Commissioner's Decision No. 1499
Décision du commissaire n^{o} 1499

TOPICS: G00 Utility
C00 Disclosure - Adequacy or Deficiency of Description;

SUJETS: G00 Utilité
C00 Divulgation - Caractère adéquat ou inadéquat de la description

Application No. 2,663,657
Demande n^{o} 2 663 657

IN THE CANADIAN PATENT OFFICE

DECISION OF THE COMMISSIONER OF PATENTS

Patent application number 2,663,657, having been rejected under subsection 30(3) of the *Patent Rules*, has subsequently been reviewed in accordance with paragraph 30(6)(*c*) of the *Patent Rules*. The recommendation of the Patent Appeal Board and the decision of the Commissioner are to refuse the application.

Agent for the Applicant:

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INTRODUCTION

[1] This recommendation concerns the review of rejected patent application number 2,663,657, which is entitled "Power Generation System." The patent application is owned by Allan Jerome, who is also the inventor. The outstanding defects to be addressed in this review are whether or not the claims define useful subject matter and whether or not the specification is sufficient. The Patent Appeal Board (the "Board") has reviewed the rejected application pursuant to paragraph 30(6)(*c*) of the *Patent Rules*. As explained below, our recommendation is to refuse the application.

BACKGROUND

The application

[2] Canadian patent application 2,663,657 is based on a previously filed Patent Cooperation Treaty application and is considered to have a filing date of September 20, 2006. It was made available to the public on March 27, 2008.

[3] The application relates to a power generation system which incorporates a hydrogen plasma generator to produce thermal power, which is then converted into electrical power. Some of the electricity generated is used in a water splitting apparatus for producing the necessary hydrogen supply.

Prosecution history

[4] On February 5, 2016, a Final Action ("FA") was written pursuant to subsection 30(4) of the *Patent Rules*. The FA explained that the application is defective on the grounds that the claims on file (i.e. claims 1-26) define subject matter that lacks utility and thus do not comply with section 2 of the *Patent Act.* The FA identified two additional minor defects, namely, that a term in claim 17 was missing an antecedent and thus lacks clarity as required by subsection 27(4) of the *Patent Act* and that a reference in Figure 2 was inaccurate and thus contravenes subsection 37(2) of the *Patent Act.*

[5] In an August 4, 2016 response to the FA ("RFA"), the Applicant submitted arguments for allowance and provided a set of proposed claims 1-26 which addressed the defect identified in the FA regarding claim 17. A replacement Figure 2 was also provided to correct the defect therein.

[6] As the Examiner considered the application still did not comply with the *Patent Act* and *Patent Rules*, the application was forwarded to the Board for review pursuant to subsection 30(6) of the *Patent Rules*, along with a Summary of Reasons ("SOR") maintaining the rejection of the application. The SOR indicated that the proposed changes to claim 17 and Figure 2 would rectify those minor defects, but that the proposed claims still failed to define useful subject matter.

[7] With a letter dated October 19, 2016, the Board sent the Applicant a copy of the SOR and offered the Applicant the opportunity to make further written submissions and to attend an oral hearing.

[8] With its response to the SOR ("RSOR") of November 30, 2016, the Applicant confirmed its interest in having the matter reviewed by the Board.

[9] The present Panel was formed to review the application under paragraph 30(6)(*c*) of the *Patent Rules* and to make a recommendation to the Commissioner as to its disposition. In a preliminary review letter dated March 12, 2019 (the "PR" letter), we presented our analysis and rationale as to why, based on the record before us, the subject matter of the claims on file did not comply with the utility requirements of section 2 of the *Patent Act*. Under the provision of subsection 30(6.1) of the *Patent Rules*, we also raised a new defect regarding insufficiency of the description contrary to subsection 27(3) of the *Patent Act*.

[10] With respect to the two minor defects in claim 17 and Figure 2, we stated in the PR letter that the proposed amendments to claim 17 and Figure 2 would rectify those defects; accordingly, we stated that these two minor defects were not issues that required any further analysis. However, the PR letter stated that the Panel's view regarding the utility and sufficiency defects would have remained even if the proposed claims had been adopted.

[11] In its response to the PR letter (the "RPR" letter) dated April 4, 2019, the Applicant indicated that a hearing was no longer required and that no written submissions would be made in response to the PR letter.

ISSUES

[12] In view of the above history, and in recognition that the defects regarding claim 17 and Figure 2 have been sufficiently addressed, there are two outstanding issues to address in this review:

- whether claims 1-26 on file define subject matter that is useful as required by section 2 of the *Patent Act*; and
- whether the specification is sufficient as required by subsection 27(3) of the *Patent Act*.

LEGAL PRINCIPLES AND PATENT OFFICE PRACTICE

Purposive construction

[13] In accordance with *Free World Trust v Électro Santé Inc*, 2000 SCC 66 [*Free World Trust*], essential elements are identified through a purposive construction of the claims done by considering the whole of the disclosure, including the specification and drawings (see also *Whirlpool Corp v Camco Inc*, 2000 SCC 67 [*Whirlpool*] at paragraphs 49(f) and (g) and 52). In accordance with the *Manual of Patent Office Practice*, revised June 2015 (CIPO) [*MOPOP*] at §13.05, the first step of purposive claim construction is to identify the skilled person and his or her relevant common general knowledge (CGK). The next step is to identify the problem addressed by the inventors and the solution put forth in the application. Essential elements can then be identified as those required to achieve the disclosed solution as claimed.

[14] When determining if a document's disclosure is a matter of CGK, it is helpful to consider the guidance in *Uponor AB v Heatlink Group Inc*, 2016 FC 320 at para. 48, citing *Eli Lilly & Co v Apotex Inc,* 2009 FC 991 at para. 97, which provides a comprehensive description of common general knowledge:

> a) The common general knowledge imputed to such an addressee must, of course, be carefully distinguished from what in patent law is regarded as public knowledge;
>
> b) Common general knowledge is a different concept derived from a common sense approach to the practical question of what would in fact be known to an appropriately skilled addressee - the sort of man, good at his job, that could be found in real life;
>
> c) Individual patent specifications and their contents do not normally form part of the relevant common general knowledge, though there may be exceptions.
>
> d) Regarding scientific papers generally:

> i. It is not sufficient to prove common general knowledge that a particular disclosure is made in an article, or series of articles, or in a scientific journal, no matter how wide the circulation of that journal may be, in the absence of any evidence that the disclosure is accepted generally by those who are engaged in the art to which the disclosure relates;
>
> ii. A piece of particular knowledge as disclosed in a scientific paper does not become common general knowledge merely because it is widely read, and still less because it is widely circulated;
>
> iii. Such a piece of knowledge only becomes general knowledge when it is generally known and accepted without question by the bulk of those who are engaged in the particular art; in other words, when it becomes part of their common stock of knowledge relating to the art;
>
> iv. It is difficult to appreciate how the use of something which has in fact never been used in a particular art can ever be held to be common general knowledge in the art.

[15] As stated in *MOPOP* §15.02.02b, regarding CGK:

> The common general knowledge distinguishes the body of information that is widely recognised from that which is simply publicly available. Individual disclosures may become common general knowledge, but only when they are generally known and regarded as a good basis for further action. At the same time, some information that forms part of the common general knowledge may not have been written down at all.

Utility

[16] The statutory basis for the utility requirement is derived from section 2 of the *Patent Act*:

> "Invention" means any new and useful art, process, machine, manufacture or composition of matter, or any new and useful improvement in any art, process, machine, manufacture or composition of matter.

[17] In *AstraZeneca Canada Inc v Apotex Inc*, 2017 SCC 36 at para 53, the Supreme Court of Canada stated that the "[u]tility will differ based on the subject-matter of the invention as identified by claims construction," and outlined the approach that should be undertaken to determine whether a patent discloses an invention with sufficient utility under section 2 of the *Patent Act*:

> [54] To determine whether a patent discloses an invention with sufficient utility under s. 2, courts should undertake the following analysis. First, courts must identify the subject-matter of the invention as claimed in the patent. Second, courts must ask whether that subject-matter is useful - is it capable of a practical purpose (i.e. an actual result)?
>
> [55] The Act does not prescribe the degree or quantum of usefulness required, or that every potential use be realized - a scintilla of utility will do. A single use related to the nature of the subject-matter is sufficient, and the utility must be established by either demonstration or sound prediction as of the filing date (AZT, at para. 56).

[18] Therefore, utility must be established either by demonstration or sound prediction as of the Canadian filing date. Utility cannot be supported by information and expertise that only became available after the filing date: *Apotex Inc v Wellcome Foundation Ltd*, 2002 SCC 77 at para 56 [*AZT*], cited in the passage above.

[19] Where the utility of an invention is to be established by demonstration, the demonstration must have occurred as of the filing date but need not have been included in the description: *Eli Lilly Canada Inc v Apotex Inc*, 2015 FC 1016, at paras 138 to 142. Information establishing the demonstrated utility as of the filing date may be provided after the filing date by the applicant.

[20] The doctrine of sound prediction allows establishing asserted utility even where that utility had not been fully verified as of the filing date. However, a patent application must provide a "solid teaching" of the claimed invention as opposed to "mere speculation" (*AZT*, at para 69).

[21] The soundness of a prediction is a question of fact (*AZT*, at para 71). A sound prediction analysis should consider three elements (*AZT*, at para 70):

1. there must be a factual basis for the prediction;
2. 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
3. there must be proper disclosure of the factual basis and line of reasoning.

[22] In *Bell Helicopter Textron Canada Ltée v Eurocopter*, 2013 FCA 219 [*Eurocopter*], the Federal Court of Appeal clarified that an assessment of the soundness of a

prediction is to be performed through the eyes of the skilled person, possessed of the common general knowledge in the art, stating at para 152:

> In my opinion, the factual basis, the line of reasoning and the level of disclosure required by the doctrine of sound prediction are to be assessed as a function of the knowledge that the skilled person would have to base that prediction on, and as a function of what that skilled person would understand as a logical line of reasoning leading to the utility of the invention [emphasis added].

[23] The Court went on to note that the part of the factual basis not grounded in scientifically accepted laws or principles, or forming part of the CGK, may need to be disclosed in the specification:

> [153] Where the factual basis can be found in scientifically accepted laws or principles or in information forming part of the common general knowledge of the skilled person, then no disclosure of such factual basis may be required in the specification. On the other hand, where the factual basis is reliant on data which does not form part of the common general knowledge, then disclosure in the specification may indeed be required to support a sound prediction.

[24] Further, in *Allergan Inc v Apotex Inc*, 2016 FC 344, the Federal Court clarified (at para 57) that, aside from the common general knowledge, the factual basis and sound line of reasoning relied upon for sound predictions must be found in the application:

> In my view, until the Federal Court of Appeal or the Supreme Court of Canada rules otherwise, Canadian jurisprudence is that, with the exception of matters of common general knowledge, the factual basis and the line of reasoning must be included in the patent [emphasis added].

Sufficiency of disclosure

[25] Paragraphs 27(3)(*a*) and (*b*) of the *Patent Act* require, respectively, that the specification of a patent (1) describe the invention, and (2) set out the steps for its production and use:

> The specification of an invention must:
> (a) correctly and fully describe the invention and its operation or use as contemplated by the inventor;
> (b) set out clearly the various steps in a process, or the method of constructing, making, compounding or using a machine, manufacture or composition of matter, in such full, clear, concise and exact terms as to

> enable any person skilled in the art or science to which it pertains, or with which it is most closely connected, to make, construct, compound or use it;

[26] A determination of whether the specification complies with paragraphs 27(3)(*a*) and 27(3)(*b*) of the *Patent Act* requires that three questions be answered: What is the invention? How does it work? Having only the specification, can the person of skill in the art produce the invention using only the instructions contained in the disclosure? (*Teva Canada Ltd v Novartis AG*, 2013 FC 141, citing *Teva Canada Ltd v Pfizer Canada Inc*, 2012 SCC 60 [*Teva SCC*] and *Consolboard Inc v MacMillan Bloedel (Sask) Ltd*, [1981] 1 SCR 504 at 526, 1981 CanLII 15).

[27] An affirmative answer to the third question requires that the person skilled in the art not be called upon to display inventive ingenuity or undertake undue experimentation: *Aventis Pharma Inc v Apotex Inc,* 2005 FC 1283; *Mobil Oil Corp v Hercules Canada Inc* (1995), 63 CPR (3d) 473 (FCA); *Merck & Co v Apotex Inc*, [1995] 2 FC 723, 1995 CanLII 3586 (CA).

[28] The relevant date for assessing compliance with subsection 27(3) of the *Patent Act* is the filing date: *Teva SCC*, at para 90.

[29] According to *MOPOP* §9.03:

> Although external documents may be referred to in the description, the invention must be described and enabled by the description alone as interpreted by the person skilled in the art in view of their common general knowledge. Specific prior art knowledge (e.g. information only available in one or a few documents, and which has not been shown to be commonly known and accepted) may be considered not to be "common general knowledge", and in such cases those specific teachings from the prior art necessary to describe or enable the invention must be included in the description in order to provide a full and complete disclosure.

ANALYSIS

Claim Construction

[30] The Applicant did not respond to the claim construction provided in the PR letter. Therefore we adopt for this review the skilled person, the CGK, the problem and solution, the meaning of certain terms in the claims, and the essential elements that were set out in the PR letter.

The skilled person

[31] The PR letter identified the person skilled in the art as "a person skilled in power generation and especially the generation of electrical energy from thermal energy, and with the splitting of water to obtain hydrogen." We also noted that this person would have a background in electrical engineering, physics and chemistry.

The CGK

[32] The PR letter identified the following knowledge belonging to the CGK of the skilled person:

- knowledge of micro-pipe heat exchangers for efficient transfer of thermal energy from one area to another;
- knowledge of conventional electrical power generation using the combustion of a fuel to produce thermal energy which is then converted to electrical energy for storage or to power a load. Such systems utilize control systems to regulate the fuel supply to meet load conditions;
- knowledge that conventionally accepted energy conversion efficiency is never greater than unity (i.e., is less than 100% efficient) and that an overall system efficiency is the product of the efficiencies of each energy conversion stage, with losses expected at each stage due to heat, friction, resistance, etc.;
- knowledge of general chemical properties of elements including conventionally accepted theories of atomic properties including the lowest energy state of an electron termed the ground state (also known as "n=1" state); and
- knowledge of general laws and theories of physics, including quantum mechanics and thermodynamics, including, for example, the Law of Conservation of energy.

The problem and solution

[33] The problem understood by the skilled person reading the application on the filing date is that thermal to electric power generation suffers inefficiencies such as the high cost of primary fuels and the losses in the transfer of thermal and electrical energy. The solution is a system based on the combination of a hydrogen-powered thermal to electric converter combined with a micro-pipe heat sink wherein the conversion of thermal energy to electrical energy provides sufficient energy to sustain the system using only water as the primary fuel.

The claims on files

[34] Independent claims 1 and 2 are directed to the combination of elements comprising a power generation system. We consider that claim 1 is representative of the claimed solution:

> A power generation system arranged to use water as a primary source, the system comprising:
>
> - a water splitting apparatus for performing a water splitting process that decomposes the water into diatomic hydrogen and oxygen;
> - a first energy conversion apparatus comprising:
>
> a first hydrogen plasma generator arranged to receive a first supply of the diatomic Hydrogen from the water splitting apparatus for use thereof in a first reaction process performed by said first hydrogen plasma generator, from which thermal energy is generated;
>
> a thermal to electric converter having a hot side thereof thermally coupled to said first hydrogen plasma generator to generate electrical power from the thermal energy generated by said first hydrogen plasma generator; and
>
> a first micro-pipe heat sink thermally coupled to a cold side of the thermal to electric converter to transfer thermal energy from said cold side of the thermal to electric converter to a first flow of working fluid that passes through said first micro-pipe heat sink;
>
> - a second energy conversion apparatus comprising:
>
> a second hydrogen plasma generator arranged to receive a second supply of the diatomic Hydrogen from the water splitting apparatus for use thereof in a second reaction process performed by said second hydrogen plasma generator, from which thermal energy is generated; and
>
> a second micro-pipe heat sink thermally coupled to said second plasma generator to transfer the thermal energy from said second plasma generator to a second flow of working fluid that passes through said second micro-pipe heat sink; an electrical energy storage device connected to the thermal to electric converter of the first energy conversion apparatus for charging said electrical energy storage device with the electrical power generated by said first energy conversion apparatus;
>
> - a thermal energy storage device and a heat pump that connects said thermal energy storage device to the first micro-pipe heat sink by way of a flow passage through which thermal energy in the first flow of working

> fluid is conveyable to said thermal energy storage device by said heat pump;
> - an electrical system connected to the electrical energy storage device and to the thermal to electric converter and comprising an electrical output, a voltage converter and signal conditioning means that are connectable to an electrical load for powering of said electrical load from said electrical energy storage device or said thermal to electric converter; and
> - an electronic controller operably connected to the water splitting apparatus, the first and second energy conversion apparatuses, and the electrical and thermal energy storage devices in order to control the water splitting process of the water splitting apparatus and the reaction processes of the plasma hydrogen generators, control conditions of the first and second flows of working fluid through the first and second micro pipe heat sinks, and determine and control energy levels of the electrical and thermal energy storage devices.

[35] Claim 2 defines an embodiment comprising similar components in combination; however, it differs from claim 1 in that rather than defining first and second "hydrogen plasma generators" as the thermal sources, claim 2 defines first and second "thermal energy generating devices" as the source of thermal energy.

[36] Claims 3-26 are dependent claims defining additional limitations to the independent system claims:

> - claims 3-13 further define uses for the ancillary oxygen that is concurrently produced during the water splitting;
>
> - claims 14-17 further define the use of the power generation system in a marine vehicle application;
>
> - claims 18-26 further define limitations to the micro-pipe heat sink and to the heat transfer processes between system components.

Meaning of certain terms used in the claims

[37] The Panel noted in the PR letter that the skilled person, in construing the meaning and scope of the terms in the claims based on the understanding of the application, would know that:

> - regarding claim 2, "a first thermal energy device" would encompass all types of thermal energy devices, including the hydrogen plasma generator; and

> - regarding both independent claims 1 and 2, that in a "power generation system," the premise of the claimed system is to produce excess power. In both claimed embodiments, a portion of the energy produced by the thermal to electric conversion is the only energy used to power the water splitter apparatus (other than initial start-up power provided by the electric energy storage device). Thus, the skilled person would understand the claims to be to a self-sustaining generation system using only water as a fuel source.

Essential elements

[38] Given the relevant CGK and in consideration of the problem and solution being addressed by the application, the PR stated that the skilled person would consider all of the claimed elements to be essential in combination.

Utility

[39] The claims on file (1-26) were rejected for lacking utility. As noted earlier, utility is determined based on the two steps identified by the Supreme Court of Canada: first, we must identify the subject matter of the invention as claimed; and second, we must determine whether that subject-matter is useful - is it capable of a practical purpose, i.e., an actual result? This utility can be established by either demonstration or sound prediction.

What is the subject matter of the invention as claimed?

[40] The subject matter of the invention as claimed is electrical power generation using water as a source of hydrogen to power thermal to electric converters as a self-sustaining power supply. Additional features include micro-pipe heat sinks and thermal energy management.

Was the required utility established by demonstration as of the filing date?

[41] In the RFA, the Applicant made reference to "many independent tests" and "four public demonstrations," including online videos, which, the Applicant asserted, adds to the evidence previously submitted to the office regarding the operability of an alleged hydrogen plasma generator device disclosed in an unrelated United States patent 6,024,935 ("the Mills patent"), identified in the instant application.

[42] Regarding these references, as we stated in the PR letter:

> a) most if not all of the evidence submitted (tests and experiments, etc.) relating to the hydrogen plasma device was produced by entities

> related to the patentee Mills or under contract to Mills, except tests conducted by Rowan University and NASA, which themselves appear inconclusive as to the source of the insignificant change in heat;
> b) the video referenced in the RFA provides no proof that it is the same plasma generator disclosed in the Mills patent that is being viewed, nor that the device used produces excess energy: instead, the video shows some sort of general combustion at best; and
> c) the grant of a patent or publication of a patent application in another jurisdiction is not determinative of the utility or other validity requirements in Canada.

[43] Furthermore, as set out in the PR letter, there is no evidence from the application as filed or from subsequently filed submissions that as of the filing date the Applicant had built, demonstrated or tested the claimed power generation system that exploits excess energy from a hydrogen plasma generator using water as the primary fuel source, where the conversion of thermal energy to electrical energy provides sufficient energy to sustain the system. Although the application refers to several other patent documents and publications in the description, none of these provide any demonstration of the Applicant's power generation system as claimed.

[44] Accordingly, we consider that the utility of the claimed invention has not been established on the basis of demonstration.

[45] In the RFA, the Applicant argued that the crux of the issue is "whether atomic hydrogen when reacted with Mills' specified catalysts, experimentally and consistently produce excess energy." The Applicant then states that there is zero evidence in references cited by Examiner that authors have done the necessary experiments to disprove this argument:

> That is, the references cited by the Examiner do not document any experimentation of the prescribed catalytic reactions of Mills on which to empirically demonstrate in-utility of the hydrogen plasma generator, and instead only provide criticism and opinion on Mills' and the hydrino theory. [emphasis added]

[46] However, as we stated in our PR letter, we have found upon a review of the evidence on file that the utility of the invention as claimed has not been established on the basis of demonstration as of the filing date of the application. In such a case, there is no requirement for the panel to demonstrate its inutility.

[47] In the RFA, the Applicant also provided arguments that "there is no basis in the *Patent Act* or jurisprudence to include an evaluation of industry interest and exploitation as part of the patentability assessment for a claimed invention…."

[48] As we stated in the PR letter, the Panel accepts this last argument to the extent that the commercial success is not directly used to evaluate utility. As stated by the Court in *Eurocopter* at para 131, "utility in this context means useful for the purpose claimed, not commercial acceptance." The fact that an invention has not been constructed, fully tested and commercially exploited is not determinative of the question of utility. In a case where the utility of a claimed invention has not been demonstrated by complete testing, the invention may still be established to be useful on the basis of sound prediction, which is considered in the following section.

Was the required utility established by sound prediction as of the filing date?

[49] As noted in the section "Legal Principles and Patent Office Practice" above, the factual basis, the line of reasoning and the level of disclosure required for a sound prediction are to be assessed as a function of the knowledge that the skilled person would have to base that prediction on, and as a function of what that skilled person would understand as a logical line of reasoning leading to the utility of the invention.

i. *Factual basis*

[50] Regarding the matter of hydrogen powered thermal to electric conversion, the description references, as the preferred embodiment, the hydrogen plasma generator disclosed in the Mills patent.

[51] Additional references are disclosed to a number of patents for the remaining components (micro-pipes, thermal to electric converters, water splitting options, hydrogen storage, etc.).

[52] No references or other data sources are disclosed that support the notion of self-sustaining power generation, i.e., that the claimed system (comprising all components in combination as defining by claim 1 or claim 2) will generate excess energy from the use of water as the primary fuel.

[53] Instead, as we noted in the PR letter, the premise of the Inventor's basis of the useful operation of the invention is summarized in para 114 of the description:

> [114] Hydrogen produced at water splitting apparatus 122 will thenceforth be delivered to each of hydrogen plasma generators 140, typically after being separated from oxygen in a reactant stream via the means described herein. Diatomic hydrogen will thenceforth be converted to atomic hydrogen, and supplied to thermal energy sources/plasma generators 140. Plasma generation at generators 140 will result in the liberation of thermal energy, which will be transferred to thermal to electric converter 151 via a hot side thereof. Thermal energy will thenceforth be transferred from thermal to electric converter 151 to a micro-pipe heat exchanger on the cold side thereof. Electrical current will be produced by each thermal to electric converter, as described herein, to electrical system 175 to power an electrical load. Plasma generation can be increased or decreased to meet the power demands on the system.

[54] The other significant factor in identifying the factual basis in this particular case is the skilled person's CGK. Among the aspects of the CGK stated above, the PR letter identified three particular aspects that inform the relevant factual basis:

- the scientifically accepted principle of ground states and the lowest energy state of hydrogen is at n=1, and not a fractional energy state;

- the scientifically accepted principle that self-sustaining energy generation, wherein energy output is greater than input power and total losses, cannot exist with the known laws regarding the conservation of energy; and

- the knowledge that water splitting and thermal to electric conversions are nowhere near unity (100%) efficiency, and the scientifically accepted principle that no energy conversion can be greater than 100% efficient.

ii. *Line of reasoning*

[55] A sound prediction of utility requires an articulable and sound line of reasoning from which the desired result can be inferred from the factual basis.

[56] As previously stated, the subject matter of claims 1 and 2 for which a scintilla of utility is required is the generation of excess electrical energy using water as a primary fuel.

[57] The Applicant makes the following assertion in the description relating to the utility of the invention:

> [115] By implementing the aforementioned concepts, substantial improvements in the design and operation of power generation, thermal

> energy management and vehicle propulsion can be realized over other known systems. In particular, the present disclosure provides a virtually unlimited range when used in the context of marine vessels, obviating completely the need for refueling and fuel storage, and fuel delivery costs. Moreover, the size and weight of propulsion systems may be reduced over earlier designs, and negative environmental consequences of operation reduced. In addition, the use of water as a fuel presents substantial safety improvements as compared with earlier designs such as fossil fuel and nuclear propulsion systems.

[58] As set out in the PR letter, in order to consider the line of reasoning sound, the skilled person, reading the description, would need to accept as sound both: a) the proposal from the Mills patent on hydrogen plasma that ground states exist lower than one and is a more compelling theory then the accepted principles and laws of quantum mechanics and chemistry; and b) that a machine (system of components) can generate power having efficiencies greater that unity and produce excess energy using only water as the fuel source, and be self-sustaining. As stated in the SOR, the skilled reader would need to accept as the line of reasoning both of the following two hypotheses:

> The hydrogen atom can be induced below the ground state, and in doing so, release sufficient energy to power a system described in the independent claims. That is, enough energy is produced to power the marine vessel of claim 14, or the submarine vessel of claim 15, using only water as a primary fuel…..

and

> A conventional hydrogen engine (i.e., fuel cell) can release sufficient energy to power a system described in the independent claims. That is, will a conventional engine produce enough energy to power the marine vessel of claim 14, or the submarine vessel of claim 15, using only water as a primary fuel? …

[59] As summarized in the PR letter, to be considered sound, these hypotheses would have to be accepted by the skilled person in view of the conventionally and widely accepted scientific principles and theorems that make up part of the skilled person's CGK.

iii. Disclosure of factual basis, line of reasoning

[60] To establish a sound prediction of utility, the factual basis and line of reasoning underlying the prediction, except to the extent that they form part of the CGK at the filing date, must be disclosed in the specification as filed. The description must be sufficient so that a skilled person would understand the basis of the prediction and be able to soundly predict that the entire scope of the claimed invention would work once reduced to practice.

[61] As stated in *MOPOP* §12.04.03c:

> Where a sound prediction relies on additional information that is not publicly available, such information must be included in the description at the time of filing. In contrast with evidence that *demonstrates* utility, an applicant cannot provide evidence after the filing date to properly disclose a *sound prediction*, even if the evidence was generated before the filing date.
>
> Since the disclosure is directed to a person skilled in the art, the disclosure must allow that person to make a sound prediction. It is not enough for the description to disclose information that allows for a sound prediction only when interpreted in view of information not available to the public (e.g. proprietary knowledge possessed by the applicants only), or only when interpreted by an expert having a level of knowledge beyond that expected of the person skilled in the art.

[62] We stated in the PR letter that, in the Panel's view, none of the additional tests, studies or experiments that allegedly support the operation or utility of the Mills' patent are found in the description at the filing date. And there is no evidence that this information comprised part of the CGK on that date; i.e., there is no evidence of any widespread, generally accepted application or adoption of the theory or extraordinary benefits of the hydrogen plasma generator on the filing date. Therefore, the data related to these tests, studies or experiments do not form part of the disclosure (of the factual basis and line of reasoning) from which a skilled person would make a prediction of utility of the claimed invention.

Analysis of predicted utility

[63] As set out in our PR letter, the person skilled in the art would not have considered that the utility of the combination defined in claims 1 and 2 had been established by sound prediction as of the filing date. The skilled person would have appreciated that the theory underlying the invention is not consistent with the generally accepted laws of physics and quantum mechanics, but instead relies on a new and

as yet not generally accepted version of quantum mechanics, i.e., a theory of a new fractional quantum energy state for a hydrogen atom which is used in a hydrogen plasma generator to produce excess energy. The existence of hydrinos and the ability of a hydrogen atom to release energy in transition to a fractional ground state would not be generally accepted by the skilled person given the CGK at the filing date. The description does not disclose sufficient information to allow the skilled person to soundly predict that the claimed system would produce an excess of energy.

[64] Furthermore, in addition to the lack of sound prediction for the operation of the hydrino-based hydrogen plasma thermal source covered by the scope of claims 1 and 2, we are of the view that the skilled person would also not consider there to be a factual basis or sound line of reasoning for the predicted ability of the claimed power generation system to generate power using water as the primary fuel without any other external energy source. Based on the principles of conservation of energy, energy cannot be created or destroyed. And due to frictional (heat) loss, no machine is capable of generating more energy than is input. Claims 1 and 2 would be an energy sink, not an energy source. We agree with the statements in the SOR that, regardless of whether or not the system in claim 1 or 2 uses the Mills' hydrogen plasma generator or simply a conventional hydrogen thermal engine, conventional physics shows this system could not generate energy beyond its own needs, but would rather sink energy. The energy required or lost through each stage of conversion (the water splitting apparatus, the plasma/thermal generators, the thermal to electric converters and the associated storage, control and transmission means) would be greater than the energy produced by the system itself. In our view, the skilled person would not soundly predict the utility of this system as claimed in light of the conservation of energy.

Conclusions on utility

[65] Therefore, as stated in the PR letter, and absent any further submission provided in response by the Applicant, we consider that the Applicant has not established utility for the subject matter of claims 1 to 26 as of the filing date of the application, on the basis of either demonstration or sound prediction. Accordingly, we consider that the subject matter of the claims on file lacks utility and does not comply with section 2 of the *Patent Act*.

Sufficiency of disclosure

[66] In the PR letter, the Panel stated that the specification is defective for failing to provide the skilled person with clear, concise and complete information so as to allow them to produce the invention as claimed using only the instructions contained in the disclosure without the use of inventive ingenuity or the need to undertake undue experimentation.

[67] The PR letter noted at least two areas where the skilled person would require a degree of ingenuity or undue experimentation in order to put the invention into practice: the claimed hydrogen plasma generator; and the claimed generation of excess power.

[68] First, the only disclosure relating to the operation of the claimed hydrogen plasma generator is the reference to the Mills patent within the description. In order to make and operate the power generation system in claim 1 or claim 2, the skilled person would need an available, operable, and compatible hydrogen plasma generator, such as disclosed by Mills, which could be integrated with the other components of the claimed power generation system. However, the specification of the Mills patent merely discloses the hypothesis and theory of operation of a hydrino catalyst reactor, some apparent experimental apparatus and suggestions for incorporation into a larger thermal plant. Examples 1-5 found in the Mills patent appear to relate to experiments in support of disclosed theory that to the skilled person would be a proof of concept at best. Mere reference to the theory and experiments proposed in the Mills patent does not enable the skilled person to produce or operate a thermal hydrogen plasma generator as defined in claims 1 and 2. Rather than leading the skilled person step by step through the making of a functional hydrogen plasma generator, the specification "necessitates the working out of a problem": *Pioneer Hi-Bred Ltd v Canada (Commissioner of Patents)*, [1989] 1 SCR 1623 at 1641, 1989 CanLII 64.

[69] Second, the disclosure does not provide the skilled person with any indication or teaching to overcome the known inefficiencies inherent in the disclosed combination of energy conversion stages. This is necessary for the system to produce excess energy, i.e., to produce enough energy to be self-sustaining using only water as the fuel source. As stated above, the skilled person would have understood from the CGK that such a system as claimed would be an energy sink and that the efficiency of the system would be less than unity, and thus not self-sustaining. While the description does describe the series of component stages that

comprise the system, there is no disclosure of the manner of implementing the stages to obtain sufficient energy to power a load (such as a marine vessel or other motor) and sufficient energy to power the water splitting apparatus at a rate to produce sufficient hydrogen. The skilled person's CGK was insufficient to achieve this implementation and the expected efficiencies. Without implementation details, the disclosure is insufficient to enable the skilled person to produce the invention as claimed; its achievement would require inventive ingenuity and/or excessive experimentation.

[70] The Applicant did not provide any further submission in response to the Panel's above analysis as set out in the PR letter regarding the sufficiency of the description.

[71] Accordingly, the Panel's view is that the specification does not meet the requirements of paragraph 27(3)(*b*) of the *Patent Act*.

Proposed claims

[72] The Applicant submitted proposed claims 1-26 with its RFA. The proposed claims differ from the claims on file only in regard to claim 17, wherein a minor antecedent issue was corrected.

[73] As we stated under "Prosecution history" section above, the proposed claims would only be considered for recommendation by the Panel if they would overcome the utility and insufficiency defects raised in the FA and by the Panel. As the subject matter of the proposed claims is essentially identical to the subject matter of the claims on file, it follows that our view is that the subject matter of the proposed claims also lacks utility contrary to section 2 of the *Patent Act* for the same reasons.

[74] Given the proposed claims would not remedy any defects of the claims on file, it follows that the proposed claims are not considered a necessary specific amendment under subsection 30(6.3) of the *Patent Rules* as specific amendments necessary for compliance with the *Patent Act* and *Patent Rules*.

RECOMMENDATION OF THE BOARD

[75] In view of the above, the Panel recommends that the application be refused on the basis that the claims on file define subject matter that lacks utility and thus does not

comply with section 2 of the *Patent Act*, and furthermore, that the description is insufficient and does not comply with subsection 27(3) of the *Patent Act*.

[76] Further, we do not consider the claims proposed on August 4, 2016 to constitute specific amendments necessary to comply with the *Patent Act* and *Patent Rules*. Accordingly, we decline to recommend that the Applicant be notified under subsection 30(6.3) of the *Patent Rules* that said proposed claims are necessary.

Andrew Strong	Marcel Brisebois	Paul Fitzner
Member	Member	Member

DECISION OF THE COMMISSIONER

[77] I concur with the findings of the Board and its recommendation to refuse the application as the claims on file do not comply with section 2 of the *Patent Act*, and the specification does not comply with subsection 27(3) of the *Patent Act*.

[78] Accordingly, I refuse to grant a patent for this application. Under section 41 of the *Patent Act*, the Applicant has six months to appeal my decision to the Federal Court of Canada.

Johanne Bélisle
Commissioner of Patents
Dated at Gatineau, Quebec,
this 15th day of October, 2019