Federal Court  Cour fédérale

Date: 20231213

Docket: T-1488-20

Citation: 2023 FC 1684

Toronto, Ontario, December 13, 2023

PRESENT: The Honourable Mr. Justice Manson

BETWEEN:

STEELHEAD LNG (ASLNG) LTD. and STEELHEAD LNG LIMITED PARTNERSHIP

Plaintiffs

and

ARC RESOURCES LTD., ROCKIES LNG LIMITED PARTNERSHIP, ROCKIES LNG GP CORP., and BIRCHCLIFF ENERGY LTD.

Defendants

AND BETWEEN:

ARC RESOURCES LTD., ROCKIES LNG LIMITED PARTNERSHIP, ROCKIES LNG GP CORP., and BIRCHCLIFF ENERGY LTD.

Plaintiffs by Counterclaim

and

STEELHEAD LNG (ASLNG) LTD., STEELHEAD LNG LIMITED PARTNERSHIP, AZIMUTH CAPITAL MANAGEMENT IB LTD., AZIMUTH ENERGY PARTNERS IV (NR) LP, AND AZIMUTH ENERGY PARNTERS IV LP

Defendants by Counterclaim

PUBLIC JUDGMENT AND DECISION
(Confidential Judgment and Reasons issued December 13, 2023)

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I. Introduction

[1] This proceeding is a counterclaim commenced by the Defendants/Plaintiffs by Counterclaim against the Plaintiffs/Defendants by Counterclaim. The counterclaim challenges the validity of Canadian Patent No. 3,027,085 (the "085 Patent") pursuant to the *Patent Act*, RSC, 1985, c P-4 [*Patent Act*].

[2] The Court previously held on summary trial that the Defendants/Plaintiffs by Counterclaim did not infringe on the 085 Patent and accordingly dismissed the action underlying this counterclaim (*Steelhead LNG (ASLNG) Ltd v ARC Resources Ltd*, 2022 FC 998). Here, the Defendants/Plaintiffs by Counterclaim seek a declaration that the claims of the 085 Patent are invalid.

[3] For the reasons that follow, I find that:

1. Claims 24, 25, 27, 28, and 29 are valid;

2. Claims 26, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, and 55 are valid insofar as they depend on claims 24, 25, 27, 28, and 29, directly or indirectly, and are otherwise invalid;

3. Claims 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, and 84 are invalid.

II. Background

[4] The background to the previous decision, the parties' joint statement of facts, and the evidence presented in the course of trial are set out below as relevant.

A. *The Parties*

(1) The Plaintiffs/Defendants by Counterclaim (hereinafter, “Steelhead”)

[5] Steelhead LNG (ASLNG) Ltd. is a company incorporated pursuant to the laws of British Columbia (“Steelhead ASLNG”). Steelhead ASLNG is a wholly owned subsidiary of Steelhead LNG Limited Partnership (“Steelhead LP”). Steelhead LP is a partnership formed in and under the laws of Manitoba.

[6] Azimuth Capital Management IB Ltd., Azimuth Energy Partners IV (NR) LP, and Azimuth Energy Partners IV LP (collectively, “Azimuth”) were not plaintiffs in the initial action but were named as defendants in the counterclaim. Azimuth did not take part in this proceeding, except in relation to costs.

(2) The Defendants/Plaintiffs by Counterclaim (hereinafter, “Arc”)

[7] ARC Resources Ltd. is an oil and gas producer with a corporate office in Calgary, Alberta. ARC Resources Ltd. is the successor in interest to Seven Generations Energy Ltd. by way of amalgamation in early 2021.

[8] Birchcliff Energy Ltd. is an intermediate oil and gas company with a corporate office in Calgary, Alberta (“Birchcliff”). Birchcliff and ARC Resources Ltd. are limited partners of Rockies LNG Limited Partnership (“Rockies LP”). Rockies LP is a limited partnership comprised of a

group of natural gas producers in Alberta and British Columbia. Rockies LNG GP Corp. is the general partner of Rockies LP (“Rockies GP”).

B. *The Technical Background*

(1) Natural Gas and LNG

[9] Natural gas is a mixture of gaseous hydrocarbons. Methane accounts for about 90% or more of that mixture by volume. Other hydrocarbons typically found in natural gas are ethane, propane, and butane. In addition, natural gas will often contain impurities like water and carbon dioxide.

[10] Liquefied natural gas (“LNG”) is natural gas in its liquid state. The temperature at which natural gas converts between its vapour and liquid states is approximately -162°C. Natural gas in its liquid state occupies less volume (approximately 1/600th) than its corresponding gaseous state. One reason for liquefying natural gas is to make it easier to transport as cargo in a ship, which is called an LNG carrier or tanker.

(2) Commercial Liquefaction

[11] The parties agree that, by June 2018, there were several commercially available liquefaction systems and processes for liquefying natural gas. These include the single mixed refrigerant (“SMR”) process, the dual mixed refrigerant (“DMR”) process, the nitrogen (“N2”) expander process, the propane pre-cooled mixed refrigerant (“C3-MR”) process, and the Cascade

process. At a basic level, a closed-loop refrigeration cycle used to convert natural gas to LNG will include a compressor, condenser, expansion device, and evaporator. Commercially, these liquefaction systems and processes take place in LNG facilities.

[12] The development of an LNG facility will typically progress in stages or phases. The early or planning phases of an LNG facility are commonly referred to as feasibility, pre-FEED (front end engineering design), and FEED stages, which are followed by an EPC (engineering procurement and construction) phase.

[13] Electricity to support the LNG facility may be sourced from a power grid – that is, a network of power generation, transmission and distribution that commonly provides power to communities. Alternatively, it may be produced more locally, at or near the LNG facility.

(3) Floating LNG Facilities

[14] LNG facilities may be placed on land or on sea. It was known as of June 2018 that conditions nearshore (alternatively referred to as “at-shore”) are typically more benign than conditions further offshore.

[15] Floating LNG (“FLNG”) facilities are on-sea facilities that float on a water-based vessel. Floating vessels may incorporate a ballast system to (among other reasons) maintain an even keel and ensure the vessel’s stability. This was known in June 2018. It was also known then that a ballast system could be open-looped or closed-looped. An open-loop ballast system allowed ballast fluid (typically seawater) to enter a ship’s ballast tank system and be discharged to surrounding

waters. A closed-loop system could be designed to either (a) treat the ballast fluid before it is discharged to surrounding waters (a hybrid closed-loop ballast) or (b) operate without discharging ballast fluid to surrounding waters (a permanently closed-loop ballast).

C. *The 085 Patent*

(1) Description and Relevant Dates

[16] Steelhead ASLNG is named as the owner of the 085 Patent, entitled "Liquefaction Apparatus, Methods, and Systems". It relates generally to apparatus, methods, and systems respecting nearshore liquefaction of natural gas.

[17] The application for the 085 Patent was filed on December 10, 2018. The application became open to public inspection on February 8, 2019. The patent issued on November 3, 2020 and is set to expire on December 10, 2038.

[18] The patent claims priority from PCT International Patent Application No. PCT/CA2018/050662 filed on June 1, 2018. Pursuant to section 28.1 of the *Patent Act*, the claim date is June 1, 2018.

(2) The Disclosure

[19] The background section of the 085 Patent's disclosure observes that sizeable reserves of natural gas exist in shallow waters that are inaccessible to FLNG facilities designed for deep

offshore projects. This purported gap in the technology requires improvements to water-based liquefaction.

[20] The background section is followed by a summary of the claimed invention, all of which more or less follow the language and order of the patent's claims. The disclosure's subsequent section provides exemplary drawings and a more a detailed description of the claimed invention. I discuss those details and drawings as may be relevant in the analysis below.

(3) The Independent Claims

[21] The 085 Patent's claims include four independent claims (claims 1, 21, 56, and 67) and 80 dependent claims. Independent claim 1 claims "a system for liquefaction of natural gas," comprised of (1) an external source of electricity and gas, and (2) a water-based apparatus. The water-based apparatus is comprised of a hull moored to the shore, an air-cooled electrically-driven refrigeration (or AER) system, and a plurality of storage tanks.

[22] The language of the other independent claims is similar in scope to claim 1. Independent claim 21 claims the water-based apparatus essentially as described in claim 1, but where the LNG storage tanks must be on the lower deck of the hull. Independent claim 56 claims the AER method essentially as described in claim 1. Independent claim 67 claims the water-based apparatus essentially as described in claim 1, where the storage tanks are below deck and with the addition of (1) a plurality of sensors to support coordinated functions between the water-based apparatus and the external source, and (2) a means of receiving communication to control the coordinated functions.

[23] The dependent claims add a number of elements to the invention. These include pre-treatment, membrane tanks, balanced topside configurations, LNG output methods, mechanisms for coordination, deck openings, fuel gas redistribution, and further, as discussed below.

[24] The essential elements of each claim are discussed in detail in the following analysis.

III. Issues

[25] Arc seeks a declaration that the claims of the 085 Patent are invalid. The parties jointly summarized the issues to be decided as follows:

1. Construction of claims 1-84 of the 085 Patent; and
2. Whether the claims of the 085 Patent are invalid by reason of:
    a. **Anticipation** –
        1. Do Talib 2014 and/or Talib May 2013 anticipate the subject matter of claims 1-3, 5, 10, 13-16, 18-23, 26, 36-38, 41, 42, 56-59, 64-67, 70 and 82-84 of the 085 Patent?
        2. Do Sullivan 2017 and/or Sullivan 2016 anticipate the subject matter of claims 1-3, 5, 7, 8, 10, 13, 14, 21, 23, 26, 36-39, 41, 42, 56, 58, 59, 64 and 65 of the 085 Patent?
    a. **Obviousness** – Would the subject matter defined by the claims have been obvious on the claim date to a person skilled in the art?
    b. **Insufficiency** – Does the 085 Patent satisfy the requirements of subsection 27(3) of the *Patent Act*?

c. **Ambiguity** – Does the 085 Patent satisfy the requirements of subsection 27(4) of the *Patent Act*?

d. **Overbreadth** – Are the claims of the 085 Patent broader than either the invention made by the named inventors of the 085 Patent or the invention disclosed in the specification of the 085 Patent?

e. **Lack of Sound Prediction/No Demonstrated Utility** – Had the inventors demonstrated or soundly predicted a utility related to the subject matter of the claims of the 085 Patent by the Canadian filing date?

[26] In the course of trial, Arc abandoned the ground of ambiguity. They also abandoned anticipation with respect to claims 10 and 23. Consequently, they abandoned anticipation with respect to claims that depend on claims 10 and 23, to the extent of the dependency. Finally, they restricted the lack of utility challenge to claim 29.

IV. The Parties' Evidence

A. *Arc's Expert Witness*

[27] Michael Wyllie is a professional engineer in the United Kingdom ("UK"). He received a Bachelor of Science degree in Chemical and Process Engineering from Heriot-Watt University in Edinburgh, UK in 1980.

[28] Mr. Wyllie has practiced engineering in the oil and gas industry for over 40 years. In the course of his career, he worked at Foster Wheeler Energy Ltd, Total Marine Oil Ltd (now Total

Energies), Shell UK Exploration and Production, Altra Consultants (which he co-founded), and SBM Offshore NV. In those organizations, he assumed various roles, including process engineer, chief engineer, project director, and chief technology officer.

[29] Mr. Wyllie's career involved working on FLNG facilities, floating platforms, and mooring systems. He worked extensively on floating production storage and offloading ("FPSO") units, a floating vessel that receives hydrocarbons, processes them into liquid form, and stores them for offloading.

[30] Mr. Wyllie is presently the Managing Director and Principal Consultant with OpenWater Energy Ltd, a company he founded in 2019. He is also a Fellow of the UK Institution of Chemical Engineers.

[31] I accepted Mr. Wyllie's expert qualification as follows:

> Mr. Michael Wyllie is a professional engineer with energy industry related expertise. His expertise includes the design, manufacture and operation of facilities, systems and equipment used in the production, storage and transportation of hydrocarbons, including those that operate in a water-based environment such as FLNGs, FPSOs, FSRUs, FSUs and LNG carriers, and their related systems and equipment. His expertise also includes the steps undertaken in the energy industry to develop a project from its early to final stages.

[32] Mr. Wyllie was asked to provide his opinion on the following issues: (1) who is the skilled person of the 085 Patent?; (2) what is the common general knowledge of that skilled person?; (3) what is the proper construction of the 085 Patent's claims?; (4) is the 085 Patent's subject matter novel?; (5) is the 085 Patent's subject matter obvious?; (6) is the 085 Patent's disclosure

sufficient?; (7) are the 085 Patent's claims broader than what it discloses?; and (8) does the 085 Patent's subject matter lack utility? Mr. Wyllie provided his opinion in his expert report, dated May 26, 2023.

[33] I found Mr. Wyllie to be a knowledgeable and credible expert witness. He was consistent in his evidence throughout his oral testimony, including cross-examination. I discuss his evidence as may be relevant in the analysis below.

B. *Steelhead's Expert Witness*

[34] Willem Ravesloot is a project executive consultant in the Netherlands. He received a Master of Science degree in Mechanical Engineering from the Delft University of Technology in the Netherlands in 1989.

[35] Mr. Ravesloot spent most of his career with Shell plc, including its subsidiaries and joint ventures. His roles included acting as project engineer, lead engineering manager, business group manager, and project director.

[36] Mr. Ravesloot's career focus has been LNG facilities generally, but not FLNG facilities in particular. His main responsibilities pertained to the design, construction, operation, and maintenance of LNG facilities in various locations around the world, including Canada.

[37] Mr. Ravesloot is currently a project executive consultant with Gawwer BV, a consulting company that he founded and owns. He also acts as the managing partner at MACH10 Energy BV,

a consulting firm that caters to oil and gas operators. Finally, Mr. Ravesloot consults with Partners in Performance, where he provides assessments of LNG projects as a subject matter expert.

[38] I accepted Mr. Ravesloot's expert qualification as follows:

> Mr. Willem (Wim) Ravesloot is an engineer with expertise in mechanical engineering and related engineering disciplines in the field of oil & gas and liquefied natural gas. In particular, Mr. Ravesloot has expertise in the design, development, and operation of land-based and floating liquefied natural gas facilities, including in the design, selection, implementation, and operation of liquefaction processes as well as process equipment used for liquefaction of natural gas such as compressors and compressor drivers, cooling systems, control systems, safety systems, and storage facilities. Additionally, Mr. Ravesloot is a project executive with particular expertise in project engineering, engineering project management, and project development in the oil & gas and liquefied natural gas industry.

[39] Mr. Ravesloot was asked to provide his opinion on the same issues as Arc's expert, with some variation. First, with respect to novelty and anticipation, Mr. Ravesloot's mandate was restricted to the publications cited by Arc's expert. Second, with respect to overbreadth and utility, Mr. Ravesloot's mandate was limited to claim 29.

[40] Mr. Ravesloot is a knowledgeable and qualified expert witness in his field. That said, he applied incorrect legal standards in his analysis on various issues, as discussed further below. That misapprehension of certain legal principles that he needed to apply in his report reduces the weight to be given to his testimony in these proceedings.

[41] Moreover, Mr. Ravesloot's testimony was sometimes inconsistent, not only with prior statements he made in the course of the infringement action that underlies this counterclaim, but also with his own evidence in this proceeding. At times, he tended to be evasive during cross-examination.

[42] I discuss Mr. Ravesloot's evidence and any problems therewith, as may be relevant, below.

C. *Fact Witnesses*

(1) For Arc

(a) *Andrew Loose*

[43] Andrew Loose is an engineer with extensive experience working on LNG and FLNG projects. Between 2006 and 2021, he was an employee of KBR. KBR is an international company that provides consultancy, engineering, and construction services to clients in the energy sector.

[44] Between 2016 and 2018, Mr. Loose and others in KBR wanted to secure an engineering contract from Steelhead in relation to an FLNG project. They met with Victor Ojeda and Alex Brigden of Steelhead on March 23, 2016, for that purpose. In their meeting, Mr. Loose and his colleagues provided Steelhead with a presentation. The presentation included a discussion of the Triton FLNG project, which KBR helped design between 2011 and 2014.

[45] [redacted]

1. [redacted]
2. [redacted]
3. [redacted]

[46] Because Triton LNG was not relied upon as prior art, the relevance of Mr. Loose's evidence in that regard is limited to the background to the invention story.

[47] Mr. Loose also testified that he attended an FLNG conference in June 2014. There, he attended a public presentation by Thomas Larsen, Vice President Technical at Höegh LNG (the "Larsen presentation"). The Larsen presentation discussed nearshore FLNG facilities. It also contained a slide discussing various options for an FLNG facility design, including among them air-cooling, electrical drives, power from shore, storage in the FLNG facility, and various mooring methods.

[48] Mr. Loose testified that there was no expectation for confidentiality communicated during the Larsen presentation. However, on cross examination, he admitted that the slides stated that its content cannot be reproduced, distributed, or divulged without Höegh LNG's written consent.

[49] I found Mr. Loose to be a credible witness.

(b) *Paul Sullivan*

[50] Paul Sullivan has over 30 years of experience in engineering and construction in the LNG industry. In 2017 and 2018, he was Vice President, Projects at Steelhead and then Project Advisor

to its CEO. All of the 085 Patent's inventors reported to Mr. Sullivan in his capacity as Vice President, directly or indirectly.

[51] Prior to his time with Steelhead, Mr. Sullivan was with WorleyParsons (now known as Worley). However, he was still involved with Steelhead, as Steelhead had retained WorleyParsons as a contractor on some of its FLNG projects.

[52] Mr. Sullivan testified that he attended an event organized by the Society of Petroleum Engineers in Houston, Texas in July 2016, where he presented on the topic of nearshore FLNG to between 50 and 70 individuals, most of whom were engineers ("Sullivan 2016"). Mr. Sullivan also testified that he presented on the topic of nearshore FLNG facilities at the FLNG World Congress on June 21, 2017 ("Sullivan 2017", and collectively with Sullivan 2016, the "Sullivan presentations").

[53] The Sullivan presentations are two of four documents that Arc relies on to argue anticipation and obviousness. The other two are papers written in part by Javid Talib of Black & Veatch in 2014 ("Talib 2014") and 2013 ("Talib 2013", and collectively with Talib 2014, the "Talib papers").

[54] I found Mr. Sullivan to be a credible witness.

(2) For Steelhead

(a) *Alex Brigden*

[55] Alex Brigden is a professional engineer in the UK with extensive experience on offshore projects. He joined Steelhead between April 2015 and January 2019 where he worked on Steelhead's Malahat LNG project and Sarita Bay (later Kwispaa) LNG project. Both projects were planned for areas close to the British Columbia coastline.

[56] Mr. Brigden is a named inventor of the 085 Patent and was very involved in developing its claimed "at-shore LNG concept". He acted as Vice President, Technical at Steelhead between 2017 and 2019. All other co-inventors were members of his technical team, and they all reported to him. His evidence in chief pertained primarily to the invention story behind the 085 Patent.

[57] According to Mr. Brigden, he and his team were not aware of anyone "having put forward" an FLNG facility composed of LNG storage units, electrically driven compressors, air cooled refrigeration, and an external electric power source. Instead, they arrived at this concept through their project development process. This process involved (1) concept identification, (2) concept evaluation, and (3) concept selection. The project development process yielded a number of documents summarizing Steelhead's final design selections and the reasoning behind them. Mr. Brigden said that Steelhead spent millions of dollars and a number of years to arrive at the final concept.

[58] On cross-examination, Mr. Brigden recalled that he met with representatives of KBR in March 2016, consistent with Mr. Loose's testimony above, but did not recall who gave a presentation. He also admitted that:

1. He carried on work with respect to an FLNG facility before joining Steelhead;

2. Respecting electric compressors – (i) he knew prior to joining Steelhead of other LNG projects where electric compressors were used; (ii) he himself led an LNG project prior to joining Steelhead that contemplated using electric compressors on a separate on-land LNG project; (iii) he knew that electric drivers and gas turbines were the two options available for compressors; (iv) there is a limit to the reductions in greenhouse gas ("GHG") emissions when using gas turbine compressors; (v) electric compressors would significantly reduce GHG emissions and ensure regulatory compliance; and (vi) "political support" would be "lost" in British Columbia if GHG emissions from Steelhead's facility were not in the bottom quartile of global LNG plants;

3. Respecting air-coolers – (i) he knew that air coolers had less of a negative environmental impact than water coolers; (ii) he knew that air coolers were used in prior projects; and (iii) he knew that First Nations in the relevant project areas would voice opposition to the use of water coolers because of the effect on the marine environment;

4. Respecting LNG storage – (i) he knew prior to joining Steelhead that a barge could feasibly support a processing facility and include integrated storage tanks; and (ii) he knew sloshing would not be a problem nearshore; and

5. Respecting sensors – he knew that sensors were used to monitor spills for "a long time" before June 2018.

[59] Mr. Brigden also stated on cross-examination that the following features of the at-shore LNG concept were, in his view, “essential”, “required”, “important”, or otherwise “part of” the concept he helped design:

1. setting the air coolers in a layout that uses space efficiently while maintaining safety;

2. placing some elements of the facility strictly on-shore, while keeping others on the floating vessel;

3. modifying the membrane storage tanks’ chamfers to lower the center of gravity and improve stability;

4. using transverse beams to support the deck of the facility;

5. pre-treatment of feed gas at a separate location to limit impurities to within a narrow range;

6. using flexible, durable, and insulated electrical lines for the transit bridge;

7. using a voltage of 138kV to balance the number of electric cables connected to the FLNG facility; and

8. a cryogenic spill protection system that routed spills away from the hull and other facility elements.

[60] Mr. Brigden at times conceded on cross-examination only after counsel for Arc showed him prior statements he made that were inconsistent with his evidence at trial. Given the inconsistent statements and admissions he made on cross-examination, I give his evidence limited weight, and I discuss it as may be relevant in my analysis below.

(b) *Victor Ojeda*

[61] Victor Ojeda was the President of Steelhead between 2013 and 2019. He oversaw the direction of the business during his tenure. He also acted as interim Vice President, Technical for several months in 2016.

[62] The only relevant portion of Mr. Ojeda's evidence in chief pertains to Steelhead's dealings with KBR in 2016. Mr. Ojeda stated that when he met with Mr. Loose and other members of the KBR team, Steelhead's work on the at-shore LNG concept was already underway and its key concepts were already decided. He also testified that Steelhead entered into a mutual non-disclosure agreement with KBR. Mr. Ojeda specifically denied that the at-shore LNG concept was based on KBR's work.

[63] Mr. Ojeda remained consistent on cross-examination. I find him to be a credible witness. I discuss his evidence as may be relevant in my analysis below.

V. Analysis

A. *Claim Construction*

(1) General Principles

[64] The Supreme Court of Canada has outlined the principles of claim construction in three decisions: *Whirlpool Corp v Camco Inc*, 2000 SCC 67 [*Whirlpool*] at paragraphs 49 to 55; *Free World Trust v Électro Santé Inc*, 2000 SCC 66 [*Free World Trust*] at paragraphs 44 to 54; and *Consolboard Inc v MacMillan Bloedel (Saskatchewan) Ltd*, 1981 CanLII 15 (SCC), [1981] 1 SCR 504 (SCC) at paragraph 27. The Federal Court of Appeal summarized those principles in *Tearlab Corporation v I-MED Pharma Inc*, 2019 FCA 179 [*Tearlab*] at paragraphs 31 to 34, as follows:

> [31] The *Patent Act* promotes adherence to the language of the claims, which in turn promotes fairness and predictability (*Free World Trust* at paras. 31(a), (b) and 41). The words of the claims must, however, be read in an informed and purposive way (at para. 31(c)), with a mind willing to understand (at para. 44). On a purposive construction, it will be apparent that some elements of the claimed invention are essential while others are non-essential (at para. 31(e)). The interpretative task of the court, in claim construction, is to separate and distinguish between the essential and the non-essential elements, and to give the legal protection to which the holder of a valid patent is entitled only to the essential elements (at para. 15).
>
> [32] To identify these elements, the claim language must be read through the eyes of a [person of skill in the art], in light of the latter's common general knowledge (*Free World Trust* at paras. 44-45; see also *Frac Shack* at para. 60; *Whirlpool* at para. 53). As noted in *Free World Trust*:
>
> > [51] …The words chosen by the inventor will be read in the sense the inventor is presumed to have intended, and in a way that is sympathetic to accomplishment of the inventor's purpose expressed or implicit in the text of the claims. However, if the inventor has misspoken or otherwise created an unnecessary or troublesome limitation in the claims, it is a self-inflicted wound. The public is entitled to rely on the words used *provided* the words used are interpreted fairly and knowledgeably. [Emphasis in the original.]

> [33] Claim construction requires that the disclosure and the claims be looked at as a whole "to ascertain the nature of the invention and methods of its performance, … being neither benevolent nor harsh, but rather seeking a construction which is reasonable and fair to both patentee and public" (*Consolboard* at p. 520; see also *Teva Canada Ltd. v. Pfizer Canada Inc.*, 2012 SCC 60, [2012] 3 S.C.R. 625 at para. 50). Consideration can thus be given to the patent specifications to understand what was meant by the words in the claims. One must be wary, however, not to use these so as "to enlarge or contract the scope of the claim as written and … understood" (*Whirlpool* at para. 52; see also *Free World Trust* at para. 32). The Supreme Court recently emphasized that the focus of the validity analysis will be on the claims; specifications will be relevant where there is ambiguity in the claims (*AstraZeneca Canada Inc. v. Apotex Inc.*, 2017 SCC 36, [2017] 1 S.C.R. 943 at para. 31; see also *Ciba* at paras. 74-75).
>
> [34] Finally, it is important to stress that claim construction must be the same for the purpose of validity and for the purpose of infringement (*Whirlpool* at para. 49(b)).

[65] In short, the Court must interpret claims purposively and with a mind willing to understand, taking into account the whole of the specification where there is ambiguity, but ultimately adhering to the language of the claims. The Court's task is to identify the essential elements of the claimed invention. The Court must do all this from the perspective of a person of skill in the art at the publication date, taking into account the common general knowledge as it was then.

(2) Person of Skill in the Art

[66] In *Free World Trust*, at paragraph 44, the Supreme Court of Canada, quoting Harold G. Fox, *The Canadian Law and Practice Relating to Letters Patent for Inventions*, 4th ed. (Toronto: Carswell, 1969) at 184, described a "person skilled in the art" as follows:

> [A] hypothetical person possessing the ordinary skill and knowledge of the particular art to which the invention relates, and a mind willing to understand a specification that is addressed to him. This hypothetical person has sometimes been equated with the "reasonable man" used as a standard in negligence cases. He is assumed to be a man who is going to try to achieve success and not one who is looking for difficulties or seeking failure.

[67] And in *Whirlpool*, at paragraph 53, the Court held that:

> [T]he patent specification is not addressed to grammarians, etymologists or to the public generally, but to skilled individuals sufficiently versed in the art to which the patent relates to enable them on a technical level to appreciate the nature and description of the invention: H. G. Fox, *The Canadian Law and Practice Relating to Letters Patent for Inventions* (4th ed. 1969), at p. 185. The court, writes Dr. Fox, at p. 203, must place itself
>
> > in the position of some person acquainted with the surrounding circumstances as to the state of the art and the manufacture at the time, and making itself acquainted with the technical meaning in that art or manufacture that any particular word or words may have.

[68] Therefore, in taking the place of a person skilled in the art, the Court must assume a mind willing to understand the claims before it – one that is equipped with the set of skills, knowledge, and technical acumen ordinarily known within that particular art at the relevant time.

(3) Common General Knowledge

[69] Common general knowledge refers to what would generally have been known to the person of skill in the art at the date of publication (*Apotex Inc v Sanofi-Synthelabo Canada Inc*, 2008 SCC 61 [*Sanofi*] at para 37).

[70] Common general knowledge does not include all information in the public domain. The mere fact that some information is published in an individual patent, a scientific publication, or any other document will not suffice on its own to establish that that information is within the common general knowledge of a person skilled in the art. Instead, that information must be ordinarily known within the art or industry (*Gemak Trust v Jempak Corporation*, 2022 FCA 141 at paras 95-96).

(4) Application

(a) *Person of Skill in the Art*

[71] Arc's expert is of the view that the 085 Patent addresses two categories of subject matter. The first category is floating production facilities. The second is the production of LNG. He states that the skilled person is in fact a "skilled team".

[72] With respect to the first category (floating production facilities), Arc's expert describes the person of skill in that field as someone with an engineering degree in a relevant discipline – namely mechanical, structural, naval, or chemical and process engineering. For some of the claims, the relevant disciplines may also include electrical or instrumentation engineering. The skilled person also has at least five years of multidisciplinary experience with floating production facilities, which may be focused on FLNG facilities, but may also include experience with other floating facilities.

[73] In relation to the second category (the production of LNG), Arc's expert describes the skilled person as someone with a chemical and process engineering degree and a minimum of five

years experience with LNG production. This person understands the types of processes used in LNG production like the SMR and DMR liquefaction systems, as well as those used in pre-treating the natural gas feed.

[74] Steelhead's expert believes that the skilled person is someone with an engineering background. He singles out mechanical engineering as the skilled person's sub-discipline. However, he acknowledges that the skilled person may alternatively have a degree in industrial, chemical, or electrical engineering. Ultimately, he concludes that the skilled person addressed by the 085 Patent is one with a bachelor's degree in a relevant engineering field and two to four years experience – or, in lieu of that experience, a master's degree in LNG facility design and only one to two years of hands-on training.

[75] I find that the 085 Patent is directed towards a skilled person (or persons) with a background in both mechanical and naval engineering and at least four years of experience with LNG and floating production facilities, such as FLNG or FPSO facilities.

(b) *Common General Knowledge*

[76] Both expert witnesses agree that the common general knowledge of the skilled person is the same for all relevant dates. They also generally agree that the following topics are part of the skilled person's common general knowledge:

1. Natural gas and its various chemical components;

2. Liquid natural gas, its chemical properties, and its commercial advantage;

3. The production of natural gas and its treatment to remove impurities and/or heavy hydrocarbons;

4. The refrigeration cycle and its main stages;

5. Common liquefaction processes associated with natural gas;

6. Compressors, their various types, and their role in refrigeration and liquefaction;

7. The engineering stages involved in LNG facility development;

8. Floating facilities used in LNG production, particularly FLNG facilities;

9. The various classes of LNG storage tanks, including membrane tanks;

10. The use of ballast systems and mooring methods to stabilize and fix the location of an FLNG facility; and

11. FLNG facilities that were constructed by June 2018, including Shell's *Prelude* facility.

[77] The two experts disagree in their reports on some topics, and Arc's expert's overview of the skilled person's common general knowledge included more topics in contrast to Steelhead's

expert's report. Upon review of their reports, I find that the following matters are also part of the skilled person's common general knowledge, notwithstanding any disagreement or omission by either expert:

1. Modular design – it was known that a facility's constituent units may be constructed separately at different locations and then put together during final assembly;

2. Sensors, automation, and containment – it was known that LNG facilities, including FLNG facilities, use sensors and control systems to monitor the facility, automate operations, ensure safety, and contain hazards and spills;

3. Nearshore FLNG facilities – the skilled person would have been aware of the concept of an FLNG facility operating nearshore and the potential benefits associated with such a concept;

4. Marine systems – the skilled person would have been aware of the main components of a marine vessel; and

5. Offloading – the skilled person would have been aware of offloading systems used on an FLNG facility, particularly offloading "arms" or hoses.

(c) *Construing the Claims*

[78] The relevant date for the purposes of claim construction is the date of publication: February 8, 2019.

[79] Both experts state that the elements of each claim are all essential to that claim. I agree.

[80] The experts also generally agree on the proper construction of the claims, except with respect to two phrases: (1) “water-based apparatus”, and (2) “void space… capable of containing”. I adopt the construction agreed upon by the experts and apply it as necessary. As for the areas of disagreement, I resolve them as follows.

(i) The meaning of “water-based apparatus”

[81] Arc’s expert adopts a broad interpretation of the term “water-based apparatus”. Specifically, he interprets it to include not only a barge, a ship, and a floating platform, but also a gravity-based platform – meaning a vessel that is floated to position and then grounded on the seabed. Steelhead’s expert takes a narrower view. To him, the term refers to a facility that is continuously floating on the water. He therefore excludes gravity-based platforms from the definition.

[82] I agree with Steelhead’s expert that the term “water-based apparatus” excludes gravity-based platforms. The disclosure of the 085 Patent and the independent claims state that the “water-based apparatus” would be “moored” to a location on-shore. This would be understood by the skilled person to be a method of keeping a floating vessel in place – one that is not used on gravity-based platforms.

(ii) The meaning of "void space… capable of containing"

[83] Claim 29 speaks of a "void space… capable of containing" fluid with a weight similar to the AER System. Arc's expert interprets this to mean that the void space must always be able to contain that fluid, including when the AER System is installed on the vessel. In contrast, Steelhead's expert understands the term to mean that the void space would only be used during manufacturing.

[84] I accept that there is ambiguity here, one that arises from the use of the word "capable". Essentially, Arc's expert's view is that "capable" here means "able at all times", while Steelhead's expert's opinion is that it means "able when needed". Steelhead's expert resolves this ambiguity by citing page 16 the 085 Patent's disclosure, which states at lines 11 to 21 that the void space would be filled "during manufacturing" of the vessel to "simulat[e]" the weight of the AER System and, second, that the fluid would be incrementally "releas[ed]" as the AER System is loaded on the vessel.

[85] Arc argues that it is not necessary to review the patent's disclosure if claim 29 is read along with the claims that it depends on. Once claim 29 is so read, there will be no ambiguity, since it will be evident that the void space must be capable of carrying the fluid after the AER System is installed.

[86] I have reviewed claim 29 along with the claims that it depends on. I have also reviewed the portions of the disclosure that Steelhead's expert cites. I find that the correct view is that expressed

by Steelhead's expert, that the void space is meant to be filled with fluid during manufacturing and not after the AER System is installed.

B. *Anticipation*

[87] An invention is anticipated if (1) there is citable prior art that discloses the essential elements and special advantages of the invention, and (2) that disclosure enables a person skilled in the art to perform the invention without undue burden (*Sanofi* at paras 24-27).

[88] The cut-off date for citable prior art is prescribed in section 28.2(1) of the *Patent Act*. Relevant here are the following two cut-off dates: (1) one year prior to the filing date, if the prior art was disclosed by the patentee or by a person who acquired the information from the patentee, and (2) the claim date, if the prior art was disclosed by any other person.

[89] The application for the 085 Patent was filed on December 10, 2018. The patent claims priority as of June 1, 2018. The cut-off date for citable prior art made by Steelhead is December 10, 2017. For all other prior art, the cut-off date is June 1, 2018. The pieces of prior art relied on here (i.e. the Sullivan presentations and the Talib papers) all precede the earliest of those dates and are therefore citable.

[90] Where the Court is satisfied that any individual piece of citable prior art discloses the elements of the invention, the Court must also be satisfied that this disclosure would enable a person skilled in the art to perform the invention. The skilled person is assumed to be willing to

engage in some trial and error, but without undue burden. What constitutes undue burden will differ from one case to the next (*Sanofi* at para 37).

[91] The Court must apply the test for anticipation to each individual piece of prior art that is alleged to anticipate the invention, separate from any others. Anticipation cannot be established by assembling together components from various publications (*Western Oilfield Equipment Rentals Ltd v M-I LLC*, 2021 FCA 24 at para 85, citing *Free World Trust* at para 26).

(1) Optionality and Anticipation

[92] Steelhead argues that the disclosure of options in an individual publication would not disclose their various configurations. Consequently, no prior art can be anticipatory here by simply disclosing a set of options that include within their possible configurations the subject matter of the 085 Patent. The prior art must disclose that particular configuration to anticipate it. In essence, Steelhead's argument is that optionality precludes anticipation. I disagree.

[93] Steelhead rests much of its argument on the following passage from *Beloit Canada Ltée/Ltd v Valmet Oy*, [1986] FCJ No 87, 8 CPR (3d) 289 at 297 (FCA) [*Beloit*]:

> One must, in effect, be able to look at a prior, single publication and find in it all the information which, for practical purposes, is needed to produce the claimed invention without the exercise of any inventive skill. The prior publication must contain so clear a direction that a skilled person reading and following it would in every case and without possibility of error be led to the claimed invention. Where, as here, the invention consists of a combination of several known elements, any publication which does not teach the combination of all the elements claimed cannot possibly be anticipatory.

[94] The Court's comments in *Beloit*, taken in their proper context, discuss a combination of elements melded together from distinct pieces of prior art, not an individual one. In fact, the paragraphs that follow the above passage make this clear:

> It is difficult to discern with precision the trial judge's findings on anticipation. At one point, he identifies four of the publications which had been pleaded as anticipatory and states:
>
> > "With respect to anticipation one cannot rely, as already stated, on a combination of elements found in several prior art publications, but must rely either on Black Clawsen (sic), Heys, Millspaugh, or Goodwillie." (Case, p. 2141)
>
> Later, in his Summary of Conclusions, he says:
>
> > "5.On the issue of obviousness and anticipation (prior art) I find that neither patent should have been registered in Canada the invention being obvious. It is also likely that there was sufficient prior art disclosed in prior patents or publications as to give directions to inventors in question and all men skilled in the art, to enable them to make the two inventions." (Case, p. 2150)
>
> I find this latter passage extremely difficult. Since it is all that he says about anticipation in his summary, I have to assume that the first sentence relates to obviousness and the second, to anticipation. If so, the second sentence is clearly erroneous, for it not only allows the compounding of "prior patents or publications" but also sets as a test the making of the invention rather than the production of the results disclosed by the invention.
>
> [Emphasis added]

[95] Steelhead also relies on the principle that there is "no room for experimentation or trial and error at the disclosure stage". Steelhead cites *Sanofi*, at paragraph 32, to argue this point. However, a close reading of that decision shows that it is distinguishable from the case at hand. *Sanofi* was concerned with experimentation that results in the discovery of a *new use or benefit*. In fact, the very paragraph that Steelhead cites demonstrates this distinction:

> [32] In the context of disclosure as explained in *Synthon*, "the absence of the discovery of the special advantages" to which Lord Wilberforce was referring in *Witsiepe's* means that the genus patent does not disclose the special advantages of the invention covered by the selection patent. Where there is no such disclosure, there is no discovery of the special advantages of the selection patent as compared to the genus patent, and the disclosure requirement to prove anticipation fails. At this stage, the person skilled in the art is reading the prior patent to understand whether it discloses the special advantages of the second invention. No trial and error is permitted. If in reading the genus patent the special advantages of the invention of the selection patent are not disclosed, the genus patent does not anticipate the selection patent.
>
> [Emphasis added]

[96] Phrased more broadly, the patentee must discover a new use or enhanced benefit from the selected invention when compared to the wider genus of known inventions. It is therefore incorrect to say, as Steelhead suggests, that a skilled person offers something novel by simply selecting one combination from a number of options disclosed by a piece of prior art. Something more is needed for novelty. That combination would have to offer a benefit or use that was not yet known or disclosed.

[97] It is clear that Steelhead's expert did not make this distinction. Instead, he applied the wrong legal standard for anticipation in his analysis, assuming that the disclosure of options cannot disclose specific configurations. In paragraph 352 of his report, for example, Steelhead's expert states that:

> 352. A skilled person would recognize that these [the options in Talib 2014] are options for various different components of LNG facilities. The skilled person would not consider the disclosure of different options for the key components of a facility to be the disclosure of a particular facility design. The Talib papers describe only two specific barge-based configurations which the papers say

> have been “advanced through the front-end engineering and design (FEED) stage.”
>
> [Emphasis added]

[98] In fact, as Arc points out, Canadian case law is now clear that a piece of prior art need not disclose the “exact invention” that is claimed. Disclosure merely requires that the skilled person is able to discern the elements of the claimed invention from the piece of prior art (*Sanofi* at paras 23-26). Selecting one combination from a variety of known options is not novel unless that combination offers a unique benefit that was previously unknown. Put another way, if a person carrying out the prior disclosure in a piece of prior art would infringe a claim, then the test for anticipation would be met (*Schering-Plough Canada Inc v. Pharmascience Inc*, 2009 FC 1128 at para 87).

[99] Notably, Steelhead’s expert acknowledged during cross-examination that Table 1 of Talib 2014 (which is identical to Figure 7 of Talib 2013) discloses a flexible set of options precisely because of the diversity of uses and benefits they offer. In other words, the configurations disclosed allow a skilled person to accommodate a given project’s specifications:

> Q. Well, what it [Talib 2014] says is, and I don't think we're that far apart, that the owner selects the best options depending upon its specific application.
>
> A. Yes.
>
> Q. Good. Let's focus on those words, "select the best options for its specific application." This recognizes that it's the owner's selection and it's driven by what its end goals are given the specifications. Fair?
>
> A. Fair.

> Q. And specific application contemplates that decisions will be driven, for example, by things like proximity to land, need to protect the seawater, things like that?
>
> A. There are a lot of considerations that go into selecting the ultimate configuration.
>
> Q. The decision is made by the owner. That's what it says on this page?
>
> A. That's correct.
>
> […]
>
> Q. Let's go to page 45. Top of page 45, left column in green we see Table 1. Do you see that?
>
> A. Yes. I see that.
>
> Q. And it, again, speaks about available options. Do you see that?
>
> A. Yes.
>
> Q. And available options would mean the same thing here as what was meant earlier, meaning they're available to the owner to choose from?
>
> A. Yes.

[100] Steelhead's expert also admitted on cross-examination that, if the correct articulation of law is that the disclosure of options discloses their various configurations, then Sullivan 2017 discloses the elements of the 085 Patent's independent claims:

> Q. […] So I want you to assume that, under Canadian law, the presentation of four options is the disclosure of each option. If you assume that, then you would agree with me that all of the essential elements of 1, 21, 56 and 67 have been disclosed in Sullivan, if you accept my proposition?
>
> A. My understanding was that if the invention is disclosed in its entirety with all the components shown, it means it has been disclosed. If not all the components are disclosed, then not.

> Q. And I'm asking you to assume that the disclosure of the four compressor drivers, each one has individually been disclosed. So I'm asking you to assume that when there was disclosure on Slide 11 of four drivers, that includes a disclosure of the electric drivers. I'm asking you to assume that. And my friends and I will argue about the law on Friday.
>
> But if you assume that, then you would agree with me that Sullivan 2017 discloses all of the elements of the claimed invention in independent claims 1, 21, 56 and 67?
>
> A. I think I -- in my report and even this morning, I explicitly stated what has been disclosed and what has not been disclosed. If you say that what has not been disclosed as part of an option table, and assuming that an option table means disclosure --
>
> Q. Yes.
>
> A. -- then those elements have been shown.
>
> [Emphasis added]

[101] Steelhead says that the configuration claimed by the 085 Patent is a novel invention. Based on the above, the patent must disclose a new use or enhanced benefit to the combination that was not previously known. I am unable to discern any such new use or enhanced benefit from the evidence before the Court. In fact, the background section to the 085 Patent describes the intended use and purported benefit of the claimed invention as access to natural gas in shallow waters for commercial purposes. Each of Sullivan 2017, Sullivan 2016, Talib 2014, and Talib 2013 contemplates such use and benefit.

[102] Therefore, the only way for any of the claims of the 085 Patent to be novel is if they include elements in their configuration that were not part of the options or configurations disclosed by any given piece of prior art.

(2) Implementation and Feasibility

[103] Separately, Steelhead's expert also assumes that a prior art cannot be anticipatory in the absence of a proof of concept (i.e. a project in an advance stage of design or construction). For example, in paragraph 353 of his report, he explains that:

> 353. Although Talib states that they [the papers' subject matter] were advanced to FEED, the skilled person would not consider these two papers to be disclosing a design at the level of detail and maturity that would be found in a design that has gone to FEED. As I noted above at paragraphs 146 to 147, FEED represents a significant degree of maturity, and FEED design packages would normally include hundreds of documents such as detailed engineering specifications for equipment, processes, operating conditions, and drawings. In contrast, these two papers only show three basic schematic drawings for each of the two designs and a high-level brief description of each concept contained in two paragraphs.
>
> [Emphasis added]

[104] A generous interpretation of Steelhead's expert's views is that, in the arena of FLNG facilities, a document that fails to provide a detailed design of the claimed invention would not enable the skilled person to perform the invention, notwithstanding their experience and common general knowledge. This interpretation disregards that the purported invention in this case is itself nothing more than a *concept* for an FLNG facility – that is the claimed invention. All that is necessary is for the disclosure to allow the skilled person to arrive at that claimed invention without undue hardship. It is not a pre-requisite for that piece of prior art to enable full commercial implementation. The fact the prior disclosure has not proceeded through pre-FEED or FEED is not the proper question.

[105] Given Steelhead's expert's assumptions on implementation, as well as his incorrect approach to the law on optionality, I prefer Arc's expert's analysis in relation to anticipation, which is more consistent with the applicable legal principles.

(3) Multiple Dependencies

[106] Arc does not allege that any one of the Talib papers or the Sullivan presentations anticipates *all* the claims in the 085 Patent. Where Arc does not allege that a prior art anticipates a claim, I take no view with respect to that prior art and that claim. That said, in some instances, the claims on which I take no position are in fact partly relied on by other claims that Arc says were anticipated. In such instances, where I find that the dependent claim is anticipated, I do so only insofar as that claim's prior dependencies are also anticipated.

(4) Does Sullivan 2017 or Sullivan 2016 anticipate the subject matter of claims 1-3, 5, 7, 8, 13, 14, 21, 26, 36-39, 41, 42, 56, 58, 59, 64 and 65 of the 085 Patent?

(a) *Independent Claim 1*

[107] Independent claim 1 claims "a **system** for liquefaction of natural gas," essentially comprised of:

1. an external source of electricity and feed gas (the "external source"); and
2. a "water-based apparatus" connected to the external source and moored to an on-shore location, itself comprising:
    a. a hull containing a bow, a stern, and a centerline axis connecting the bow and stern;

b. an “air-cooled electrically-driven refrigeration system (‘AER System’)” – that receives electricity and gas from the external source and that uses:

1. electrically-driven compressors, and
2. air cooling

to convert the feed gas into LNG and discharge the resulting thermal energy to ambient air; and

c. a “plurality of LNG storage tanks” in a single row along the hull’s centerline axis, configured to:

1. receive the LNG from the AER system; and
2. output it to an LNG transport vessel.

[108] The elements of claim 1 are all anticipated by each of the Sullivan presentations. In Sullivan 2017 in particular:

1. Slide 9 shows a schematic of an FLNG facility that includes:
   a. external “power cables” connected to the FLNG facility, which the skilled person would understand to be an external source of electricity;
   b. a floating vessel with a barge structure on which multiple liquefaction trains are placed;
   c. a description of the facility as “at-shore”, from which the skilled person would understand that the facility is moored for operation nearshore;
   d. liquefaction trains using cooling fans with no associated gas turbines/generators, indicating to the skilled person that they rely on air coolers and (by process of elimination) electrically-driven compressors; and

e. LNG offloading arms next to an LNG carrier adjacent to the facility, from which the skilled person would understand that the facility has on-barge LNG storage tanks below deck that are configured to be offloaded to a transport vessel;

2. Slide 11 shows a list of "proven technologies" for compressor drivers, which includes electric motors;

3. Slides 12 and 13 show schematics of an "at-shore" FLNG facility that is moored "proximate to land" and "not permanently manned", and that includes:

   a. multiple liquefaction modules;

   b. cryogenic heat exchangers;

   c. air coolers;

   d. no gas turbines/generators, from which the skilled person would understand by process of elimination that the systems use electrically-driven compressors; and

   e. a "single row" of "LNG storage" tanks placed below deck along the hull's centerline axis; and

4. Slides 14 and 15 show a table describing a number of features of an "at-shore LNG" facility design, including:

   a. "onshore" source of electricity;

   b. "air-cooling";

   c. "conditioned gas" from a pipeline, which the skilled person would understand as an external source of feed gas;

   d. a "barge or ship shape vessel" structure, with "integrated storage";

e. “on barge” liquefaction; and

f. “jetty based loading arm” to be used for offloading.

[109] In Sullivan 2016, slides 9, 13, 14, and 15 show the same information as slides 11, 9, 14, and 15 of Sullivan 2017, respectively. Sullivan 2016 therefore presents the same elements as those slides in Sullivan 2017.

[110] The above list discloses all the elements of claim 1. I note in particular that from slide 9 of Sullivan 2017, the skilled person would clearly observe an external source of electricity, a barge with all its marine elements, multiple liquefaction trains, and a separate LNG carrier for offloading. Any element that may be missing in slide 9 of Sullivan 2017 is explicitly mentioned in slide 11 (i.e. electric motors) and slides 14 and 15 (i.e. external feed gas, air cooling, and a single row of tanks). Again, all of those slides are in Sullivan 2016.

[111] The disclosures above would enable the skilled person to understand and find disclosure of the subject matter of independent claim 1 without undue hardship. Indeed, most of the disclosed elements are presented together in one slide, and whatever elements remain are listed among other design options in subsequent slides.

(b) *Independent Claims 21 and 56*

[112] Independent claim 21 claims the water-based **apparatus** essentially as described in claim 1, adding that the LNG storage tanks “are on the lower deck of the hull”. Independent claim 56 claims the AER **method** essentially as described in claim 1. Any prior art that anticipates all of the

essential elements of the system of claim 1 also anticipates the water-based apparatus and the AER method of claims 21 and 56.

[113] Since the Sullivan presentations each disclose and enable the subject matter of claim 1, and since slide 9 of Sullivan 2017 and slide 13 of Sullivan 2016 each disclose the existence of storage tanks below deck, I am satisfied that the Sullivan presentations also anticipate the apparatus of claim 21 and the method of claim 56.

(c) *Dependent Claims 2 and 3: Pre-treatment*

[114] Claim 2 includes the system of independent claim 1 and adds that the source gas would be pre-treated to remove "unwanted elements". Claim 3 includes the systems of claims 1 and 2 and specifies that pre-treatment would remove heavy hydrocarbons.

[115] Slide 14 of Sullivan 2017 and slide 14 of Sullivan 2016 both disclose that the feed gas would be a "pipeline specification conditioned gas". A skilled person would understand this to mean that the feed gas is pre-treated to remove impurities and heavy hydrocarbons. I note as well that the same slide says that further treatment would be "required, but to a lower duty specification due to… gas pre-conditioning". It also states that pre-treatment could occur on barge or onshore.

[116] The skilled person would therefore understand that the pre-treatment can be implemented to varying degrees and specifications, and may occur in different locations. This discloses the elements of claims 2 and 3. And given that this disclosure is embedded among a list of other design

options for an FLNG facility, the skilled person would be able to arrive at the claimed system with little trial and error and without undue hardship.

(d) *Dependent Claims 5 and 65: Onshore Generation & Onshore Location*

[117] Claim 5 includes any of the systems of claims 1 to 4 and adds that (1) the external source of electricity and gas would generate "a portion" of the "received electricity", and (2) the at-shore location would comprise a jetty, a quayside, a shoreline or a position proximate to a shoreline location. Claim 65 includes any of the methods of claims 56 to 64, adding that the external source of electricity would generate "all of" that electricity.

[118] Slide 15 of Sullivan 2017 and slide 15 of Sullivan 2016 disclose that the power supply could be "arranged from [the] onshore grid". However, this simply discloses that the source of electricity could be external to the FLNG facility, that it could be onshore, and that it could rely on the grid. I do not read that as disclosing that the source itself is *generating* electricity. Slide 9 of Sullivan 2017 and slide 13 of Sullivan 2016 disclose a power generator, but that generator is not external to the facility.

[119] It bears repeating for emphasis here that claims 5 and 65 specify, respectively, that "the external source generates a portion of the received electricity" and that it "generat[es] all of the received electricity with a power generator" [emphasis added]. I understand the term "generate" here to mean that the external source engages in some process that converts a source of fuel into electricity in proximity to the water-based apparatus. That electricity is then supplied to power the water-based apparatus.

[120] Neither one of the Sullivan presentations discloses onshore power *generation* or any other form of external power generation. Therefore, in the absence of that disclosure, claims 5 and 65 are not anticipated by the Sullivan presentations.

(a) *Dependent Claims 7 and 8: Mooring*

[121] Claim 7 includes any of the systems of claims 1 to 6 and adds that (1) “one of a port side or a starboard side of the water-based apparatus is moorable to a structure anchored or otherwise affixed or connected to the shore”. Claim 8 includes the system of claim 7, adding that (2) “one of the port side or the starboard side is engageable with a walkway structure”.

[122] Slide 16 of Sullivan 2017 shows a number of FLNG facilities moored along their port side or starboard side to a walkway connected to the shoreline. Slide 20 of Sullivan 2016 also shows three FLNG facilities moored along their port side or starboard side to a walkway connected to the shoreline. Each of these slides discloses the elements of claims 7 and 8 and enables the skilled person to understand their subject matter. These claims are anticipated.

(b) *Dependent Claim 13: Knock-out Drum*

[123] Claim 13 depends on any of the systems of claims 1 to 12, adding that (1) “the AER System comprises one or more refrigeration trains”, and (2) “each refrigeration train of the one or more refrigeration trains comprises a portion of the electrically-driven compressors, a portion of the air coolers, and knock-out drums”.

[124] Slide 9 of Sullivan 2017 and slide 13 of Sullivan 2016 each show a nearshore FLNG facility with multiple liquefaction trains. And as discussed above, each of the Sullivan presentations discloses electrically-driven compressors and air coolers as options for the liquefaction system.

[125] Arc's expert says that the skilled person would know that a liquefaction train necessarily includes multiple knock-out drums, since they are used to separate liquefied gas from gas vapour. Steelhead's expert adds that "a skilled person would also appreciate that generally one would have a knock-out drum per compressor or per compression stage". I agree.

[126] Therefore, in addition to disclosing the other elements of claim 13, the Sullivan presentations also each disclose knock-out drums by merely disclosing the existence of liquefaction trains. The disclosures would also enable the skilled person to understand and arrive to the subject matter of claim 13. It is therefore anticipated.

(c) *Dependent Claims 14, 38, and 64: DMR Process*

[127] Claim 14 includes the system of claim 13, where the refrigeration trains are "operatively configured to perform a [DMR] process".

[128] Claim 38 claims any of the apparatuses of claims 36 or 37, where each refrigeration train "comprises a pre-cooling heat exchanger, a warm-mixed refrigeration circuit, a cold-mixed refrigeration circuit, an expander, and an end flash vessel". Both experts agree that these are elements of the DMR process, and that this refrigeration process is essentially the subject matter of claim 38.

[129] Claim 64 includes any one of claims 56 to 63, where the AER System performs a DMR process.

[130] The DMR process is disclosed in slide 11 of Sullivan 2017 and Slide 9 of Sullivan 2016 as one option among three liquefaction processes. I have already concluded that the DMR process is part of the skilled person's common general knowledge. Therefore, the skilled person would be able to understand how the DMR process disclosed by the Sullivan presentations applies to the FLNG facility concept. The skilled person would thereby be able to perform the subject matter of claims 14, 38, and 64. The claims are anticipated.

(d) *Dependent Claim 26: Membrane Tanks*

[131] Claim 26 includes any one of the apparatuses of claims 21 to 25, where each LNG storage tank is a membrane tank, and each membrane tank comprises a lower membrane that defines a storage volume and an upper membrane that seals the storage volume. In my view, the distinction between a tank's lower membrane and its upper membrane is redundant. I explain this further in my analysis of the Talib papers' anticipation of claims 19, 20, and 26.

[132] Membrane tanks are disclosed in slide 15 of both Sullivan 2017 and Sullivan 2016. Both presentations disclose that "standard membrane [tanks] may be feasible" as LNG storage options. Arc's expert also points to slide 13 of Sullivan 2017, which has no counterpart in Sullivan 2016. Slide 13 depicts LNG storage tanks that Arc's expert says a skilled person would understand to be membrane tanks from their shape and design. I agree.

[133] These disclosures enable the skilled person to arrive at the claimed subject matter. Claim 26 is therefore anticipated.

(e) *Dependent Claims 36 and 37: AER Components*

[134] Claim 36 includes any one of the apparatuses of claims 21 to 35, where (1) the AER System's modules "comprise one or more refrigeration trains", (2) each refrigeration train "comprises a portion of the electrically-driven compressors and a portion of the air coolers", and (3) "the cryogenic heat exchanger comprises a separate cryogenic heat exchanger for each" refrigeration train. Claim 37 includes the apparatus of claim 36 and adds that the refrigeration trains comprise (4) "a first refrigeration train operatively configured to receive a first portion of the feed gas and output a first portion of the LNG", and (5) "a second refrigeration train operatively configured to receive a second portion of the feed gas and output a second portion of the LNG", the two trains being independent of one another.

[135] I have already found that the Sullivan presentations each disclose multiple refrigeration trains that use electrically-driven compressors and air coolers. Arc's expert says that the skilled person would understand that the presence of multiple refrigeration trains is indicative of the fact that they operate independently of one another. I agree.

[136] The elements of claims 36 and 37 are thereby disclosed, and the skilled person would be able to understand and arrive at the subject matter of those claims without undue difficulty. Claims 36 and 37 are anticipated.

(f) *Dependent Claim 39: Balanced Topside Configuration*

[137] Claim 39 includes the apparatus of claim 37, where (1) "the hull defines a port side, a starboard side, and a mid-ship axis extending between the port and starboard sides at a center of the hull", (2) "a substantial portion of the first refrigeration train is aft of the mid-ship axis and a substantial portion of the second refrigeration train is forward of the mid-ship axis", and (3) "the weights of the refrigeration trains are balanced against one another around the mid-ship axis to stabilize the apparatus".

[138] The Sullivan presentations both disclose various examples of FLNG facilities, all of which have a hull with a port side, a starboard side, and a mid-ship axis. However, only Sullivan 2017 discloses an example where two liquefaction trains are counterbalanced across the mid-ship axis. Namely, slides 12 and 13 of Sullivan 2017 show a nearshore FLNG facility design where two DMR liquefaction trains are counterbalanced accordingly. Therefore, only Sullivan 2017 discloses the elements of claim 39. In my view, that disclosure would enable to the skilled person to understand and arrive at the subject matter of claim 39.

[139] Claim 39 is therefore anticipated by Sullivan 2017, but not Sullivan 2016.

(g) *Dependent Claim 41: Pre-treatment & Land-based Source*

[140] Claim 41 includes any of the apparatuses of claims 21 to 40, adding that (1) the feed gas would be "at least partially pre-processed", and (2) the external source comprises at least one land-based source "in communication with the water-based apparatus".

[141] I have already discussed pre-treatment above (see claims 2 and 3), where I found that pre-treatment was disclosed. The same conclusion applies here.

[142] As for the second element, the experts understood it to mean that one or more of the sources of electricity or gas would be onshore and that said source(s) would be connected to the water-based apparatus. This is disclosed in slides 14 and 15 of both Sullivan 2017 and Sullivan 2016, which note that the feed gas would come from a "pipeline", the pre-treatment location could be onshore, and the power supply would be the onshore grid. This discloses the second element, and the skilled person would be able to perform the subject matter of claim 41 from that disclosure.

[143] Therefore, claim 41 is anticipated by each of the Sullivan presentations.

(h) *Dependent Claim 42: Separate Sources & Non-Propulsion*

[144] Claim 42 includes any of the apparatuses of claims 21 to 41, adding that (1) "the water-based apparatus is configured to operate without requiring a propulsion system and without requiring a non-emergency power generation system", and (2) "the external source comprises a first source for the electricity and a second source for the feed gas".

[145] The experts agree that claim 42 means in part that the water-based apparatus would not be self-propelled, either by having no propulsion system altogether or by not engaging it. They also agree that claim 42 excludes the apparatus from having any power generation system on the vessel itself, unless that system is for emergency use. The experts also agree that the reference to a "first

source" and a "second source" means that the source of electricity is distinct from the source of feed gas.

[146] Slides 14 and 15 of Sullivan 2017 and slides 14 and 15 of Sullivan 2016 disclose that the FLNG facility could be powered by the onshore grid and that the source of gas could be a pipeline. This enables the skilled person to understand that the FLNG facility could be powered entirely by the onshore grid. The skilled person would also be able to understand that the onshore grid and the gas pipeline are two distinct sources.

[147] I agree with Arc's expert that the skilled person would know through their common general knowledge that a nearshore FLNG facility could be towed to place and that it therefore does not need a propulsion system. Since the FLNG facility designs described by Sullivan 2017 and Sullivan 2016 do not explicitly require a propulsion system, the skilled person would be able to understand that a propulsion system is not required.

[148] Claim 42 is therefore anticipated.

(i) *Dependent Claims 58 and 59: Outputting LNG*

[149] Claim 58 includes the method of any of claims 56 or 57, where the method also comprises "routing the LNG through the upper deck when outputting the LNG from the AER System and the plurality of LNG storage tanks". Claim 58 essentially refers to one or more openings through the upper deck that connect to the LNG storage tanks below deck. The LNG produced at the end of the liquefaction method would be routed into the storage tanks through those openings. LNG that

is being moved out of the tanks and into an LNG transport vessel would also be routed through those openings.

[150] Claim 59 includes the method of claim 58, where the method also comprises "routing the LNG through an [input-output] port proximate to a mid-ship axis of the apparatus when outputting the LNG from the plurality of LNG storage tanks to an LNG transport vessel that is separate from the water-based apparatus". I understand claim 59 to essentially refer to an input-output ("IO") port near the middle of the vessel that connects to the LNG storage tanks. LNG can then be routed from the LNG storage tanks, through the port, and into an LNG transport vessel.

[151] As I have already discussed, slide 9 of Sullivan 2017 and slide 13 of Sullivan 2016 both show three liquefaction trains and allude to the existence of storage tanks below deck. Arc's expert argues that the skilled person would know using their common general knowledge that routing LNG from the liquefaction trains to the storage tanks necessarily requires the existence of openings that connect the upper deck to the storage tanks. I agree that this amounts to disclosure of the routing mechanism claimed by claim 58, one which would enable the skilled person to understand and arrive at the subject matter of the claim.

[152] Slide 9 of Sullivan 2017 and slide 13 of Sullivan 2016 both show an "offloading arm". Arc's expert explains that the skilled person would understand the term "offloading arm" to refer to a type of hose or group of hoses that can withstand cryogenic temperatures and that is used to route LNG from the facility's storage tanks to an LNG transport vessel. I am satisfied that this

discloses the "IO port" claimed by claim 59 so as to enable the skilled person to understand and arrive at the subject matter of that claim.

[153] The Sullivan papers therefore anticipate claims 58 and 59.

(5) Does Talib 2014 or Talib 2013 anticipate the subject matter of claims 1-3, 5, 13-16, 18-22, 26, 36-38, 41, 42, 56-59, 64-67, 70 and 82-84 of the 085 Patent?

(a) *Independent Claim 1*

[154] Independent claim 1 is anticipated separately by each of Talib 2014 and Talib 2013.

[155] In Talib 2014:

1. Table 1 lists "onshore grid/generation" as an option for powering the facility;

2. the last paragraph of page 41 and the first paragraph of page 43 explain that the proposed nearshore FLNG facility would be used to convert "pipeline gas" and that facility would serve "multiple pipelines" and "many locations";

3. the last paragraph of page 41, Figure 7, and the paper as a whole focus on FLNG facilities that have a "barge structure" and that are "nearshore, in protected waters and/or dockside";

4. Figure 7 provides an "[e]xample of a barge layout with an electric motor drive and aerial cooling";

5. the second to last paragraph of page 44 discusses "multiple [liquefaction] trains" and "smaller liquefaction modules";

6. Figures 2 discloses a refrigeration process whereby pre-treated "feed gas" is a process input and compressors are powered by electric motors;

7. the third paragraph on page 41, the last three paragraphs on page 44, and the first two lines on page 46 discuss the SMR process, multiple liquefaction trains;

8. Figures 2, 3 and 5, as well as the first few paragraphs of page 42, disclose a "main [heat] exchanger", a "refrigerant heat exchanger", and various liquefaction methods like SMR, DMR, and C3-MR that rely on cryogenic heat exchangers;

9. Talib 2014 as a whole is concerned with floating LNG facilities;

10. Figure 7 and Table 1 both propose the use of air coolers;

11. Figures 2 and 5 indicate that the LNG produced by the facility would go into storage;

12. Table 1 and page 45 disclose on-barge storage tanks below deck, and Figure 6 illustrates an example where those tanks are placed in a single row along the hull's centerline axis; and

13. Figure 9 and the second and sixth paragraphs on page 45 indicate that LNG tanks on the facility could be offloaded periodically onto LNG carriers.

[156] In Talib 2013:

1. Figure 7 lists "onshore grid/generation" as an option for powering the facility;

2. the last paragraph in the Abstract section explains that the proposed nearshore FLNG facility would be used to convert "pipeline gas";

3. Figures 9 to 11 all show various designs of barges, and the second paragraph of the Abstract section discloses that an FLNG facility could be placed nearshore;

4. Figure 9 provides an "[e]xample barge layout with [an] electric motor drive and aerial cooling";

5. the third paragraph in the Abstract section discloses the possibility using multiple liquefaction trains;

6. Figure 2 discloses a refrigeration process whereby pre-treated “feed gas” is a process input and compressors are powered by electric motors;

7. the fifth and sixth complete paragraphs on page 4 disclose the possibility of using multiple liquefaction trains, which could rely on electric motors;

8. Figures 2 and 6, as well as the third to sixth paragraphs of page 2, disclose a “main [heat] exchanger” and a “refrigerant heat exchanger”;

9. Talib 2013 as a whole is concerned with floating LNG facilities;

10. Figures 7 and 9 both propose the use of air coolers;

11. Figures 2 and 6 indicate that the LNG produced by the facility would go into storage;

12. Figure 7 discloses on-barge storage tanks below deck, and Figure 8 illustrates an example where those tanks are placed in a single row along the hull’s centerline axis; and

13. the third to last paragraph on page 4 discloses that LNG tanks on the facility could be offloaded periodically onto LNG carriers.

[157] The skilled person, equipped with the common general knowledge, would understand from the above features of each of Talib 2014 and Talib 2013, and in the same order listed, that the FLNG facility:

1. could have an external source of electricity connected to it;

2. would have an external feed of natural gas connected to it;

3. would be moored and would by necessity include a hull with a bow, a stern, and a centreline axis;

4. could include an AER System (i.e. air coolers and electrically-driven compressors) for refrigeration;

5. would use one or more liquefaction modules assembled using modular construction;

6. would input the feed gas and the electricity into the refrigeration process;

7. would use a plurality of electrically-driven compressors;

8. would use cryogenic heat exchangers;

9. would place the liquefaction systems on the water-based apparatus;

10. could release thermal heat from the liquefaction process into ambient air;

11. would output the LNG produced by the facility into storage;

12. could include a plurality of storage tanks along the hull's centreline axis to receive the LNG produced; and

13. would allow for the stored LNG to be loaded onto a separate transport vessel.

[158] The skilled person, equipped with the common general knowledge, would discern all these elements directly and without difficulty from each of Talib 2014 and Talib 2013. Since those elements constitute all of the essential elements in independent claim 1, that claim is disclosed by each of the Talib papers.

[159] The disclosures of each of the Talib papers are sufficient to enable the skilled person to understand and find disclosure of the subject matter of independent claim 1. Notably, Table 1 of Talib 2014 and Figure 7 of Talib 2013 both propose electrically-driven compressors, air coolers, on-barge LNG storage, and receiving electricity from an external source onshore as possible design options for the facility. Figure 7 of Talib 2014 and Figure 9 of Talib 2013 also both disclose a "barge layout with an electric motor drive and aerial cooling". Both papers explain on page 45 and page 4, respectively, that "these choices can be made with or without onboard LNG storage". A skilled person would understand that each of the Talib papers discloses the subject-matter claimed by claim 1 without undue difficulty.

[160] I find that each of the Talib papers anticipates claim 1.

(b) *Independent Claims 21 and 56*

[161] As discussed above, independent claim 21 claims the water-based **apparatus** essentially as described in claim 1, adding that the LNG storage tanks "are on the lower deck of the hull". Independent claim 56 also claims the AER **method** essentially as described in claim 1. Any prior art that anticipates all of the essential elements of the system of claim 1 will necessarily also anticipate the water-based apparatus and the AER method of claims 21 and 56.

[162] Since the Talib papers each disclose and enable the subject matter of claim 1, and since Figure 6 of Talib 2014 and Figure 8 of Talib 2013 each disclose the existence of storage tanks below deck, I am satisfied that each of the Talib papers also anticipates the apparatus of claim 21 and the method of claim 56. It follows that each of the Talib papers anticipates claims 21 and 56.

(c) *Independent Claim 67*

[163] Independent claim 67 claims the water-based apparatus essentially as described in claim 1, where the storage tanks are below deck. The apparatus also includes (1) a plurality of sensors to support coordinated functions between the water-based apparatus and the external source, and (2) a means of receiving and sending communication from and to (3) a controller for controlling the coordinated functions.

[164] Table 1 of Talib 2014 and Figure 7 of Talib 2013 contemplate LNG storage on barge, "below deck". Figure 6 of Talib 2014 and Figure 8 of Talib 2013 both show an example of a barge with a single row of tanks below deck along the centreline axis. This discloses storage tanks below deck and enables the skilled person to understand and perform that aspect of the invention.

[165] The fourth and fifth paragraphs of page 43 of Talib 2014 disclose that the feed gas composition and pressure could be varied, that "process adjustments can be handled in the computer control system", and that "variation is accomplished in the distributed control system (DCS)" which is "configured to sense and adjust the flow with changing load on the system". Talib 2014 also adds that "the process is always under complete control by the operator at the core level, again with the DCS system". Table 1 of Talib 2014 also discloses that the facility's control room could be onshore. Talib 2013 contains the same information as Talib 2014 in the second paragraph of page 3 and in Figure 7.

[166] The skilled person would understand these elements to be disclosing a computerized controller system that exchanges data with the feed gas source and the refrigeration system. The skilled person would also understand, according to Arc's expert, that sensors would be installed on both the gas source and the FLNG facility. I agree.

[167] Steelhead's expert argues that the control system described in the Talib papers does not include the coordinating function described by claim 67. However, both of the Talib papers describe the "distributed control system" as being "configured to sense and adjust the flow with

changing load on the system" [emphasis added]. Accordingly, the system provides a coordinating function. Therefore, both of the Talib papers disclose each of the elements of claim 67.

[168] In my view, these disclosures also enable the skilled person to understand and be able to perform the claimed invention. I note in particular that, since the skilled person would know from their common general knowledge that an FLNG facility will typically have sensors that serve an automation function, it would take them little effort to arrive at the subject matter of claim 67 upon reading the Talib papers' disclosures. Claim 67 is anticipated by each of the Talib papers.

(d) *Dependent Claims 2, 3, and 22: Pre-treatment*

[169] The systems of claims 2 and 3 are summarized above. Claim 22 includes the apparatus of independent claim 21, specifying that the feed gas would exclude "at least" heavy hydrocarbons.

[170] The last paragraph of page 41 of Talib 2014 states that the source of feed gas would be a "US pipeline". The same is true of the second and last paragraphs of page 1 of Talib 2013. The skilled person would know that natural gas fed through a US pipeline would be pretreated to remove both heavy hydrocarbons and impurities like carbon dioxide, water, and hydrogen sulfide.

[171] In the first paragraph of page 43 of Talib 2014, the paper discloses that the "heavier C5+ components… must be removed" from the feed gas, along with inert gas, carbon dioxide, and nitrogen (N2). Moreover, both Table 1 of Talib 2014 and Figure 7 of Talib 2013 indicate that pre-treatment and removal of water from the feed gas could occur "onshore" before reaching the facility.

[172] I agree with Arc's expert that each of the Talib papers discloses the pre-treatment of natural gas to exclude unwanted elements, including at least heavy hydrocarbons. I also agree that the skilled person would be able to perform the subject-matter of claims 2, 3, and 22 from the above disclosures. Therefore, all three claims are anticipated by each of the Talib papers.

(e) *Dependent Claims 5, 65, 83, and 84: Onshore Generation & Onshore Locations*

[173] I summarized the system of claim 5 and the method of claim 65 above. Claim 83 includes the apparatus of any of claims 67 to 82, adding that the onshore location would comprise (potentially among other things) a jetty, a quayside, a shoreline or a position proximate to a shoreline location. Claim 84 depends on claims 67 to 82, except that the at-shore location must consist of a jetty, a quayside, a shoreline or a position proximate to a shoreline location, to the exclusion of other options.

[174] Both Table 1 of Talib 2014 and Figure 7 of Talib 2013 discuss the possibility of using an "onshore… generator" to supply power to the facility. The table also suggests the possibility of using the "onshore grid" to supply power. The skilled person would understand that the external source of electricity could be the onshore grid or the onshore generator. By extension, the skilled person would understand that onshore generation could be used in conjunction with the grid to generate "a portion" of the electricity. Therefore, each of the Talib papers discloses the possibility of generating the electricity at the external source, whether to supply all or a portion of the facility's needs.

[175] Both Talib 2014 and Talib 2013 describe the FLNG facility as being nearshore "in protected waters and/or dockside". The skilled person would understand those terms include a jetty, a quayside, a shoreline, or a position proximate to the shoreline. I agree with Arc's expert that this constitutes disclosure of those various onshore positions and that the skilled person would understand that those positions could be selected alone or in combination with others.

[176] The skilled person would be able to understand that the Talib papers disclose the subject matter of claims 5, 65, 83, and 84. For one, including "onshore… generation" as one option in Table 1 of Talib 2014 and Figure 7 of Talib 2013 among other design options for an FLNG facility would enable the skilled person to arrive without difficulty at that claimed invention and perform that part of the claimed subject-matter. Further, the clear description of the FLNG facility concept as being nearshore, in protected waters, or dockside would enable the skilled person to conclude that the at-shore location could be comprised of a jetty, a quayside, a shoreline or a position proximate to a shoreline location, whether solely or in conjunction with other options. Claims 5, 65, 83, and 84 are anticipated by each of the Talib papers.

(f) *Dependent Claim 13: Knock-out Drums*

[177] Figure 2 of Talib 2014 and Figure 2 of Talib 2013 each show a liquefaction process with three knock-out drums. The Talib papers also each disclose electrically-driven compressors and air coolers as options for the liquefaction system.

[178] Similar to my discussion of claim 13 and the Sullivan presentations, I conclude that each of the Talib papers discloses knock-out drums by merely disclosing the existence of liquefaction

trains. The disclosures would also enable the skilled person to understand and arrive to the subject matter of claim 13. It is therefore anticipated.

(g) *Dependent Claims 36 and 37: AER Components*

[179] As discussed, the Talib papers each disclose multiple refrigeration trains that use electrically-driven compressors and air coolers. The skilled person would understand that the presence of multiple refrigeration trains is indicative of the fact that they operate independently of one another. The elements of claims 36 and 37 are thereby disclosed, and the skilled person would be able to understand and arrive at the subject matter of those claims without undue difficulty. Claims 36 and 37 are anticipated by each of the Talib papers.

(h) *Dependent Claims 14, 38, and 64: DMR Process*

[180] The DMR process is disclosed in both of the Talib papers. The third paragraph of page 42 of Talib 2014 explains that the DMR process may be used to scale a FLNG facility's operations. The first paragraph of page 2 of Talib 2013 contains a similar statement. I have also already concluded that the DMR process is part of the skilled person's common general knowledge. Therefore, upon reading the disclosures of the Talib papers with respect to the DMR process, the skilled person would understand how it applies to the FLNG facility concept and would be able to perform the subject matter of claims 14, 38, and 64. The claims are therefore anticipated.

(i) *Dependent Claim 41: Pre-processing & Land-based Source*

[181] Both experts understood the first element to mean that the feed gas underwent at least some pre-treatment before reaching the water-based apparatus. I have already discussed pre-treatment above (see claims 2, 3, and 22), and found it was anticipated. The same conclusion applies here.

[182] As for the second element, the experts understood it to mean that one or more of the sources of electricity or gas would be onshore and that said source(s) would be connected to the water-based apparatus. As I noted above for claims 5 and 65, both Table 1 of Talib 2014 and Figure 7 of Talib 2013 discuss the possibility of using an "onshore… grid/generator" to supply power to the facility. In addition, the last paragraph of page 41 of Talib 2014 and the first page of Talib 2013 both state that the source of feed gas would be a "US pipeline", which the skilled person would understand as including onshore pipelines. These possibilities disclose a design configuration where at least one external source of electricity or gas is onshore and connected to the water-based apparatus. And the skilled person would likewise be able to arrive at that configuration without undue hardship.

[183] Since both elements are disclosed and enabled, claim 41 is anticipated.

(j) *Dependent Claims 15, 16, 18, 66, and 82: Controllers & Sensors*

[184] Claim 15 includes any one of the systems of claims 1 to 14, where (1) the feed gas is at least partially pre-processed, (2) the external source comprises at least one land-based source, and (3) the disclosed system also comprises a "controller with the at least one land-based source and

the water-based apparatus". Claim 16 includes the system of claim 15 and adds that (4) the system also comprises a "plurality of sensors comprising sensors of the at least one land-based source and sensors of the water-based apparatus". Claim 18 includes the systems of claims 15 to 17, adding that (5) the controller comprises one or more devices located remotely from the water-based apparatus and the at least one land-based source.

[185] Similar to claims 15, 16, and 18, claim 66 includes any of the methods of claims 56 to 65, adding that the claimed method comprises "operating and controlling the water-based apparatus and the external source with a controller in communication with both the external source and the water-based apparatus".

[186] Further, claim 82 claims any of the apparatuses of claims 67 to 80, where "the controller is external to the water-based based [sic] apparatus".

[187] I have discussed pre-processing (see claims 2, 3, 22, and 41) and land-based sources (see claim 41) and found that they were anticipated. I have also discussed controllers, sensors, and means of communication between the two (see claim 67) and found all such elements anticipated. The same applies here.

[188] The only outstanding element from the ones disclosed above is the controller's location, which claims 18 and 82 describe as "remote" and "external" from the water-based apparatus. Again, Table 1 of Talib 2014 and Figure 7 of Talib 2013 both state that the facility's control room

could be located onshore. This discloses a remote and external location for the controller and enables the skilled person to arrive at that design feature.

[189] Therefore, claims 15, 16, 18, 66, and 82 are all anticipated by each of the Talib papers.

(k) *Dependent Claims 19, 20, and 26: Membrane Tanks*

[190] Claim 19 includes any of the systems of claims 1 to 18, adding that each LNG storage tank is a membrane tank. Claim 20 includes the system of claim 19 and adds that each membrane tank "comprises a lower membrane that defines a storage volume and an upper membrane that seals the storage volume". Claim 26 includes any one of the methods of claims 21 to 25, where each LNG storage tank is a membrane tank, and each membrane tank comprises a lower membrane that defines a storage volume and an upper membrane that seals the storage volume.

[191] The fifth paragraph on page 45 of Talib 2014 and page 5 of Talib 2013 both state that "hull LNG membrane containment systems would be an option" for large scale storage. I agree with Arc's expert that this discloses the option of using membrane tanks. Given that the skilled person would know of membrane tanks as part of their common general knowledge, this disclosure would suffice to enable the skilled person to perform this element – that is, to arrive at a design configuration that uses membrane tanks for LNG storage. Claim 19 is anticipated.

[192] With respect to the differentiation between lower membranes and upper membranes on the one hand and membrane tanks on the other, that distinction appears to be of no practical significance. Indeed both experts acknowledge this to some degree: Steelhead's expert says that

the skilled person would understand the distinction to refer to portions of the membrane tank; whereas Arc's expert goes a step further and says that there is a redundancy whereby each of the elements of claims 19, 20, and 26 is claiming membrane tanks *per se*.

[193] I agree that all the elements of claims 19, 20, and 26 are claiming membrane tanks *per se*. I see no distinction between claiming membrane tanks and claiming its two halves for the purposes of this patent. Therefore, like claim 19, claims 20 and 26 are also anticipated by each of the Talib papers.

(l) *Dependent Claim 42: Propulsion System & Separate Sources*

[194] As with the Sullivan presentations, Table 1 of Talib 2014 and Figure 7 of Talib 2013 each disclose that the FLNG facility could be powered by an onshore grid. This enables the skilled person to understand that the FLNG facility could be powered entirely by the onshore grid.

[195] Each of the Talib papers also specifies at various points that the feed gas could be from a pipeline. The skilled person would be able to understand that the onshore grid and the gas pipeline are two distinct sources.

[196] Finally, as with the Sullivan presentations, I agree with Arc's expert that the skilled person would know through their common general knowledge that a nearshore FLNG facility does not need a propulsion system. Since the FLNG facility designs described in either of the Talib papers do not explicitly require a propulsion system, the skilled person would be able to understand that a propulsion system is not required.

[197] Claim 42 is anticipated by each of the Talib papers.

(m) *Dependent Claim 57: Pre-treatment & Onshore Location*

[198] Claim 57 includes the method of claim 56 and adds that (1) the feed gas would exclude heavy hydrocarbons, and (2) the at-shore location would comprise a jetty, a quayside, a shoreline or a position proximate to a shoreline location. I have already discussed both elements above (see claims 2, 3, 22 for the first element, and claims 5, 65, and 83 for the second) and found that they are disclosed and enabled by each of the Talib papers. The same applies here.

(n) *Dependent Claims 58 and 59: Outputting LNG*

[199] Similar to the Sullivan presentations, Figure 6 of Talib 2014 and Figure 8 of Talib 2013 each show an example barge with liquefaction occurring on the upper deck and storage tanks located below deck. The skilled person would know using their common general knowledge that routing LNG from the liquefaction trains to the storage tanks necessarily requires the existence of openings that connect the upper deck to the storage tanks. This constitutes disclosure of the routing mechanism claimed by claim 58, one which would enable the skilled person to understand and arrive at the subject matter of the claim.

[200] Figure 7 of Talib 2014 and Figure 9 of Talib 2013 also show an offloading arm. Again, the skilled person would understand this to refer to a part that can withstand cryogenic temperatures and that is used to route LNG from the facility's storage tanks to an LNG transport vessel. This

discloses the “IO port” claimed by claim 59 so as to enable the skilled person to understand and arrive at the subject matter of that claim.

(o) *Dependent Claim 70: Coordinated Functions*

[201] Claim 70 includes any one of claims 67 to 69, where (1) the AER System “comprises one or more refrigeration trains” and (2) “the coordinated functions [of claim 67] include management of one or more refrigeration trains via the controller”. I already discussed the first element above (see claim 13). I held there, as I do here, that that element is anticipated by each of the Talib papers.

[202] As for the second element, I note again the fourth and fifth paragraphs of page 43 of Talib 2014 and the second paragraph of page 3 of Talib 2013. Both indicate that the control system would control the “refrigerant flow”. This means that the controller described by the papers necessarily regulates and communicates with the refrigeration trains. The second element is therefore disclosed. Furthermore, as with claim 67, the skilled person would be able to perform this element without undue hardship. Claim 70 is anticipated by each of the Talib papers.

(6) Summary of Findings on Anticipation

[203] I find that:

1. Sullivan 2017 anticipates claims 1, 2, 3, 7, 8, 13, 14, 21, 26, 36, 37, 38, 39, 41, 42, 56, 58, 59, and 64.

2. Sullivan 2016 anticipates claims 1, 2, 3, 7, 8, 13, 14, 21, 26, 36, 37, 38, 41, 42, 56, 58, 59, and 64.

3. Talib 2014 anticipates claims 1, 2, 3, 5, 13, 14, 15, 16, 18, 19, 20, 21, 22, 26, 36, 37, 38, 41, 42, 56, 57, 58, 59, 64, 65, 66, 67, 70, 82, 83, and 84.

4. Talib 2013 anticipates claims 1, 2, 3, 5, 13, 14, 15, 16, 18, 19, 20, 21, 22, 26, 36, 37, 38, 41, 42, 56, 57, 58, 59, 64, 65, 66, 67, 70, 82, 83, and 84.

[204] As I noted earlier, the dependent claims are anticipated only to the extent to which they depend on other anticipated claims, and are not anticipated otherwise. Furthermore, the following claims are not anticipated by the Talib papers or the Sullivan presentations: 4, 6, 9, 10, 11, 12, 17, 23, 24, 25, 27, 28, 29, 30, 31, 32, 33, 34, 35, 40, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 60, 61, 62, 63, 68, 69, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, and 81.

C. *Obviousness*

[205] The Supreme Court of Canada outlined a four-step analysis to assessing obviousness in *Sanofi*, at paragraph 67, as follows:

> (1) (a) Identify the notional "person skilled in the art";
>
> (b) Identify the relevant common general knowledge of that person;
>
> (2) Identify the inventive concept of the claim in question or if that cannot readily be done, construe it;

> (3) Identify what, if any, differences exist between the matter cited as forming part of the "state of the art" and the inventive concept of the claim or the claim as construed;
>
> (4) Viewed without any knowledge of the alleged invention as claimed, do those differences constitute steps which would have been obvious to the person skilled in the art or do they require any degree of invention?

[206] I have already described the skilled person and the common general knowledge as of the relevant dates. My findings there are equally applicable for the first step of the obviousness analysis here.

[207] Under the second step, the Court must identify the “inventive concept” or otherwise construe the claim. The “inventive concept” is “the solution taught by the patent”. It is the end point towards which the claim advances the art (*Bristol-Myers Squibb Canada Co v Teva Canada Limited*, 2017 FCA 76 at paras 65-66). The inventive concept is ultimately informed by the claim’s construction (*Tearlab* at para 88). However, it may be difficult to ascertain for some claims, and the Court may simply rely on the claim’s construction without the need for further elaboration (*Ciba Specialty Chemicals Water Treatments Limited’s v SNF Inc*, 2017 FCA 225 [*Ciba*] at paras 76-77; *Tearlab* at paras 76-78). This is not to say, however, that the Court should bypass the inventive concept as a matter of course (*Apotex Inc v Shire LLC*, 2018 FC 637 at paras 115-117; *Frac Shack Inc v AFD Petroleum Ltd*, 2018 FC 1047 at paras 48, 49, and 52).

[208] I have already construed the 085 Patent’s claims and identified their essential elements.

[209] Under the third step, the Court must ascertain the "state of the art". For this, the Court may consider any citable prior art within the public domain (*Ciba* at paras 56-59), a subset of which is the skilled person's common general knowledge (*Eli Lilly Canada Inc v Mylan Pharmaceuticals ULC*, 2016 FCA 119 at paras 23-25). The Court need not determine obviousness by reference to the prior art at large, but only what was cited by the party challenging the validity of the patent. Moreover, that party may present the Court with a "mosaic" from different pieces of prior art that together show that the purported invention is obvious (*Ciba* at para 60).

[210] Section 28.3 of the *Patent Act* specifies the cut-off date for prior art that may be cited for the purposes of the obviousness analysis. Relevant here are the following two dates: (1) one-year prior to the filing date, if the prior art was disclosed by the patentee or someone who obtained knowledge from the patentee, and (2) the claim date, if the prior art was disclosed by any other person.

[211] As for the fourth step of the analysis, the question is whether the skilled person would be able to fill the gap between the state of the art and the inventive concept or the construed claim (*Ciba* at para 62). Courts have often described the skilled person here as "unimaginative", lacking a "scintilla of inventiveness or imagination", and "wholly devoid of intuition" (*Tearlab* at para 81; *Hospira Healthcare Corporation v Kennedy Trust for Rheumatology Research*, 2020 FCA 30 at para 79, citing *Beloit* at 294). The skilled person can therefore have recourse to nothing but the common general knowledge and pieces of prior art available to the skilled person by a reasonably diligent search (*Ciba* at para 62). If the skilled person is able to bridge the gap identified under the third step, then the purported invention is obvious.

[212] In assessing if a purported invention is obvious, the Court must be vigilant against hindsight analysis, particularly where an expert alleges that the purported invention is obvious. As the Federal Court of Appeal cautioned in *Beloit*:

> Every invention is obvious after it has been made, and to no one more so than an expert in the field. Where the expert has been hired for the purpose of testifying, his infallible hindsight is even more suspect. It is so easy, once the teaching of a patent is known, to say, "I could have done that"; before the assertion can be given any weight, one must have a satisfactory answer to the question, "Why didn't you?"

[213] I am cognizant that this caution is particularly relevant where the patent in question purports to invent a new combination of known parts (*Bridgeview Manufacturing Inc v 931409 Alberta Ltd (Central Alberta Hay Centre)*, 2010 FCA 188 at paras 50-51).

(1) Multiple Dependencies

[214] Similar to what I indicated regarding the anticipation analysis above, where I find that a dependent claim is obvious, I do so only insofar as that claim depends on other obvious claims.

(2) The State of the Art

[215] The application for the 085 Patent was filed on December 10, 2018. The patent claims priority as of June 1, 2018. Therefore, the cut-off date for citable prior art made by Steelhead is December 10, 2017. For all other citable prior art, the cut-off date is June 1, 2018. I address that art as may be relevant below.

(3) Is the subject matter of the 085 Patent's claims obvious?

[216] The Talib papers and the Sullivan presentations are all part of the citable prior art. I have already concluded that they anticipate the subject matter of independent claims 1, 21, 56, and 67. I have also concluded that they anticipate the subject matter of dependent claims 2, 3, 5, 7, 8, 13, 14, 15, 16, 18, 19, 20, 22, 26, 36, 37, 38, 39, 41, 42, 57, 58, 59, 64, 65, 66, 70, 82, 83, and 84, but only insofar as those claims depend on other anticipated claims.

[217] Since the Sullivan presentations and the Talib papers are citable prior art for the purpose of obviousness, I find that there is no difference between that state of the art and the claims listed above. Those claims are therefore obvious in addition to being anticipated, but only insofar as they depend on other obvious claims.

(a) *Dependent Claim 4: Gas Redistribution to External Source*

[218] Claim 4 depends on the systems of each of claims 1 to 3, where "the AER System outputs a fuel gas to the external source". Both experts agree that "fuel gas" here refers to hydrocarbons that have gone through the AER System, but which are then diverted to produce power.

[219] Arc's expert says that it was known by June 2018 that fuel gas could be partly redirected from liquefaction trains to generate power on the LNG facility, be it on land or offshore. However, Arc's expert also acknowledges that directing fuel gas from liquefaction trains on a *nearshore* FLNG facility to an *external* source to generate power is distinct from that starting point. I agree. There is therefore a difference between the state of the art and claim 4.

[220] Arc's expert argues that bridging the difference here would be obvious to the skilled person. I also agree. Since it was known by June 2018 that fuel gas could be redirected from liquefaction trains to generate power for an LNG facility, it follows that the skilled person would have understood that the same mechanism could be used to supply a nearshore facility's external source of power (such as an onshore generator) with fuel gas. Claim 4 would therefore be obvious to the skilled person in light of that person's common general knowledge and the Sullivan and Talib references.

(b) *Dependent Claim 6: Gas-powered Generator*

[221] Claim 6 depends on the system of claim 5, where "the external source comprises a gas-powered generator operative to generate the portion of the received electricity". This is already known by the citable prior art. Table 1 of Talib 2014 and Figure 7 of Talib 2013 each contemplate the use of an "onshore generator" as a potential source of external energy for a nearshore FLNG facility. There is therefore no gap between the state of the art, which includes the Talib papers, and claim 6.

[222] One may argue that the phrase "onshore generator" does not distinctly specify that the generator would be gas-powered, and that there is a distinction as a result. Even if that is true, the skilled person would be able to bridge that gap without difficulty. In either case, claim 6 is obvious.

(c) *Dependent Claims 9 and 44-51: Cryogenic Spill Management*

[223] Claim 9 depends on the system of claim 8, where "the water-based apparatus comprises a containment system operatively configured to direct spills of cryogenic fluid over the other one of the port side or the starboard side."

[224] Claim 44 depends on any one of the apparatuses of claims 21 to 43, adding a "containment system operatively configured in connection with the upper deck to collect spills of cryogenic fluid". Claim 45 also depends on claims 21 to 43, adding a "containment system operatively configured adjacent to the upper deck to collect spills of cryogenic fluid".

[225] Claim 46 depends on the apparatus of any of claims 44 or 45, where "the containment system comprises channels positioned above the upper deck to collect the spills of cryogenic fluid".

[226] Claim 47 depends on any one of the apparatuses of claims 21 to 43, adding (1) "a process deck located above the upper deck", and (2) "a containment system that is located between the process deck and the upper deck and operatively configured to collect spills of cryogenic fluid". Claim 48 claims the apparatus of claim 47, where (3) "the containment system comprises channels that are suspended from or formed integral with the process deck to collect the spills of cryogenic fluid".

[227] Claim 49 depends on the apparatus of claim 48, where (4) “the hull comprises a plurality of support structures extending through the upper deck, and the plurality of support structures are adapted to support the process deck and the one or more interconnected modules of the AER System”. Claim 50 depends on the apparatus of claim 49, where (5) “each module of the one or more interconnected modules of the AER System is supported by the plurality of support structures with a support frame operatively configured to transfer a weight of the module, restrain relative movements between the module and the hull, and limit a transfer of vibrations from the module to the upper deck”.

[228] Claim 51 depends on the apparatus of either of claims 46 or 48, where “the channels comprise a network of conduits arranged above the upper deck”.

[229] In essence, claims 9 and 44 to 51 are all concerned with preventing, limiting, and managing cryogenic spills by various means, including: (1) placing containment systems that collect spills and then directing the spills to a desirable location, as with claims 9, 44-48, and 51 and/or (2) placing support structures that stabilize process decks on which the AER System rests, as with claims 49 and 50. This is the inventive concept of claims 9 and 44 to 51.

[230] Arc’s expert’s evidence on the issue of cryogenic spill management is not immediately clear. On the one hand, he says that “the idea of incorporating those types of devices and systems on an FLNG did not originate with the 085 Patent’s inventors”. Yet, he also says that “the known detection and containment systems were not previously disclosed to form part of an FLNG as described by the claims”. I understand Arc’s expert’s evidence to mean that these systems and

devices were known, but they were not used on *nearshore* FLNG facilities, and that there is a difference between the state of the art and the inventive concept here. I accept that conclusion.

[231] That said, the devices and systems described in these claims were frequently used by June 2018 on offshore FLNG facilities. The skilled person would have also known about those devices and systems as part of their common general knowledge. In my view, therefore, the skilled person would know to apply those same devices and systems to the nearshore context using only their common general knowledge.

[232] Claims 9 and 44 to 51 are obvious.

(d) *Dependent Claims 10 and 23: Voltage*

[233] Claim 10 depends on any of the systems of claims 1 to 9, where "the received electricity is equal or greater than approximately 100kV".

[234] Claim 23 depends on any of the apparatuses of claims 21 and 22, where "the received electricity is equal to or greater than approximately l00kV and the at-shore location comprises a jetty, a quayside, a shoreline or a position proximate to a shoreline location".

[235] I have already found that the citable prior art discloses an at-shore location comprising a jetty, a quayside, a shoreline or some other position near the shoreline. The Talib papers each contemplate that the FLNG facility would be "nearshore, in protected waters and/or dockside".

The same is true of each of the Sullivan presentations, which show various examples of nearshore FLNG facilities that are moored near a shoreline, quayside, or other proximate locations.

[236] Arc's expert interprets the phrase "approximately 100kV" to include voltages as low as 90 kV. He says that the skilled person would know as part of their common general knowledge that many FLNG facilities inevitably use voltages of 90kV or greater, particularly ones with larger production capacities. I agree. Claims 10 and 23 are obvious.

(e) *Dependent Claim 11: Transit Bridge*

[237] Claim 11 depends on the system of any of claims 1 to 10, where "the received electricity is received with a line including one or more conductors, and the system further comprises a transit bridge extendable between the water-based apparatus and the external source to support the line".

[238] I agree with Arc's expert that the term "transit bridge" here refers to an elevated support structure that power lines would pass through. I also agree with Steelhead's expert that the crux of claim 11 "implies a semi-permanent connection to the facility that must be designed in a way that permits tidal movement of the vessel on one end but [is] fixed to shore on the other".

[239] Both experts say that there is a difference between the system of claim 11 and the state of the art as it was in June 2018. I disagree with both experts. The state of the art includes the notion of using a transit bridge to connect power lines from the shoreline to the FLNG facility. Slide 9 of Sullivan 2017 and slide 13 of Sullivan 2016 both show power cables on a transit bridge that is fixed to the shoreline. The skilled person would understand that the power cables are connected to

the FLNG facility shown in each slide. The Sullivan presentations are both citable prior art for the purposes of obviousness. Therefore, there is no difference between the state of the art and the invention disclosed by claim 11. The claim is obvious.

(f) *Dependent Claims 12, 35, 43, and 79: Closed Loop Ballast System*

[240] Claim 12 depends on the system of any of claims 1 to 11, where "the water-based apparatus comprises a closed loop ballast system operable with a ballast fluid to assist in stabilizing the water-based apparatus moored in proximity to the at-shore location without discharging the ballast fluid to water proximate the at-shore location".

[241] Claim 35 depends on the apparatus of any one of claims 21 to 32, where "the water-based apparatus comprises a closed loop ballast system operable with a ballast fluid to stabilize the water-based apparatus when moored in proximity to the at-shore location without discharging the ballast fluid to water proximate to the at-shore location"; the closed loop ballast system comprising "a plurality of ballast tanks below the upper deck" and "one or more pumps operatively configured to move the ballast fluid between the plurality of ballast tanks".

[242] Claim 43 depends on the apparatus of any one of claims 21 to 34, where "the water-based apparatus comprises a closed loop ballast system operable with a ballast fluid to stabilize the water-based apparatus when moored in proximity to the at-shore location without discharging the ballast fluid in water proximate to the at-shore location."

[243] Claim 79 depends on any of the apparatuses of claims 67 to 78, adding “a closed loop ballast system operable with a ballast fluid to assist in stabilizing the water-based apparatus when moored in proximity to the at-shore location”; the closed loop ballast system comprising “a position sensor”, a “plurality of ballast tanks”, and “one or more pumps operable with the controller to move ballast fluid between the plurality of ballast tanks responsive to the position sensor without discharging any of the ballast fluid to water proximate to the at-shore location”.

[244] Claims 12, 35, 43, and 79 all disclose the same inventive concept: a closed loop ballast system. The parties agree that a closed loop ballast system was a known method of stabilizing a marine vessel. The claimed inventions are therefore obvious, as there is no difference between them and the state of the art.

[245] It is arguable that claims 35 and 79 disclose a distinct inventive concept from claims 12 and 43. Claim 35 discloses multiple ballast tanks and pumps able to move the ballast fluid between said tanks. Claim 79 discloses the same elements, but also includes a position sensor that communicates with the ballast tanks’ pumps. However, as I have already concluded above, the skilled person’s common general knowledge includes an understanding of how closed loop ballast systems work. In my view, this includes the use of multiple ballast tanks, pumps, and position sensors. In either case, claims 35 and 79 are still obvious.

(g) *Dependent Claims 17, 33, 34, 52, 53, 63, 68, 69, 71-78, 80, and 81: Sensors, Controllers, and Coordination*

[246] Claim 17 depends on claim 16, where "the controller operates the AER System and at least a power supply component at the at least one land-based source based on data output from the sensors of the water-based apparatus and the sensors of the at least one land-based source." The controller and the sensors here refer to elements from claim 16 (and claim 15 by extension).

[247] Claim 33 depends on the apparatuses of any one of claims 21 to 32, adding that the apparatus further comprises (1) a plurality of sensors operatively configured to detect spills of cryogenic fluid and leaks of gas. Claim 34 depends on claim 33, and further adds that the apparatus comprises (2) channels to collect the spills of cryogenic fluid, (3) downcomers in communication with the channels to direct the cryogenic fluid over and away from one side of the hull, and (4) nozzles to spray exterior surfaces of the one side of the hull with a protective fluid in response to the plurality of sensors.

[248] Claim 52 depends on the apparatus of any one of claims 46 and 48 to 51, adding (1) "sensors positioned to detect the spills of cryogenic fluid in the channels", and (2) "piping that is in communication with the channels and adapted to direct the spills of cryogenic fluid over and away from a side of the hull". Claim 53 depends on claim 52, adding (3) "a nozzle operable to protect the side of the hull from the spills of cryogenic fluid by spraying exterior surfaces of the side of the hull with a protective fluid when the sensors detect the spills of cryogenic fluid in the channels."

[249] Claim 68 depends on the apparatus of claim 67, where (1) “the first data comprises demand data associated with the AER System”, (2) “the second data comprises supply data associated with the external source”, and (3) “the coordinated functions comprise energy management functions responsive to the demand and supply data”. The “first data”, “second data”, and “coordinated functions” all refer to elements from claim 67.

[250] Claim 69 depends on any of the apparatuses of claims 67 or 68, where “the coordinated functions include management of the AER System and a power generator located at the external source via the controller.”

[251] Claim 71 claims any of the apparatuses of claims 67 to 69, where (1) “each train of the one or more refrigeration trains comprises a portion of the electrically-driven compressors and a portion of the air coolers”, and (2) “the coordinated functions include management of the portion of the electrically-driven compressors and the portion of the air coolers for each train via the controller”.

[252] Claim 72 depends on the apparatus of any one of claims 67 to 71, where (1) “the first data comprises detection data associated with a spill of cryogenic fluid or a leak of flammable gas on the water-based apparatus”, (2) “the water-based apparatus comprises a plurality of actuators operable to affect the spill of cryogenic fluid or the leak of gas”, and (3) the coordinated functions comprise operating one or more actuators of the plurality of actuators based on the detection data. Claim 73 depends on claim 72, adding that (4) “the coordinated functions comprise identifying a

location of the spill of cryogenic fluid on the water-based apparatus via the controller based on the detection data".

[253] Claim 74 depends on the apparatus of any of claims 67 to 73, where the plurality of sensors comprise at least one of a liquid sensor, a gas sensor, and a visual sensor. Claim 75 also depends on the apparatus of any of claims 67 to 73, but where the plurality of sensors comprise a liquid sensor utilizing fiber optic or ultrasonic leak detection methods. Claim 76 also depends on the apparatus of any of claims 67 to 73, where "the plurality of sensors comprise a gas sensor utilizing air-sampling methods".

[254] Claim 77 depends on the apparatus of any of claims 67 to 76, where "the plurality of sensors comprise one or more sensors positioned about the water-based apparatus to capture visible effects of the spill of cryogenic fluid or the leak of gas on the water-based apparatus". Claim 78 depends on claim 77, where "the one or more sensors are operatively configured to output one or more video feeds of the visible effects to the controller".

[255] Claim 80 depends on the apparatus of any one of claims 67 to 79, where "the plurality of LNG storage tanks are positioned on the lower deck of the hull", and "each LNG tank of the plurality of LNG tanks comprises at least one pump operable with the controller to output the LNG".

[256] Claim 81 depends on the apparatuses of any one of claims 67 to 80, adding "a wireless data communication technology operatively configured to communicate the first data, the second data, and the control signals".

[257] The inventive concept of claims 17, 33, 34, 52, 53, 63, 68, 69, 71-78, 80, and 81 is the use of sensors, and controllers to coordinate various components of the invention, including (1) the external source's input into the AER System, as in claims 17, 68, and 69, (2) the distribution of compressors and coolers across the liquefaction trains, as with claim 71, (3) the outputting of LNG from the storage tanks, as with claim 80, and (4) cryogenic spill management, as with claims 33, 34, 52, 53, 63, 72, 73, 77, and 78. The inventive concept also permits a variety of sensors to be used – including liquid, gas, and visual sensors – as well as wireless communication.

[258] I have already concluded that the Talib papers both disclose the use of sensors, controllers, and coordinating functions (see claims 15, 16, 18, 66, 70, and 82). In addition, the Sullivan presentations and the Talib papers all disclose an external source providing inputs to the AER System, which relies on electrically-driven compressors and air coolers. They also disclose LNG storage tanks from which the LNG would be outputted. I have also found that cryogenic spill management is obvious (see claims 9 and 44-51 above).

[259] The issue then is whether it is obvious for sensors and controllers to be used to coordinate those particular functions and operations. Arc's expert acknowledges that this is distinct from the state of the art as I summarized it above. I agree. The question is whether the skilled person would bridge the difference.

[260] I am satisfied that the skilled person would bridge the difference. As Arc's expert argues, the skilled person would have known by June 2018 that FLNG facilities rely on sensors and controllers to coordinate various processes on the facility. In fact, on cross-examination, Steelhead's expert conceded that the skilled person would have known that LNG facilities, including FLNG facilities, typically had sensors and control systems to manage, for example, power generators and pre-treatment systems. It follows that the skilled person would be able to extend the use of such sensors (including liquid, gas, and visual sensors, as well as wireless communication methods) to the functions and operations described by claims 17, 33, 34, 52, 53, 63, 68, 69, 71-78, 80, and 81. Those claims are obvious.

(h) *Dependent Claims 24, 25, 27 and 28: Deck Opening & IO Port*

[261] Claim 24 claims the apparatus of any one of claims 21 to 23, where "all of the LNG is routed into the hull from the AER System through an opening extending through the upper deck and out of the hull from the plurality of LNG storage tanks through the opening." Claim 25 depends on claim 24 and further adds "an IO port that is adjacent the opening and operatively configured to: receive the electricity and feed gas; and output the LNG from the plurality of LNG storage tanks to the LNG transport vessel".

[262] The prior art discloses the use of deck openings to route the LNG from the liquefaction trains to the LNG storage tanks (see my comments above regarding claims 58 and 59). The state of the art therefore includes this concept. Arc's expert nevertheless acknowledges that there is a distinction between the state of the art and the inventive concept here, since in both claims 24 and 25, there is only one deck opening that is connected to multiple storage tanks. I agree.

[263] Arc's expert also acknowledges that the skilled person "would not configure the topside of an at-shore FLNG to have a single opening in its upper (or main) deck for routing all of the LNG". He nevertheless says that a single deck opening is "neither ingenious nor inventive" because it is unsafe. However, safety goes to utility, not obviousness. Arc's expert's evidence is consistent with the view that the subject matter of claim 24 (and claim 25 by extension) is not obvious.

[264] Even if I did find that the subject matter of claim 24 was obvious (which I do not find), claim 25 would still not be obvious. The IO port claimed by claim 25, although previously known, was used solely to input feed gas and output LNG. According to Arc's expert, IO ports were not used to receive electricity as well. There is a gap between what is claimed in claim 25 and the state of the art, as of June 2018, which is not bridged on the evidence.

[265] As with claim 24, Arc's expert says that the skilled person would not configure an IO port to receive electricity as described in claim 25. Instead, he again says that the design is uninventive because it is unsafe. However, obviousness is not determined by safety concerns, which may be relevant to utility but are not in play here. Claim 25 is not obvious.

[266] Since claim 27 depends only on claim 25, and since claim 28 in turn depends only on claim 27, neither claim 27 nor claim 28 are obvious.

(i) *Dependent Claim 29: Void Space*

[267] Claim 29 depends only on the apparatus of claim 28, where (1) "a top surface of each upper membrane is spaced apart from the upper deck to define a void space", and (2) "the void space is

sized and shaped to be capable of containing an amount of fluid having a weight that is approximately equal to a weight of the AER System".

[268] Since claim 28 is not obvious, claim 29 is also not obvious. Nevertheless, the parties discussed claim 29 at length in their submissions. I will therefore briefly canvass the inventive concept of claim 29 and whether it would still be non-obvious regardless of my conclusion with respect to claim 28.

[269] The inventive concept of claim 29 is the void space below the upper deck, which is able to contain fluid of a similar weight to the AER System before that system is installed. As I find below in my discussion on utility, the evidence shows that this aspect of the claim could present benefits to the manufacturing process of the FLNG facility.

[270] Arc's expert acknowledges that claim 29's inventive concept is distinct from the state of the art. I agree. He goes on to argue that, while the "skilled person would not incorporate a void space as described by claim 29 as a feature of an at-shore FLNG", the claim is still not inventive because it is unsafe. Again, this is not relevant for the purposes of obviousness in respect of this claim. The fact that the skilled person would not be able to bridge the gap between claim 29 and the state of the art is sufficient to conclude that the claim is not obvious.

[271] Claim 29 is therefore not obvious regardless of my conclusion regarding claim 28.

(j) *Dependent Claims 30, 31, 32, 54, 55, 60, 61, and 62: Gas Redistribution for Liquefaction*

[272] Claim 30 depends on each of the apparatuses of claims 21 to 29, adding that the claimed apparatus also comprises a gas collection and distribution system, which is configured to (1) receive a "first gas" from the AER System and a "second gas" from the LNG storage tanks, (2) convert "a portion" of the first and second gas to a high-pressure fuel gas, and (3) recycle the high-pressure fuel gas to the AER System. Claim 31 depends on the apparatus of claim 30, where (4) the first gas is different from the second gas. Claim 32 depends on claim 31, where (5) the collection and distribution system is configured to receive an input of a third gas from the LNG transport vessel.

[273] Claim 54 depends on any of the apparatuses of claims 21 to 29, adding that the claimed apparatus also comprises a gas collection and distribution system, which is configured to (1) collect low-pressure fuel gas from the AER System as a by-product of liquefaction, (2) convert a portion of the collected gas into a high pressure fuel gas for use as a feed gas, and (3) output the high-pressure fuel gas to the AER System.

[274] Claim 55 also depends on any of the apparatuses of claims 21 to 29, adding that the apparatus also comprises a fuel gas collection and distribution system configured to (1) receive fuel gas from the AER System and from at least one of the plurality of LNG storage tanks, and (2) convert the fuel gas into a feed gas for use by the AER System.

[275] Claim 60 depends on any of the methods of claims 56 to 59, adding that the liquefaction method further comprises (1) receiving fuel gas from at least one of the AER System and the plurality of LNG storage tanks, and (2) outputting the fuel gas to at least one compressor. Claim 61 depends on the method of claim 60, adding that method also comprises (3) receiving additional fuel gas from an LNG transport vessel separate from the apparatus, and (4) outputting the additional fuel gas said compressor(s). Claim 62 depends on the method of claim 61, and further adds that (5) at least one of the fuel gas and the additional fuel gas comprises a boil-off gas.

[276] Both experts agree that claims 30, 31, 32, 54, 55, 60, 61, and 62 are very similar. However, Arc's expert states that claim 30 (and claims 31 and 32 by extension) are distinct from the other five claims. He focuses in particular on the term "fuel gas". He notes that the term "fuel gas" does not refer to a substance that is chemically distinct from feed gas. The term refers instead to gas that is used for power or heat generation. From this, Arc's expert concludes that the "fuel gas" that is redirected to the AER System in claim 30 is intended to be used to generate power for the AER System. Steelhead's expert states in contrast that the use of the term "fuel gas" implies that the gas *could* be used to generate electricity for the AER System through a gas turbine generator, but that it could also be used as feed gas that undergoes the liquefaction process again.

[277] I do not find either expert persuasive based on the evidence before the Court. The notion that the fuel gas in any of these claims is redirected to the AER System to generate power would mean that that system is no longer reliant on electrically-driven compressors, but gas turbines. Yet, from its very name, a fundamental component of the AER System is electrically-driven compressors. Moreover, claim 54 states that the high-pressure fuel gas would be "for use as a feed

gas". Claim 55 uses similar wording. Therefore, the view that the claims use the term "fuel gas" to convey that said gas would be used to generate power is not correct.

[278] Understood accordingly, the "fuel gas" in these claims refers to gas that has gone through liquefaction, but that was not adequately liquefied or that has reverted back into the gaseous state while in storage. Therefore, the claims above all present the same inventive concept – namely, a system on a nearshore FLNG facility whereby gas that has not been fully liquefied or that has reverted back into the gaseous state is redistributed back into the AER System for further liquefaction.

[279] Steelhead's expert does not address claims 30, 31, 32, 54, 55, 60, 61, and 62 specifically with respect to obviousness. Arc's expert says that it was known by June 2018 that LNG facilities, including FLNG facilities, used fuel collection and distribution systems, partly to collect LNG that reverts back to the gaseous state and have it liquefied again. However, he adds that their use on a *nearshore* facility is distinct, and he acknowledges that this presents a gap between the state of the art and the inventive concept here. I agree.

[280] Arc's expert correctly argues that the gap identified here can be bridged by the skilled person. The skilled person's common general knowledge included the understanding that gas vapour would be collected during the typical stages of LNG production and storage. The skilled person would have only had to apply this understanding in the context of a nearshore FLNG facility. This is obvious.

[281] Therefore, claims 30, 31, 32, 54, 55, 60, 61, and 62 are obvious

(k) *Dependent Claim 40: Balanced Topside Configuration*

[282] Claim 40 depends on the apparatus of claim 39, where (1) "the first refrigeration train is arranged on the port side of the hull", (2) "the second refrigeration train is arranged on the starboard side of the hull", and (3) "the weight of the first train is further balanced against the weight of the second train about the centerline axis of the hull to further stabilize the water-based apparatus". As a reminder, claim 39 positions the first and second refrigeration trains so that they counterbalance one another across the mid-ship axis.

[283] Arc's expert says that the prior art discloses refrigeration trains that counterbalance one another across the mid-line axis of the vessel. I agree, as discussed with respect to claim 39 under anticipation. Arc's expert also argues that having the refrigeration trains simultaneously counterbalance one another across both the centerline axis and the mid-ship axis presents a distinct invention. I agree.

[284] As I concluded above, the skilled person would know marine systems through their common general knowledge. I understand this to include the balancing of refrigeration trains across either one of the vessel's axes. The skilled person would therefore be able to bridge the difference by counterbalancing the refrigeration trains across two axes, instead of only the mid-ship axis.

[285] Claim 40 is obvious.

(4) Summary of Findings on Obviousness

[286] I find that:

1. Claims 24, 25, 27, 28, and 29 are not obvious;

2. Claims 26, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, are not obvious insofar as they depend on claims 24, 25, 27, 28, and 29, directly or indirectly, and are otherwise obvious;

3. Claims 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, and 84 are obvious.

D. *Lack of Utility*

[287] An invention's utility is ascertained by examining its subject-matter. To have utility, the invention must provide a solution to a practical problem that pertains to the nature of that subject-matter. Any use pertaining to the invention's subject matter will do (*AstraZeneca Canada Inc v Apotex Inc*, 2017 SCC 36 [*AstraZeneca*] at paras 52-53).

[288] The degree of utility does not matter. A "scintilla" of utility will suffice. However, utility must be established at the claim date by demonstration or sound prediction (*AstraZeneca* at para 55). In *Aventis Pharma Inc v Apotex Inc*, 2006 FCA 64 at paragraph 27, citing *Apotex Inc v*

Wellcome Foundation Ltd, 2002 SCC 77, the Federal Court of Appeal summarized the test for sound prediction as follows:

> (a) First, there must be a factual basis for the prediction. […]
>
> (b) Second, the inventor must have at the date of the patent application an "articulable" and "sound" line of reasoning from which the desired result can be inferred from the factual basis; and
>
> (c) Third, there must be proper disclosure.

[289] The invention does not need to meet the exact “promise” presented by its patent regarding its utility – all that is necessary is to demonstrate that there is utility or to soundly predict it (*AstraZeneca* at para 2).

[290] Arc advances this ground solely with respect to claim 29. Claim 29 is a dependent claim that traces its dependency through several other claims (claims 28, 27, 25, 24, 23, and 22) back to independent claim 21. It claims in particular a “void space” between the upper-deck of the vessel and the top of the LNG storage tanks’ upper membrane that is “capable of containing” an amount of fluid of a weight approximately equal to the AER System’s weight on the upper deck.

[291] Arc’s expert argues that claim 29 lacks utility because, if fluid is placed in the void space while the vessel is operational (i.e. the AER System is on the upper-deck), the vessel would sink. Arc’s expert’s testimony on cross-examination as to the meaning of the phrase “capable of containing” demonstrates the assumption underlying this interpretation:

> The "capable of containing," there's no time limitation on that. So it says capable of containing, means that the void space must <u>always</u> be able to hold that weight of water.

[Emphasis added]

[292] This is a narrow and selective reading of the specification. It is not the interpretation of a skilled person with a mind willing to understand. Steelhead correctly says that a skilled person desirous of understanding would read the specification as a whole.

[293] The patent's disclosure states, first, that the void space would be filled "during manufacturing" of the vessel to "simulat[e]" the weight of the AER System and, second, that the fluid would be incrementally "releas[ed]" as the AER System is loaded on the vessel. I agree with Steelhead's expert that the skilled person would understand this to mean that the void space would be used during the vessel's manufacturing phase to ensure the stability of the vessel. Evidently, this presents more than a scintilla of utility that is soundly predicted. Therefore, claim 29 does not lack utility.

E. *Insufficiency*

[294] A patent must describe the claimed invention fully and correctly (*Patent Act* at s. 27(3)). Insufficient disclosure invalidates the patent.

[295] Insufficiency is concerned with the ability of a skilled person to replicate the invention with the information disclosed in the patent (*Teva Canada Ltd v Pfizer Canada Inc*, 2012 SCC 60 [*Teva*] at paras 51-52, citing *Pioneer Hi-Bred Ltd v Canada (Commissioner of Patents)*, [1989] 1 SCR 1623). A patent is therefore sufficient if it enables a person skilled in the art to produce or perform the claimed invention using only the information within that patent (*Teva* at paras 51-52).

[296] To assess insufficiency, the Court examines the entirety of the patent specification, including both the disclosure and the claim (*Teva* at paras 55 and 69). It is assumed that the skilled person may require some trial and error to perform the invention, but such trial and error cannot amount to a "minor research project" or guesswork (*Teva* at para 75).

[297] Arc argues that the patent would not enable a skilled person to perform the invention. This is inconsistent with their position on anticipation, where they argue that the Sullivan presentations and the Talib papers anticipate many of the 085 Patent's claims – that is, they disclose many of the patent's claims and enable the skilled person to perform them. However, in my view, the Sullivan presentations and the Talib papers disclose the invention with a similar degree of detail and specificity as the 085 Patent. Given I have already accepted that those prior disclosures would enable the skilled person to perform the invention claimed by the 085 Patent, I also find that the 085 Patent would enable the skilled person to do the same. Therefore, the 085 Patent is sufficiently disclosed.

F. *Overbreadth*

[298] A patent cannot claim more than what was invented or disclosed. If a claim is broader than either the invention or the disclosure, then that claim is invalid (*Pfizer Canada Inc v Pharmascience Inc*, 2013 FC 120 at para 84, citing *Leithiser v Pengo Hydra-Pull of Canada Ltd*, [1974] 2 FC 954 at 965 (FCA)).

[299] Arc's expert says that claim 29 is overbroad, along with any other claim that depends on it. He does not rely on overbreadth as grounds for invalidity for any other claim. Arc's expert rests

his argument on the view that, since the 085 Patent's disclosure indicates that the void space must be used only during the manufacturing process, claim 29's failure to include that limit therefore leaves it broader than what was disclosed.

[300] I disagree with Arc's expert. As I said with respect to utility, a skilled person reading claim 29 with a mind willing to understand would see that the term "capable" is ambiguous and would go to the 085 Patent's disclosure to eliminate the ambiguity. Therefore, claim 29 is not overbroad.

[301] Separate from its expert, Arc also relies on the testimony of Mr. Brigden on cross-examination. Mr. Brigden noted that a number of elements as "essential", "required", "important", or otherwise "part of" the invention he purports to have made. A full list of those elements are in the summary of Mr. Brigden's evidence above. Arc argues that these elements demonstrate that the claims are overbroad.

[302] Steelhead objected to Arc's reliance on Mr. Brigden's testimony. I agree with Arc that it may rely on Mr. Brigden's evidence even though he was called by Steelhead. It was well within Arc's right to cross-examine Mr. Brigden on what he considered to be an essential element of the invention, since it was Steelhead that adduced the evidence of Mr. Brigden with respect to the invention story.

[303] That said, I do not agree with the conclusion Arc draws from that evidence. Simply put, Mr. Brigden's evidence is not sufficient to prove overbreadth. The testimony of an inventor who is put forward as a fact witness is not pertinent to the construction of claims in the eyes of the

skilled person. That construction is made by the Court with guidance from the experts, who assist in reading the claims through the eyes of the skilled person equipped with the common general knowledge at the relevant date. Neither expert provided evidence with respect to Mr. Brigden's views on what is and is not essential to the invention. The evidence as a whole does not support a finding of overbreadth.

VI. Costs

[304] The parties agree that a lump sum costs award to the successful party is appropriate. However, the parties could not agree on what constitutes success. Due to the web of dependencies that arises out of the 085 Patent, there is a range of possible degrees of relative success. The issue then is how to properly delineate instances where the parties share a "divided success" from ones where one party clearly prevails over the other, even though they were not successful on all challenges.

[305] Steelhead takes the position that if some but not all of the claims are invalid, then each party should bear its own cost, even if only one claim is held valid or invalid (as the case may be). Steelhead cites *Aux Sable Liquid Products LP v JL Energy Transportation Inc*, 2019 FC 788 [*Aux Sable*] in support of this view. However, this decision is distinguishable from the case here. In *Aux Sable*, the patent in question included only ten claims. Therefore, when the Court concluded that only two of the claims were invalid, that conclusion pertained to a significant portion of the overall patent. This justified the Court's finding of "divided success". Here, there are 84 claims. It is unfair to deny a party costs simply because they were not successful with respect to five claims out of 84, even if the validity of those claims cascades partially to other claims that are otherwise invalid.

[306] Arc suggests that success here is best assessed by reference to the independent claims. In particular, Arc proposes that if more than half of the independent claims are found to be invalid, then they are the successful party. Arc notes that the independent claims were where the parties focused their submissions, arguments, and trial resources. I agree, particularly since "the amount of work" is a factor available to me to consider under rule 400(3)(g) of the *Federal Courts Rules*, SOR/98-106.

[307] Steelhead cites *Eurocopter v Bell Helicopter Textron Canada Limitée*, 2012 FC 842, where the Court held that "[t]here is no general rule that an independent [claim] is more important than a dependant one in the context of an invalidity action". Again, while this is true, the fact is that most of the parties' time during trial, as well as most of their submissions, were focused on the independent claims.

[308] Arc was able to show invalidity for all four independent claims, and the majority of dependent claims. It is predominantly the successful party in this proceeding.

[309] I turn now to the amount of the award.

[310] Arc is again correct in saying that the lump sum award must fall within a range of 25 to 50 percent of reasonable fees, plus disbursements. Arc also says that, consistent with prior decisions of this Court, the award should steer towards the mid-point of that range. The award should only be lower than the mid-point if Arc failed to prove invalidity on more than half of the dependent

claims, notwithstanding its success on the independent claims. I agree. This is a fair approach that acknowledges the range of possible outcomes in a proceeding such as this one.

[311] I am not persuaded by Steelhead's position that I should defer to the conclusion I made on costs in the underlying infringement action. There, I awarded a lump sum award of 30% of reasonable fees, plus disbursements. However, that is a separate proceeding from the one before me here. Moreover, I selected that point in the range because the motion for summary trial was brought on early, focused on discrete issues, and required less than three days of hearings. None of these circumstances apply here.

[312] However, Steelhead claims that if costs are to be awarded to Arc, they should be reduced to 25% due to the withdrawal/discontinuance of the abuse of process counterclaim by Arc against the Defendants by Counterclaim at a late stage of the proceedings. I have some sympathy for Steelhead's position on this issue.

[313] The Defendants/Plaintiffs by Counterclaim are awarded 30% of reasonable legal fees, plus 100% of reasonable disbursements, less those reasonable fees and disbursements wasted by the Defendants by Counterclaim on the abuse of process counterclaim. Reasonable fees are limited to three counsel at most for each discrete step in the action.

[314] I add one caveat to this conclusion. Steelhead advanced the untenable position that the Sullivan presentations were inauthentic, despite adducing no evidence to that effect. Arc was forced to call Mr. Sullivan as a witness and arrange his travel from Houston, Texas to attend the

proceedings in person. I agree with Arc that this justifies awarding full indemnity costs, inclusive of fees and disbursements, in relation to Mr. Sullivan's testimony, notwithstanding my general conclusion on costs.

[315] Azimuth are not liable for any costs, since they did not take part in the proceeding.

[316] The Defendants/Plaintiffs by Counterclaim shall provide the other party a bill of costs within 20 days of the Court's decision, and the parties shall then endeavour to agree on a reasonable costs quantum in accordance with the Court's determination within 40 days of the Court's decision, failing which they may seek guidance from the Court on any discrete issues they cannot agree upon.

VII. Conclusion

[317] Claims 24, 25, 27, 28, and 29 are valid.

[318] Claims 26, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, and 55 are valid insofar as they depend on claims 24, 25, 27, 28, and 29, directly or indirectly, and are otherwise invalid.

[319] Claims 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, and 84 are invalid.

[320] The Defendants/Plaintiffs by Counterclaim are awarded 30% of reasonable legal fees, plus 100% of reasonable disbursements, less those reasonable fees and disbursements wasted by the Defendants by Counterclaim on the abuse of process counterclaim. They are also awarded full indemnity costs, inclusive of fees and disbursements, in relation to Mr. Paul Sullivan's testimony. Azimuth is not liable for any costs.

JUDGMENT in T-1488-20

THIS COURT'S JUDGMENT is that:

1. Claims 24, 25, 27, 28, and 29 of Canadian Patent No. 3,027,085 are valid;

2. Claims 26, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, and 55 of Canadian Patent No. 3,027,085 are valid insofar as they depend on claims 24, 25, 27, 28, and 29, directly or indirectly, and are otherwise invalid;

3. Claims 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, and 84 of Canadian Patent No. 3,027,085 are invalid.

4. The Defendants/Plaintiffs by Counterclaim are awarded 30% of reasonable legal fees, plus 100% of reasonable disbursements, less those reasonable fees and disbursements wasted by the Defendants by Counterclaim on the abuse of process counterclaim. They are also awarded full indemnity costs, inclusive of fees and disbursements, in relation to Mr. Paul Sullivan's testimony. Azimuth is not liable for any costs.

"Michael D. Manson"
Judge

FEDERAL COURT

SOLICITORS OF RECORD

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