the Petition to be the formation response data) and the physical characteristics of the fractures. EX2013, ¶118. Even *Pankaj* states with respect to step 1176 utilizing equations (1)-(5) that the method involves for each wellbore “generating fracture parameters **based on wellsite data.**” EX1005, [0100]. The equations do not show a relationship between formation response data **and the sequence of stimuli.** EX2013, ¶118. In addition, as discussed above, the Petition’s mere allegation that *Pankaj*’s reference to a “nonlinear system of equations” somehow discloses a nonlinear relationship between formation response data and the sequence of stimuli is just that – a mere allegation without any explanation or support. There is no such disclosure in *Pankaj*. *Id.*.

When addressing the “updating the one of the linear or the non-linear relationship based on multiple iterations of the generated sequence” aspect of claim

4, the Petition references aspects of *Pankaj* that discuss generating integrated dynamic wellsite parameters at step 1180 of Figure 11 and performing fracture and/or production operations at one or more of the wellbores based on the integrated wellsite parameters at step 1180. Petition, 58–59 (citing EX1005, [0140]–[0141]). The Petition then summarily concludes that a POSITA “would have understood that this means the updated parameters are both (i) used for fracture and/or production operation and (ii) factored into the linear (or nonlinear) mathematical relationship mentioned above for future models.” Petition, 59. But the Petition ***makes no attempt*** to explain why or how disclosure of steps 1180 and 1182 of *Pankaj* relate in any way to equations (1)–(5) relied on for both a linear and nonlinear relationship between the sequence of stimuli and received formation response data, let alone why or how steps 1180 and 1182 disclose “updating” those alleged relationships “based on multiple iterations of the generated sequence of stimuli.” This is particularly noteworthy given that steps 1180 and 1182 occur well after the steps of Figure 11 relied on in the Petition as satisfying the generating a sequence of stimuli (relying on step 1172); receiving formation response data (relying on step 1173); and selecting a representative system model (relying on steps 1176–1177). *See id.*, 40–42 (addressing limitation [1A]), 43–45 (addressing limitation [1B]), 45–48 (addressing limitation [1C]). Notably, the declaration adds nothing, as it is almost a verbatim copy of what is in the Petition. *Compare* EX1003, ¶114, *with* Petition, 58–

59. *See also Xerox*, Paper 9 at 15.

The Petition also includes a mere parenthetical cite to Figure 4.2 of *Pankaj* and suggests this figure “show[s] loop (*‘multiple iterations’*) with matching exercise to change reservoir properties, fracture design parameters, and fluid properties.” Petition, 59. Figure 4.2 of *Pankaj*, however, depicts “[a]n example workflow for using simulations to design operations to facilitate production.” EX1005, [0070]; Both the Petition and declaration are devoid of any explanation of how such a workflow supports—or even relates to—an update of the alleged linear/non-linear relationships of equations (1)–(5) relied on in the Petition. *Compare* EX1003, ¶114, with Petition, 59. Even under the Petition’s conclusory suggestion of using updated parameters for the equations with respect to step 1182, there is no explanation of how the relationships (equations) change (they do not); at most they would just be calculated using different values for the inputs. EX2013, ¶120.

For at least the foregoing reasons, the *Pankaj-Payne* combination fails to disclose or render obvious the limitations of claims 4, 12, and 19.

B. Ground 2 Fails Because *Pankaj* and *Payne* in Further View of *Dawson* Does not Render Claims 5 and 13 Unpatentable

1. Claims 5 and 13

The *Pankaj-Payne-Dawson* combination does not disclose or render obvious the limitations of claims 5 and 13. EX2013, ¶¶ 128-33. The Petition acknowledges that *Pankaj* does not disclose that data from the one or more downhole sensors or

surface sensors is used to determine changes in flow distribution in response to a diverter drop. Petition, 64. The Petition relies on a combination with *Dawson*, which is directed to a system for determining the effectiveness of a diverter. EX1024, Abstract; EX2014, 80:14-17.

The Petition alleges that it would have been obvious to combine *Dawson* with *Pankaj* for two reasons. Petition, 66-67. The Petition first alleges that a POSITA would have been motivated to use *Dawson*'s technique to allow for a "more effective assessment of the diverter," which may be used to "improve the use of diverters." Petition, 66. The Petition states that a POSITA would have been motivated to use *Dawson*'s technique "to improve diverters in Pankaj" for the reason provided *Dawson*. Petition, 66-67. But *Pankaj* does not relate to the use of diverters and never even mentions using a diverter in its system. EX2013, ¶130. Contrary to Petitioner's position, it would not have been obvious to implement a technique to more effectively assess a diverter or to improve diverters into a system that does not even disclose the use of a diverter. *Id.*, ¶131.

The Petition's second reason for combining *Dawson* with *Pankaj* is that a POSITA would have understood that using *Dawson*'s effectiveness technique in *Pankaj*'s operation "would result in a more accurate representation of any well **with a diverter.**" Petition, 67. But again, *Pankaj* does not describe a well with a diverter. *Pankaj* does not even disclose a diverter. EX2013, ¶132. The Petition states that a

POSITA “would have recognized that, by monitoring the effectiveness of a diverter,” *Pankaj*’s model would more accurately reflect well conditions. Petition, 67. But it would not be obvious to monitor the effectiveness of a diverter in a system that does not even describe use of a diverter.

To suggest that it would be obvious to combine *Dawson* with *Pankaj* to allow for ***a more effective assessment of a diverter*** or to more accurately represent ***a well with a diverter*** even though *Pankaj* ***never describes its system as even having a diverter*** is the essence of hindsight bias the Supreme Court and Federal Circuit have cautioned against. *See, e.g., KSR Int’l*, 550 U.S. 398 at 421 (“A factfinder should be aware, of course, of the distortion caused by hindsight bias and must be cautious of arguments reliant upon *ex post* reasoning.”); *Nautilus Hyosung Inc. v. Diebold, Inc.*, IPR2016-00633, Paper 9 at 18-19 (P.T.A.B. Aug. 22, 2016) (the lack of an adequate explanation evidences that petitioner improperly “used the claimed subject matter as a roadmap to identify individual pieces of the claimed subject matter in the” cited references); *ATD Corp. v. Lydall, Inc.*, 159 F.3d 534, 546 (Fed. Cir. 1998) (“Determination of obviousness cannot be based on the hindsight combination of components selectively culled from the prior art to fit the parameters of the patented invention.”).

Accordingly, the Petition has not shown that dependent claims 5 and 13 would have been obvious.

2. Claim 6

The Petition does not allege that *Dawson* makes up for the above-described deficiencies of the *Pankaj-Payne* combination with respect to claim 1. Accordingly, the Petition has not shown that dependent claim 6 would have been obvious.

C. The Petition has not shown that any of the dependent claims challenged in Grounds 3-4 are unpatentable.

Ground 3 alleges that dependent claims 8, 15, and 20 would have been obvious over the *Pankaj-Payne-Lecerf* combination, and Ground 4 alleges that dependent claims 3, 11, and 18 would have been obvious over the *Pankaj-Payne-Klumpen* combination. Petition, 24. Dependent claims 3, 8, 11, 15, 18, and 20 depend, directly or indirectly, from one of independent claims 1, 9, and 16. The Petition does not allege that *Lecerf* or *Klumpen* make up for the above-described deficiencies of the *Pankaj-Payne* combination with respect to the independent claims. Accordingly, the Petition has not shown that dependent claims 3, 8, 11, 15, 18, and 20 would have been obvious.

VI. CONCLUSION

For the foregoing reasons, Patent Owner respectfully requests that the Board uphold the validity of the Challenged Claims.

Date: February 16, 2024

Respectfully submitted,

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CERTIFICATE OF COMPLIANCE

Pursuant to 37 C.F.R. § 42.24(d), the undersigned certifies that the foregoing Patent Owner Response, exclusive of the exempted portions provided in 37 C.F.R. § 42.24(a), contains no more than 18,659 words and therefore complies with the type-volume limitations of 37 C.F.R. § 42.24(b).

Dated: February 16, 2024

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CERTIFICATE OF SERVICE

In accordance with 37 C.F.R. § 42.6(e), the undersigned certifies that on the 16th day of February, 2024, a complete and entire copy of PATENT OWNER'S RESPONSE UNDER 37 C.F.R. § 42.220 and Exhibits 2013-2020 were served on Petitioners via electronic mail at the below addresses:

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