Citation: Gree Electric Appliances, Inc. of Zhuhai (Re), 2023 CACP11
Commissioner's Decision #1644
Décision du Commissaire nº 1644
Date: 2023 03 13

TOPIC:	F00	Novelty
	O00	Obviousness
SUJET:	F00	Nouveauté
	O00	Évidence

Application No. : 3,001,750

Demande nº 3 001 750

IN THE CANADIAN PATENT OFFICE

DECISION OF THE COMMISSIONER OF PATENTS

Patent application number 3,001,750, having been rejected under subsection 199(1) of the *Patent Rules* (SOR/2019–251), has consequently been reviewed in accordance with paragraph 86(7)(c) of the *Patent Rules*. The recommendation of the Board and the decision of the Commissioner are to refuse the application.

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INTRODUCTION

[1] This recommendation concerns the review of rejected Canadian patent application number 3,001,750 which is entitled “ENERGY GATEWAY, HOUSEHOLD APPLIANCE, DIRECT-CURRENT MICRO-GRID SYSTEM AND ENERGY MANAGEMENT METHOD THEREFOR” and is owned by Gree Electric Appliances, Inc. of Zhuhai (the Applicant).

[2] A review of the rejected application has been conducted by the Patent Appeal Board (the Board) pursuant to paragraph 86(7)(c) of the *Patent Rules* (SOR/2019-251) (*Patent Rules*). As explained in more detail below, our recommendation to the Commissioner of Patents is to refuse the application.

BACKGROUND

The application

[3] The application was filed on October 11, 2016, and was laid open to public inspection on April 20, 2017.

[4] The application relates generally to an energy management method and an energy gateway device for connecting a solar power generation device to a direct-current (DC) appliance either directly through the gateway device or via a direct-current voltage transformation device in the gateway device, depending on the withstand voltage of the appliance. The application also discloses exporting excess solar energy to the main alternating-current (AC) power grid, or importing energy from the main AC power grid in case solar energy generated by the solar power generation device is insufficient.

[5] The application has 10 claims on file (claims on file), which were received at the Patent Office on December 18, 2020.

Prosecution history

[6] On September 17, 2021, a Final Action (FA) was issued pursuant to subsection 86(5) of the *Patent Rules*. The FA identified the following defects in the

application:

- claims 1-4 and 6-10 on file lack novelty and do not comply with paragraph 28.2(1)(b) of the *Patent Act*, and
- claims 1-10 on file would have been obvious and do not comply with section 28.3 of the *Patent Act*.

[7] In a response to the FA (RFA) dated November 29, 2021, the Applicant submitted arguments in favour of the allowance of the application. The Applicant also submitted a proposed set of claims 1-8 (proposed claim set-1) to remedy the novelty and obviousness defects identified in the FA.

[8] As the Examiner considered the application not to comply with the *Patent Act*, pursuant to paragraph 86(7)(c) of the *Patent Rules*, the application was forwarded to the Board for review on February 17, 2022 along with an explanation outlined in a Summary of Reasons (SOR). The SOR indicated that the claims on file were still considered defective for the reasons set out in the FA. The SOR also indicated that proposed claim set-1 would not overcome the obviousness defect.

[9] On February 17, 2022, the Board forwarded to the Applicant a copy of the SOR along with a letter acknowledging the rejection and requested an indication of the Applicant's continued interest in having the application reviewed.

[10] In a letter dated May 16, 2022, the Applicant indicated continued interest in having the Board review the application. The Applicant also submitted arguments in favour of the allowance of the application as well as a proposed set of claims 1-8 (proposed claim set-2).

[11] A Panel of the Board (the Panel), comprised of the undersigned members, was formed to review the instant application under paragraph 86(7)(c) of the *Patent Rules*.

[12] In a preliminary review letter (PR letter) dated November 28, 2022, the Panel presented its preliminary analysis with respect to the claims on file and proposed claim set-2. The Panel was of the preliminary view that:

- claims 1-10 on file lack novelty in view of the cited prior art and do not comply with paragraph 28.2(1)(b) of the *Patent Act*,
- claims 1-10 on file would have been obvious to a person skilled in the art in view of the cited prior art and the relevant CGK, and do not comply with section 28.3 of the *Patent Act*,
- claims 1, 5 and 7 in proposed claim set-2 would lack novelty in view of D1 and would not comply with paragraph 28.2(1)(b) of the *Patent Act*,
- claims 1-8 in proposed claim set-2 would have been obvious to a person skilled in the art in view of the cited prior art and the relevant CGK, and would not comply with section 28.3 of the *Patent Act*, and
- claims 1 and 7 in proposed claim set-2 would not comply with subsection 27(4) of the *Patent Act*.

[13] The PR letter also offered the Applicant the opportunities to make written submissions and to attend an oral hearing.

[14] In a letter dated December 12, 2022, the Applicant requested that the oral hearing be delayed until February 6, 2023, which was granted.

[15] In a response to the PR letter (RPR) dated January 20, 2023, the Applicant submitted arguments in favour of allowance of the application. The Applicant also submitted a proposed set of claims 1-8 (proposed claim set-3).

[16] In a letter dated January 31, 2023, the Applicant requested that the oral hearing be cancelled.

ISSUES

[17] This review addresses the following issues:

- whether claims 1-4 and 6-10 on file lack novelty and are non-compliant with paragraph 28.2(1)(b) of the *Patent Rules*, and

- whether claims 1-10 on file would have been obvious and non-compliant with section 28.3 of the *Patent Act*.

[18] In this review, the Panel first considers the issues that pertain to the claims on file. The Panel then considers whether the latest proposed amendments, specifically proposed claim set-3 submitted in the RPR, constitute amendments necessary for compliance with the *Patent Act* and *Patent Rules* under subsection 86(11) of the *Patent Rules*.

LEGAL PRINCIPLES AND OFFICE PRACTICE

Purposive construction

[19] In accordance with *Free World Trust v Électro Santé Inc*, 2000 SCC 66, and *Whirlpool Corp v Camco Inc*, 2000 SCC 67, purposive construction is performed from the point of view of the person skilled in the art in light of the relevant common general knowledge (CGK), considering the whole of the disclosure including the specification and drawings. In addition to interpreting the meaning of the terms of a claim, purposive construction distinguishes the essential elements of the claim from the non-essential elements. Whether or not an element is essential depends on the intent expressed in or inferred from the claim, and on whether it would have been obvious to the skilled person that a variant has a material effect upon the way the invention works.

Novelty

[20] Subsection 28.2(1) of the *Patent Act* requires claimed subject matter to be new:

> The subject-matter defined by a claim in an application for a patent in Canada (the “pending application”) must not have been disclosed
>
> (a) before the one-year period immediately preceding the filing date or, if the claim date is before that period, before the claim date by the applicant, or by a person who obtained knowledge, directly or indirectly, from the applicant, in such a manner that the subject-matter became available to the public in Canada or elsewhere;

> (b) before the claim date by a person not mentioned in paragraph (a) in such a manner that the subject-matter became available to the public in Canada or elsewhere;
>
> …

[21] There are two separate requirements to show that prior art anticipates a claimed invention: there must be a prior disclosure of the claimed subject-matter and the prior disclosure must enable the claimed subject-matter to be practised by a skilled person (*Apotex Inc v Sanofi–Synthelabo Canada Inc*, 2008 SCC 61 [*Sanofi*] at paras 24–29, 49).

Obviousness

[22] Section 28.3 of the *Patent Act* requires claimed subject matter to not be obvious:

> The subject-matter defined by a claim in an application for a patent in Canada must be subject-matter that would not have been obvious on the claim date to a person skilled in the art or science to which it pertains, having regard to
>
> (a) information disclosed before the one-year period immediately preceding the filing date or, if the claim date is before that period, before the claim date by the applicant, or by a person who obtained knowledge, directly or indirectly, from the applicant in such a manner that the information became available to the public in Canada or elsewhere; and
>
> (b) information disclosed before the claim date by a person not mentioned in paragraph (a) in such a manner that the information became available to the public in Canada or elsewhere.

[23] In *Apotex Inc v Sanofi–Synthelabo Canada Inc*, 2008 SCC 61 at para 67, the Supreme Court of Canada stated that it is useful in an obviousness inquiry to follow the following four-step approach:

> (1)(a) Identify the notional “person skilled in the art”;
>
> (1)(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?

Indefiniteness

[24] Subsection 27(4) of the *Patent Act* requires claims to distinctly and explicitly define subject matter:

> The specification must end with a claim or claims defining distinctly and in explicit terms the subject-matter of the invention for which an exclusive privilege or property is claimed.

ANALYSIS

Purposive construction

[25] The purposive construction of a claim is carried out in light of the whole of the specification and takes into account what the person skilled in the art in view of their common general knowledge would understand from the whole of the specification to be the nature of the invention.

[26] The PR letter reviewed prior art documents D1-D7 cited in the FA as well as additional prior art documents D8-D14:

- D1: US2015/0256025 A1 Brhlik et al. 10 September 2015
- D2: CN103208842 A Wang et al. 17 July 2013
- D3: CN104362612 A Wu 18 February 2015
- D4: CN103618372 A Zhang et al. 5 March 2014
- D5: US2012/0205985 A1 Inakagata 16 August 2012

- D6: US2015/0092311 A1 Wang et al. 2 April 2015
- D7: US2012/0191253 A1 Rockenfeller et al. 26 July 2012
- D8: CN203798002 A Jiang et al. 27 August 2014
- D9: Cooling Post, “Klima-Therm to sell solar-powered VRF”, 12 June 2015, https://www.coolingpost.com/products/klima-therm-to-sell-solar-powered-vrf/
- D10: Modern Building Services, “Solar energy meets air conditioning”, 3 June 2015, https://modbs.co.uk/news/archivestory.php/aid/14599/Solar_energy_meets__air_conditioning.html
- D11: Wikipedia, “Uninterruptible power supply”, archived on 18 September 2015, https://web.archive.org/web/20150918170834/https:/en.wikipedia.org/wiki/Uninterruptible_power_supply
- D12: US2011/0133559 A1 Yamashita et al. 9 June 2011
- D13: US2011/0148194 A1 Lai et al. 23 June 2011
- D14: Wikipedia, “Terminal (electronics)”, archived on 29 November 2014, https://web.archive.org/web/20141129105306/https://en.wikipedia.org/wiki/Terminal_(electronics)

[27] In the absence of an English translation for documents D2-D4 and D8, machine translations from Questel Orbit were obtained, the contents of which were confirmed with other machine translation tools including WIPO Translate and Google Translate. Paragraph references in this review are to the original document.

[28] D1 discloses a direct current power server which integrates a local DC energy source, such as a photovoltaic array, and a local DC energy storage, such as a battery, to serve a DC microgrid of a building in order to directly power DC loads. It also discloses that the DC microgrid has a bidirectional connection with the main AC electrical grid.

[29] D2 discloses a solar power supply system comprising a solar panel, a photovoltaic controller, a battery, a DC/AC inverter connected to AC loads as well a DC/DC converter connected to DC loads.

[30] D3 discloses a power supply system for an air conditioner comprising a DC power supply device (photovoltaic array) and a DC/DC converter in order to

supply power to DC loads. It further discloses either a DC/AC converter or an AC power supply in order to supply power to AC loads.

[31] D4 discloses a DC microgrid system comprising three power sources, including AC power grid, photovoltaic power source and a battery. The DC microgrid also comprises a DC bus which is connected to DC loads via DC/DC converters.

[32] D5 discloses a power distribution device for supplying power to DC loads, comprising a DC power source connected to a DC/DC converter as well as an AC power source connected to an AC/DC converter. DC loads are either connected to a DC bus directly or via a DC/DC converter, depending on the desired voltage. It further discloses selling power back to the AC power source (commercial grid) when there is excess DC energy.

[33] D6 discloses a system for over-current protection of DC loads including a DC bus connected to AC loads via a DC/AC inverter and to DC loads either directly or via DC/DC converters. It further discloses the use of a variety of power sources including the AC power grid, renewable power sources such as photovoltaic panels, and energy storage devices such as batteries.

[34] D7 discloses a heating, ventilation, air conditioning and refrigeration system using variable frequency drives, which are powered by a DC photovoltaic power source as well as an AC grid power source.

[35] D8 discloses an air conditioning system comprising a photovoltaic direct drive centrifugal compressor system that uses photovoltaic direct current to directly drive the compressor.

[36] D9 and D10 disclose air conditioning systems wherein the chiller is driven by DC power directly from the photovoltaic array.

[37] D11 discloses general information about uninterruptible power supply units and their various technologies and designs including those designed to power DC equipment.

[38] D12 discloses an uninterruptible power supply (UPS) comprising a rechargeable battery, wherein the battery is charged from an AC power source and, during power outages, supplies DC power via a DC/DC converter to a DC load without

any AC conversion.

[39] D13 discloses a DC uninterruptible power supply system configured to be connected to a plurality of power sources, including a utility AC power supply and renewable DC power sources such as solar or wind power generators, and to supply DC power to loads.

[40] D14 discloses general information about terminals in electronic devices. It discloses that a terminal may simply be the end of a wire or it may be fitted with a connector or fastener.

The person skilled in the art

[41] In the PR letter at page 8, we provided our preliminary characterization of the person skilled in the art:

> The FA on page 6 identified the person skilled in the art as skilled in photovoltaics. The Applicant did not dispute the characterization in the FA. However, in view of the instant specification and the cited prior art, we preliminarily identify the person skilled in the art as a person or team skilled in the field of renewable energy generating technologies such as photovoltaics, as well as power distribution technologies including their control systems, and various DC and AC microgrid systems integrating DC power generators with the main electrical AC grid.

[42] The Applicant did not dispute the above characterization in the RPR. We therefore adopt the same characterization in this review.

The relevant common general knowledge

[43] In the PR letter at pages 8-10, we provided our preliminary characterization of the relevant CGK:

> The FA on page 6 identified the relevant CGK as known aspects of photovoltaic installations and power distributions from photovoltaic panels as demonstrated by the prior art cited in the FA. The Applicant did not dispute this characterization in the FA. However, in view of our

characterization of the person skilled in the art above, the instant specification and the cited prior art, we preliminarily identify the relevant CGK as the following:

- power distribution systems and technologies including DC and AC electrical grid systems and their respective advantages and disadvantages [instant application: background section; D1: par. [0003]-[0008]; D4: par. [0002]-[0003]; D5: par. [0002]-[0009]; D6: par. [0002]-[0007]],

- conventional power distribution systems consisting of metering device[s], circuit protection devices, switching devices, transformers, converters, controllers, and conductors [D1: par. [0003]-[0008]; D4: par. [0002]-[0003]; D5: par. [0002]-[0009]; D6: par. [0002]-[0007]],

- various electrical converters including DC/AC converters (inverters), AC/DC converters (rectifiers), DC/DC converters, and AC/AC converters [D1: par. [0003]-[0008]; D4: par. [0002]-[0003]; D5: par. [0002]-[0009]; D6: par. [0002]-[0007]],

- DC and AC microgrids being connected to DC energy generators and the main AC electrical grid using various converters [instant application: background section; D1: par. [0003]-[0008]; D4: par. [0002]-[0003]; D5: par. [0002]-[0009]; D6: par. [0002]-[0007]],

- DC power distribution systems supplying DC power from various sources such as photovoltaic arrays, wind generators and storage batteries to DC loads without the need for DC/AC inverters [D1: par. [0003]-[0008]; D4: par. [0002]-[0003]; D5: par. [0002]-[0009]; D6: par. [0002]-[0007]],

- conventional microgrid technologies comprising photovoltaic arrays connected to the main AC grid via a DC/AC inverter, which in turn suppl[ies] power to AC loads directly and to DC loads via an AC/DC rectifier, and the associated reduced efficiency and reliability due to the use of additional inverters and rectifiers [instant application: background section; D1: par. [0003]-[0008]; D4: par. [0002]-[0003]; D5: par. [0002]-[0009]; D6: par. [0002]-[0007]],

- local renewable energy generating systems supplying power to local loads, and importing from or exporting to the main electrical grid when necessary depending on the local energy supply and demand levels [D5: par. [0002]-[0009]],

- air conditioners consuming large amounts of energy and being prime candidates to use solar energy in order to reduce power consumption from the main AC grid [D3: par. [0002]; D4: par. [0002]-[0003]; D7: entire document especially par. [0002]-[0005], Fig 5; D10: entire document],

- variable frequency air conditioners being directly driven by DC power from photovoltaic arrays, photovoltaic arrays producing a varying amount of DC power depending on the time of day and weather [D8: par. [0002]-[0004]; D9-D10: entire documents], and

- uninterruptable power supply (UPS) devices using various types of power sources to provide AC or DC power when necessary [D11: entire document; D12: entire document especially par. [0004]-[0006], Fig. 3-6; D13: entire document especially par. [0003]-[0004], Fig 2].

[44] The Applicant did not dispute the above characterization in the RPR. We therefore adopt the same characterization in this review.

The essential elements

[45] The instant application contains 10 claims on file, including independent claims 1 and 8, which are directed to an energy gateway and a corresponding energy management method for a DC microgrid system, respectively. We take claim 1 on file as representative of the invention for the purpose of this review.

[46] Claim 1 on file reads:

> An energy gateway, comprising:
>
> a direct current input terminal connected to a direct current output terminal of an external solar power generation device; and

> a first direct current output terminal and a second direct current output terminal configured to supply power to an external direct current electrical appliance, wherein the first direct current output terminal is directly connected to the direct current input terminal, and the second direct current output terminal is connected to the direct current input terminal via a direct current voltage transformation device,
>
> wherein the direct current electrical appliance is directly connected to the first direct current output terminal when a withstand voltage of the direct current electrical appliance is in a voltage range of the first direct current output terminal of the energy gateway; and
>
> wherein the direct current electrical appliance is connected to the second direct current output terminal when the withstand voltage of the direct current electrical appliance goes beyond the voltage range of the first direct current output terminal.

[47] Dependent claims 2-7 and 9-10 on file recite further details regarding the claimed energy gateway and energy management method for a direct current microgrid system.

[48] In relation to the essential elements, the PR letter at pages 10-11 stated:

> In our preliminary view, the person skilled in the art would understand that there is no use of language in any of the claims on file indicating that the elements in each claim are optional, a list of alternatives, a preferred embodiment or non-essential.
>
> Therefore, it is our preliminary view that all the elements of the claims on file are presumed to be essential.

[49] As the Applicant did not dispute the above identification of the essential elements in the RPR, we adopt the above position in this review.

Meaning of terms

[50] Purposive construction is also used to construe the meaning of claim terms as understood by the person skilled in the art.

[51] In the PR letter, we provided further consideration to the term “terminal” recited in the claims on file and proposed claim set-2.

[52] As stated in the PR letter at page 11:

> The claims on file and proposed claims recite various types of terminals such as direct current input terminal, direct current output terminal, and mains supply input terminal. In our preliminary view, it is necessary to construe the meaning of the term “terminal” based on the disclosure of the instant application.
>
> The description does not appear to provide any details with regards to the claimed terminals. For example, it does not define the terminals as comprising sockets, plugs or specific connecting components. Similarly, the drawings appear to disclose the claimed terminals as direct connections without a specific connecting component. Additionally, the description does not provide any details on any of the steps comprising connecting to a terminal such as “the direct current electrical appliance is directly connected to the first direct current output terminal” (claim 1 on file) or how such a step is performed.
>
> In light of the lack of technical details in the specification with respect to the claimed terminals, it is our preliminary view that a person skilled in the art would construe the term “terminal” as commonly known in the art, that is, as a connection point to an external circuit or device [D14: entire document]. Such a connection point may simply be the end of a wire or include more elaborate connecting components such as sockets, plugs or fasteners.

[53] As the Applicant did not dispute the above in the RPR, we adopt the above position in this review. Our construction of the term “terminal” equally applies to the use of the same term in proposed claim set-3, analysed further below.

[54] Furthermore, in the RPR at page 5, the Applicant submitted:

> In particular, according to the proffered construction, the direct current electrical appliance is not directly connected to the first direct current output terminal when connected via the direct current voltage transformation device, and (as incorrectly implied), the direct current electrical appliance **is directly connected to the first direct current output terminal by the**

> **simple absence of the direct current voltage transformation device**. The Applicant submits that this construction is incorrect.
>
> Respectfully, claim 1 recites, *inter alia*, “wherein the first direct current output terminal is directly connected to the direct current input terminal (1)”. The Applicant sees no justification why the expression “directly connected” as recited in claim 1 should be narrowly interpreted to simply mean “connected without passing through the direct current voltage transformation device”. The person of ordinary skill in the art would readily have understood the expression “directly connected” as meaning connected “without anything else being involved or in between” (see e.g. *https://dictionary.cambridge.org/dictionary/english/directly*). [original style of emphasis altered]

[55] We respectfully disagree with the Applicant’s argument that the person skilled in the art would have understood the expression “directly connected” in the instant application to mean connected “without anything else being involved or in between”.

[56] The description at paragraphs [0033]-[0034] discloses:

> [0033] In the direct current microgrid system in the present disclosure, a household electrical appliance, such as a photovoltaic direct drive variable-frequency air conditioner, serves as an energy gateway to ensure the energy balance of the home power supplying system, and the matched photovoltaic module may be directly connected to a direct current side of the photovoltaic direct drive variable-frequency air conditioner. The direct current side of the photovoltaic direct drive variable-frequency air conditioner is directly connected to a home direct current power distribution main line to form a direct current bus. In this case, other household electrical appliances in the home may be connected to the direct current bus, thereby forming a home direct current microgrid system to which power is supplied by a new energy source.
>
> [0034] Referring to Figure 3, an energy management method for a direct current microgrid system is further provided in the present disclosure. The energy management method includes: inputting a direct current outputted by an external solar power generation device 2 to a direct current bus; and

> connecting a direct current electrical appliance to the direct current bus directly in a case that a withstand voltage of the direct current electrical appliance is in a voltage range of the direct current bus, otherwise connecting the direct current electrical appliance to the direct current bus via a direct current voltage transformation device 5.

[57] As disclosed in the above passages, the instant description discloses that the external solar power generation device, the direct current electrical appliance and the direct current voltage transformation device are all connected via a direct current bus. Therefore, in our view, the person skilled in the art would not have understood the expression “directly connected” in the instant application to mean connected “without anything else being involved or in between” as the instant description discloses that at least a direct current bus is between the system components.

[58] In light of the above, it is our view that the person skilled in the art, based on the instant specification and their relevant CGK, would have understood the expression “directly connected” in the instant application to mean being connected via an electrical connection means such as a DC bus, without the presence of intermediary components.

Novelty

[59] In the PR letter at pages 11-15, we provided our preliminary novelty assessment with respect to the claims on file, indicating that claims 1-10 on file lack novelty:

> The FA on pages 2-5 indicated that claims 1-4 and 6-10 on file lack novelty in view of D2 or D3. The Applicant submitted a proposed set of 8 claims and argued that the new limitations introduced in those proposed claims are novel in view of the cited prior art.
>
> In our preliminary view, D3 is the closest prior art to the subject matter of the claims on file. It discloses a power supply system for an air conditioner comprising a photovoltaic array supplying DC power, a DC/DC converter in order to supply power to DC loads, and either a DC/AC converter or an AC power supply in order to supply power to AC loads.
>
> With respect to independent claim 1 on file, D3 discloses

- a direct current input terminal connected to a direct current output terminal of an external solar power generation device [D3: par. [0005]-[0007]; Figs 2, 4: photovoltaic arrays 201 are connected to microgrid system]; and

- a first direct current output terminal and a second direct current output terminal configured to supply power to an external direct current electrical appliance, wherein the first direct current output terminal is directly connected to the direct current input terminal, and the second direct current output terminal is connected to the direct current input terminal via a direct current voltage transformation device [D3: par. [0045], [0072]; Figs 2, 4: DC load 13 and DC socket 3100 for use by DC loads are connected directly to the DC bus 1, while DC socket 3200 for use by DC loads is connected to DC bus 1 via a DC/DC converter 2022],

- wherein the direct current electrical appliance is directly connected to the first direct current output terminal when a withstand voltage of the direct current electrical appliance is in a voltage range of the first direct current output terminal of the energy gateway [D3: par. [0045], [0072]]; and

- wherein the direct current electrical appliance is connected to the second direct current output terminal when the withstand voltage of the direct current electrical appliance goes beyond the voltage range of the first direct current output terminal [D3: par. [0045], [0072]].

With respect to claims 3 and 9 on file, D3 discloses:

- an alternating current output terminal configured to supply power to an external alternating current electrical appliance and a second DC/AC inverter, wherein the direct current input terminal is connected to the alternating current output terminal via the second DC/AC inverter [D3: par. [0054]; Fig 4: DC line 1 is connected to AC line 3 via DC/AC inverter 301, which in turn supplies power to AC loads 102 and AC socket 4100].

With respect to claims 4, 7 and 10 on file, D3 discloses a household electrical appliance comprising the claimed energy gateway [D3: Abstract; par. [0002]].

With respect to claim 5 on file, D3 discloses that the household electrical appliance is a photovoltaic direct drive variable-frequency air conditioner [D3: par. [0063]; Figs 2, 4: the air conditioner direct current variable frequency compressor is connected to the first direct current bus 1, which is directly driven by the photovoltaic array 201 without the use of inverters and rectifiers].

In our preliminary view, independent claim 8 on file as well as dependent claim 6 on file contain similar limitations as claim 1 on file and therefore lack novelty in view of D3.

Therefore, it is our preliminary view that claims 1 and 3-10 on file lack novelty in view of D3.

With respect to claim 2 on file, D3 discloses an embodiment with a mains supply input terminal [D3: par. [0032]; Fig 2: AC power supply 300 is connected to the microgrid system], and another embodiment where a DC/AC inverter is used to convert DC power to AC power when there is no AC power supply [D3: par. [0063]; Fig 4: DC line 1 is connected to AC line 3 via DC/AC inverter 301 to supply AC power to AC loads when there is no AC power supply]. However, D3 does not disclose an embodiment comprising a mains supply input terminal and a DC/AC inverter wherein the mains supply input terminal is connected to the direct current input terminal via the DC/AC inverter.

Therefore, it is our preliminary view that claim 2 on file is novel in view of D3.

Furthermore, D1 is also directed to the same art as the claimed invention and its disclosure anticipates several of the claims on file. For completeness, we present below our preliminary analysis of the claims on file with respect to prior art document D1.

With respect to independent claim 1 on file, D1 discloses:

- a direct current input terminal connected to a direct current output terminal of an external solar power generation device [D1: par. [0023]; Fig 3: local renewable energy source (DC) 228, which may be a photovoltaic array, supplies DC power to the power sever 204]; and

- a first direct current output terminal and a second direct current output terminal configured to supply power to an external direct current electrical appliance, wherein the first direct current output terminal is directly connected to the direct current input terminal, and the second direct current output terminal is connected to the direct current input terminal via a direct current voltage transformation device [D1: par. [0030], [0037], [0039]; Fig 3: the DC power server 204 is configured as an enclosure with a plurality of inputs and outputs, serving as a single connection point for local DC power sources, DC loads, etc.; DC bus 224 supplies power to DC loads 212, 216 and 220 directly without the use of a DC/DC converter via load connectors 316, it also supplies power to the auxiliary power output 260 via the uninterruptable power supply (UPS) 356, which includes a DC/DC converter for converting the nominal voltage of the DC bus to the auxiliary voltage V_{AUX}],

- wherein the direct current electrical appliance is directly connected to the first direct current output terminal when a withstand voltage of the direct current electrical appliance is in a voltage range of the first direct current output terminal of the energy gateway [D1: par. [0030], [0037]; Fig 3: power is supplied to DC loads 212, 216 and 220 directly without the use of a DC/DC converter]; and

- wherein the direct current electrical appliance is connected to the second direct current output terminal when the withstand voltage of the direct current electrical appliance goes beyond the voltage range of the first direct current output terminal [D1: par. [0030], [0037]; Fig 3: power is supplied to the auxiliary power output 256 via UPS 356 which includes a DC/DC converter].

We preliminarily note that, as discussed in the Meaning of terms section above, in our preliminary view the term terminal refers to a connection point

to an external device. D1 discloses that the DC power server 204 is configured as an enclosure with “a plurality of inputs and outputs and serves as a single connection point for local DC power sources, DC loads, AC sources, systems controllers, metering devices, protective devices, and switching devices” [D1: par. [0039]]. Furthermore, D1 discloses that DC loads 212, 216 and 220 are connected to the DC bus via load contactors 316 [D1: par. [0038]; Fig 4]. It is therefore our preliminary view that D1 discloses the claimed feature of input and output terminals.

With respect to claim 2 on file, D1 discloses a mains supply input terminal and a first DC/AC inverter, wherein the mains supply input terminal is connected to the direct current input terminal via the first DC/AC inverter [D1: par. [0023], [0035]; Fig 3: electrical grid (AC) 236 is connected to the DC bus via rectifiers 324, which include inverter circuits that enable them to function as bi-directional AC to DC and DC to AC converters].

In our preliminary view, independent claim 8 on file as well as dependent claims 6 on file contain similar limitations as claim 1 on file, and therefore lack novelty in view of D1.

Therefore, it is our preliminary view that claims 1, 2, 6 and 8 on file lack novelty in view of D1.

With respect to claims 3 and 9 on file, D1 does not explicitly disclose an alternating current output terminal configured to supply power to an external alternating current electrical appliance and a second DC/AC inverter, wherein the direct current input terminal is connected to the alternating current output terminal via the second DC/AC inverter.

With respect to claims 4, 5, 7 and 10 on file, D1 does not explicitly disclose a household electrical appliance comprising the claimed energy gateway.

Therefore, it is our preliminary view that claims 3-5, 7 and 9-10 on file are novel in view of D1.

In light of the above, it is our preliminary view that claims 1-10 on file lack novelty in view of the prior art and do not comply with paragraph 28.2(1)(b) of the *Patent Act*.

[60] In the RPR, the Applicant did not directly comment on the above novelty assessment with respect to the claims on file, instead submitted arguments on the basis of the proposed claims. Insomuch as the Applicant's arguments are based on features that are present in the claims on file, we address them below.

[61] With respect to D1, in the RPR at pages 5-6, the Applicant submitted:

> D1 (US2015/0256025A1) discloses a DC power server 204 that is connectable to a local renewable energy source (AC) 228 and to an electrical grid (AC) 236, and can provide power to, *inter alia*, DC lighting 212, DC ventilation fans 216, and other DC loads 220, without any DC voltage conversion between the local renewable energy source (AC) 228. In all shown embodiments, these loads 212, 216 and 220 are connectable to the local renewable energy source (AC) 228 via (a) metering units 348 (b) blocking diodes 336, (c) a DC bus 224, (d) a main breaker 304, (e) surge protection 308, (f) supplemental breakers 320, (g) more metering units 348, (h) arc-fault detection units (AFDU) 318, and (i) load contactors 316 (noting that the load contactors 316 can selectively disconnect branch circuits 312 that link each of the loads 212, 216 and 220 to the DC bus 224, as expressed at paragraph [0030]).
>
> At least the blocking diodes 336, the main breaker 304, the surge protection 308, the supplementation breakers 320 and the load contactors 316 are activatable devices that can make or break the connection between the local renewable energy source (AC) 228 and the loads 212, 216 and 220.
>
> At least because D1 fails to teach or suggest "the first direct current output terminal is directly connected to the direct current input terminal", claim 1 should be found novel over D1.

[62] We respectfully disagree. D1 discloses in Figure 2 that DC loads are directly connected to the DC Bus. It also discloses in paragraph [0022] that "[i]n some embodiments, emergency DC loads are connected directly to the DC bus 224". Similarly in paragraph [0038], D1 discloses that "[e]mergency DC loads 416 are connected directly to the DC bus 224….In one embodiment, the emergency DC loads 416 includes emergency DC lighting, but may include any other DC load considered an emergency load." D1 also discloses in paragraph [0032] that the "local renewable energy source 228 is directly integrated into DC bus 224". In

view of our construction of the expression “directly connected” in the Meaning of terms section above, it is our view that D1 discloses an embodiment wherein the first direct current output terminal is directly connected to the direct current input terminal.

[63] For completeness, we note that D1 also explicitly discloses in paragraphs [0030] and [0032] that only in some embodiments the DC power server 204 includes the following components: the main breaker 304, surge protection 308, DC bus 224 for over-current and over-voltage protection, supplemental breakers 320, arc-fault detection units (AFDU) 318 and blocking diodes 336. Furthermore, with respect to load contactors 316, as previously discussed in the PR letter (see the quote on page 19), it is our view that these load contactors are equivalent to the claimed direct current output terminals. It is therefore our view that D1 discloses an embodiment wherein the first direct current output terminal is directly connected to the direct current input terminal.

[64] In the RPR at page 6, the Applicant submitted:

> Similarly, claim 7 recites “connecting a direct current electrical appliance to a first direct current output terminal directly in a case that a withstand voltage of the direct current electrical appliance is in a voltage range of the direct current bus”. This direct connection between the first direct current output terminal and the direct current electrical appliance is also not shown in D1. Claim 7 should also be found novel over D1.

[65] We respectfully disagree. As discussed above, D1 discloses in Figure 2 that DC loads are directly connected to the DC Bus. It also discloses in paragraph [0022] that “[i]n some embodiments, emergency DC loads are connected directly to the DC bus 224”. Similarly in paragraph [0038], D1 discloses that “[e]mergency DC loads 416 are connected directly to the DC bus 224….In one embodiment, the emergency DC loads 416 includes emergency DC lighting, but may include any other DC load considered an emergency load.” D1 also discloses in paragraphs [0006] and [0020] that DC loads include appliances.

[66] For completeness, we also note that even in the embodiments shown in Figures 3 and 4, DC loads are directly connected to the load contactors 316 which, in our view, are equivalent to the claimed direct current output terminal. It is therefore

our view that D1 discloses a direct connection between the direct current electrical appliance and the first direct current output terminal.

[67] In light of the above, it is our view that D1 discloses the claimed subject matter of claims 1, 2, 6 and 8 on file.

[68] With respect to the enablement requirement, it is our view that D1 sufficiently discloses the claimed energy gateway method and system in claims 1, 2, 6 and 8 on file for the skilled person to practise the proposed invention without undue burden.

[69] With respect to D3, in the RPR at page 7, the Applicant submitted:

> …D3 (CN104362612)…, as best understood, does not appear to recite or suggest "wherein the first direct current output terminal is directly connected to the direct current input terminal (1)" as recited in claim 1, or "connecting a direct current electrical appliance to a first direct current output terminal directly in a case that a withstand voltage of the direct current electrical appliance is in a voltage range of the direct current bus" as recited in claim 7.

[70] We respectfully disagree. At paragraph [0072] as well as in Figures 2 and 4, D3 discloses a solar power generation device, comprising photovoltaic arrays 201, converters 202 and a combiner box 600, being directly connected to the first direct current bus 1. The first direct current bus 1 is also directly connected to the first direct current socket 3100, which is used as a terminal to which an external direct current appliance is directly connected. Although the PR letter indicated that the photovoltaic arrays 201 are connected to the microgrid system, in our view, the skilled person would equate the claimed solar power generation device with the disclosed PV array, converters and combiner box, and collectively these elements are directly connected to the DC bus.

[71] Therefore, it is our view that D3 discloses the claimed subject matter of claims 1 and 3-10 on file.

[72] With respect to the enablement requirement, it is our view that D3 sufficiently discloses the claimed energy gateway method and system in claims 1 and 3-10 on file for the skilled person to practise the proposed invention without undue

burden.

[73] In light of the above, we conclude that claims 1-10 on file lack novelty in view of the cited prior art and do not comply with paragraph 28.2(1)(b) of the *Patent Act*.

Obviousness

[74] The PR letter indicated that the claims on file are directed to subject matter that would have been obvious at the claim date to the skilled person in the art. The PR letter at pages 15-18 provided our obviousness assessment of the claims on file using the four-step *Sanofi* approach as set out below:

(1) Identify the notional "person skilled in the art" and their relevant CGK

[75] The person skilled in the art and their relevant CGK have been identified above under Purposive construction.

(2) Identify the inventive concept of the claim in question or if that cannot readily be done, construe it

[76] In the PR letter at page 16, we considered the combination of the essential elements of the claims to represent their inventive concepts. As the Applicant did not dispute this characterization in the RPR, we adopt the same characterization in this review.

(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

[77] As previously stated in the Novelty section, in our view, as in the PR letter, D3 is the closest prior art to the subject matter of the claims on file.

[78] With respect to D3, as stated in the PR letter at page 16:

> In light of the novelty assessment, it is our preliminary view that there are no differences between the disclosure in D3 and the subject matter of claims 1 and 3-10 on file.

> Regarding claim 2 on file, and as stated above in the novelty analysis, D3 discloses an embodiment with a mains supply input terminal [D3: par. [0032]; Fig 2: AC power supply 300 is connected to the microgrid system], and another embodiment where a DC/AC inverter is used to convert DC power to AC power when there is no AC power supply [D3: par. [0063]; Fig 4: DC line 1 is connected to AC line 3 via DC/AC inverter 301 to supply AC power to AC loads when there is no AC power supply]. However, D3 does not disclose an embodiment comprising a mains supply input terminal and a DC/AC inverter wherein the mains supply input terminal is connected to the direct current input terminal via the DC/AC inverter.

[79] Similarly, as discussed in the Novelty section, D1 is also directed to the same art as the claimed invention and, in our view, its disclosure is relevant to the obviousness analysis of the claims on file.

[80] As stated in the PR letter at pages 16-17:

> Given the novelty assessment above with respect to D1, it is our preliminary view that there are no differences between D1 and the subject matter of claims 1, 2, 6 and 8.
>
> Regarding claims 3 and 9 on file, D1 does not explicitly disclose an alternating current output terminal configured to supply power to an external alternating current electrical appliance and a second DC/AC inverter, wherein the direct current input terminal is connected to the alternating current output terminal via the second DC/AC inverter.
>
> Regarding claims 4, 5, 7 and 10 on file, D1 does not explicitly disclose a household electrical appliance comprising the claimed energy gateway.

[81] In the RPR, the Applicant did not directly comment on the obviousness analysis regarding the claims on file, instead submitted arguments for the allowance of the proposed claims. Nevertheless, we note that the Applicant's arguments are based on features that are also present in the claims on file. We address the Applicant's arguments relevant to the obviousness assessment of the claims on file in step (4) below.

(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?

[82] In the PR letter at page 17-18, we provided our preliminary view that the differences between the disclosure in the cited prior art and the inventive concept of the claims on file would have been obvious to the skilled person:

> As previously explained in the Novelty section, it is our preliminary view that there are no differences between D3 and the subject matter of claims 1 and 3-10 on file. It is therefore our preliminary view that claims 1 and 3-10 on file would have been obvious to a person skilled in the art in view of D3.
>
> With respect to claim 2 on file, D3 does not explicitly disclose an embodiment comprising a mains supply input terminal connected to connected to the direct current input terminal via the DC/AC inverter. However, in our preliminary view, it would have been obvious to a person skilled in the art to combine the two embodiments in D3 such that, even with a main AC power supply, the DC and AC lines would be connected via a converter in order to allow DC power to be converted and supplied to AC loads in case of issues with the main AC power supply. The person skilled in the art would have been motivated to combine the two embodiments in order to create a more resilient system, where in case of main AC power supply outages, the AC loads would still be able to draw power from the photovoltaic arrays.
>
> In the alternative, we preliminarily consider that D1 also discloses an energy gateway comprising a mains supply input terminal being connected to the DC input terminal via a DC/AC inverter [D1: par. [0035]; Fig 3: Electrical grid (AC) 236 is connected to the DC bus via rectifiers 324, which include inverter circuits that enable rectifiers to function as bi-directional AC to DC and DC to AC converter]. In our preliminary view, it would have been obvious to a person skilled in the art to incorporate this feature of D1 into the energy gateway of D3 in order to allow transmission of surplus DC energy to the AC grid, thus arriving at the subject matter of claim 2 on file.

Furthermore, in our preliminary view, the differences between the disclosure in D1 and the subject mater of the claims on file would have also been obvious to a person skilled in the art.

With regards to claims 1, 2, 6 and 8 on file, in light of our preliminary view that there are no differences between the disclosure of D1 and the subject matter of these claims, it is our preliminary view that claims 1, 2, 6 and 8 on file would have also been obvious to a person skilled in the art in view of D1.

Regarding claims 3 and 9 on file, D1 does not explicitly disclose the claimed limitation. However, as discussed in the Novelty section, D3 discloses an alternating current output terminal configured to supply power to an external alternating current electrical appliance and a second DC/AC inverter, wherein the direct current input terminal is connected to the alternating current output terminal via the second DC/AC inverter [D3: par. [0054]; Fig 4: DC line 1 is connected to AC line 3 via DC/AC inverter 301, which in turn supplies power to AC loads 102 and AC socket 4100]. In our preliminary view, it would have been obvious to a person skilled in the art to incorporate a DC/AC inverter and an AC output terminal in the system of D1 in order to also accommodate AC loads.

Regarding claims 4, 5, 7 and 10 on file, D1 does not explicitly disclose the claimed limitations. However, as discussed in the Novelty section, D3 discloses a household electrical appliance comprising the claimed energy gateway [D3: Abstract; par. [0002]] wherein the household electrical appliance is a photovoltaic direct drive variable-frequency air conditioner [D3: par. [0063]; Figs 2, 4: the air conditioner direct current variable frequency compressor is connected to the first direct current bus 1, which is directly driven by the photovoltaic array 201 without the use of inverters and rectifiers]. Given that air conditioners consume large amounts of energy and are prime candidates to use solar energy in order to reduce their power intake from the main AC grid, in our preliminary view, it would have been an obvious design alternative to a person skilled in the art to include the system of D1 in a photovoltaic direct drive variable-frequency air conditioner.

> In light of the above, it is our preliminary view that claims 1-10 on file would have been obvious to the skilled person in view of the cited prior art and the relevant CGK, and do not comply with section 28.3 of the *Patent Act*.

[83] In the RPR, the Applicant did not directly comment on the obviousness analysis regarding the claims on file, instead submitted arguments on the basis of the proposed claims. However, as previously mentioned, since the Applicant's arguments were based on features that are also present in the claims on file, we address them below.

[84] In the RPR, the Applicant submitted that neither D1 nor D3 discloses "wherein the first direct current output terminal is directly connected to the direct current input terminal" as recited in claim 1, or "connecting a direct current electrical appliance to a first direct current output terminal directly" as recited in claim 7.

[85] In the RPR at page 7, the Applicant further submitted that:

> The above-described distinguishing technical features of claims 1 and 7 are so that **the structure of the energy gateway is simplified**. The claimed energy gateway (claims 1-2), household electrical application (claims 3-4), direct current microgrid system (claims 5-6) and energy management method (claims 7-8) are therefore advantageous over the complex disclosure of D1. [emphasis in the original]

[86] We respectfully disagree. As discussed in detail in the Novelty section above, it is our view that both D1 and D3 disclose the aforementioned features and the claimed simplified energy gateway structure.

[87] With respect to the feature of "connecting a direct current electrical appliance to a first direct current output terminal directly" as recited in claim 7, as explained in detail in the Novelty section above, D1 discloses in paragraph [0022] that "[i]n some embodiments, emergency DC loads are connected directly to the DC bus 224". It also discloses in Figures 3 and 4 that DC loads are directly connected to the load contactors 316 which, in our view, are equivalent to the claimed direct current output terminal. Similarly, D3 discloses, at paragraph [0072] as well as in Figures 2 and 4, that the first direct current bus 1 is directly connected to the first direct current socket 3100, which is used as a terminal to which an external direct current appliance is directly connected.

[88] For completeness, we provide the following alternative analysis with respect to the feature of “wherein the first direct current output terminal is directly connected to the direct current input terminal” as recited in claim 1.

[89] With respect to D1, in our view, even if it did not disclose that the monitoring, controller and protective components shown in the complex structures of Figures 3 or 4 were optional, simply removing components such as meters, surge protectors, breakers and arc-fault detectors would not constitute an inventive step to a person skilled in the art. D1 discloses in Figure 2 a system comprising a DC power server being connected to a local renewable energy source, local energy storage, the electrical grid (AC) as well as DC loads. In our view, the person skilled in the art, wishing to provide a simpler and more efficient DC microgrid system such as the one displayed in Figure 2, would have been motivated to simplify the complex structure in Figures 3 and 4 such that only components essential for distributing power to various DC loads would be present, therefore removing protective and monitoring components, and providing a direct connection between the direct current input terminal and a direct current output terminal.

[90] With respect to D3, as explained in the Novelty section above, in our view the claimed “external solar power generation device” is equivalent to the photovoltaic arrays 201, converters 202 and a combiner box 600, which is directly connected to the first direct current bus 1. The first direct current bus 1 is also directly connected to the first direct current socket 3100, which is used as a terminal to which an external direct current appliance is directly connected. However, even if the claimed solar power generation device is not construed to be equivalent to the combination of photovoltaic arrays 201, converters 202 and combiner box 600, in our view, it would have been an obvious design alternative to a person skilled in the art to use a single photovoltaic array and removing the converters 202 and combiner 600, such that the photovoltaic array is connected directly to the direct current bus 1. The skilled person would have been motivated to do so in order to devise a simpler system requiring fewer components by using a single photovoltaic array capable of providing the required amount of power.

[91] In light of the above, we conclude that claims 1-10 on file would have been obvious to the skilled person in view of the cited prior art and the relevant CGK,

and do not comply with section 28.3 of the *Patent Act*.

Proposed claims

[92] As previously stated, in the RFA, RSOR and RPR, the Applicant submitted proposed claim set-1, proposed claim set-2 and proposed claim set-3 respectively, and argued in favour of their patentability. In this review, we provide our assessment of the latest proposed claims, specifically proposed claim set-3 submitted in the RPR containing independent claims 1 and 7.

[93] In our view, proposed claim 1 is representative of the proposed independent claims. It reads:

> An energy gateway, comprising:
>
> a direct current input terminal (1) connected to a direct current output terminal of an external solar power generation device (2);
>
> a first direct current output terminal and a second direct current output terminal configured to supply power to an external direct current electrical appliance (4), wherein the first direct current output terminal is directly connected to the direct current input terminal (1), and the second direct current output terminal is connected to the direct current input terminal (1) via a direct current voltage transformation device (5);
>
> a mains supply input terminal (6); and
>
> a first DC/AC inverter (7) capable of converting DC power to AC power and capable of converting AC power to DC power,
>
> wherein the mains supply input terminal (6) is connected to the direct current input terminal via the first DC/AC inverter (7), the mains supply input terminal (6) being further connected to a mains supply;
>
> wherein, if DC electrical energy generated by the solar power generation device is not sufficient, electrical energy is supplemented by the mains supply; and if the DC electrical energy generated by the solar power generation device is surplus, redundant DC electrical energy is converted

> into alternating current electricity via the first DC/AC inverter (7) and transmitted to the mains supply;
>
> wherein in a case that a withstand voltage of the direct current electrical appliance is in a voltage range of the first direct current output terminal of the energy gateway, the direct current electrical appliance is directly connected to the first direct current output terminal; in a case that the withstand voltage of the direct current electrical appliance goes beyond the voltage range of the first direct current output terminal, the direct current electrical appliance is connected to the second direct current output terminal.

[94] Proposed claim 7 is directed to the corresponding energy management method for a direct current microgrid and recites similar limitations as proposed claim 1. Proposed dependent claims recite similar features as the dependent claims on file.

[95] Since there is no use of language indicating that any one of the features in the proposed claims is optional, a preferred embodiment, one of a list of alternatives, or non-essential, all features presented in the proposed claims are considered to be essential to the proposed claims. Additionally, we adopt the construction of the term “terminal” and the expression “directly connected” in accordance with the Meaning of terms section above.

Novelty

[96] In our view, the proposed claims would not overcome the novelty defects identified above.

[97] In our view, D1 is now the closest prior art to the subject matter of the proposed claims, as the point of the invention for the proposed invention has shifted with respect to the claims on file.

[98] With respect to proposed claim 1, in our view, D1 discloses an energy gateway, comprising:

a direct current input terminal connected to a direct current output terminal of an external solar power generation device [D1: par. [0023]; Fig 3: Local Renewable Energy Source (DC) 228, which may be a photovoltaic array, supplies DC power to the power sever 204];

a first direct current output terminal and a second direct current output terminal configured to supply power to an external direct current electrical appliance, wherein the first direct current output terminal is directly connected to the direct current input terminal, and the second direct current output terminal is connected to the direct current input terminal via a direct current voltage transformation device [D1: par. [0020], [0022], [0030], [0032], [0037]-[0039]; Figs 2-4: the DC power server 204 is configured as an enclosure with a plurality of inputs and outputs, serving as a single connection point for local DC power sources, DC loads, etc.; local renewable energy source 228 is directly integrated into DC bus 224; DC bus 224 supplies power to DC loads 212, 216 and 220 directly, it also supplies power to the auxiliary power output 260 via the uninterruptable power supply (UPS) 356, which includes a DC/DC converter for converting the nominal voltage of the DC bus to the auxiliary voltage $V_{AUX;}$ DC loads include DC appliances such as electric vehicle chargers, DC motors and motors with variable frequency drives];

a mains supply input terminal [D1: par. [0023]; Fig 3: electrical grid (AC) 236 provides AC power to the DC power server 204]; and

a first DC/AC inverter capable of converting DC power to AC power and capable of converting AC power to DC power [D1: par. [0031], [0035]; Fig 3: rectifiers 324 additionally include inverter circuits that enable them to function as bi-directional AC to DC and DC to AC converters],

wherein the mains supply input terminal is connected to the direct current input terminal via the first DC/AC inverter, the mains supply input terminal being further connected to a mains supply [D1: par. [0023]; Fig 3];

wherein, if DC electrical energy generated by the solar power generation device is not sufficient, electrical energy is supplemented by the mains supply; and if the DC electrical energy generated by the solar power generation device is surplus,

redundant DC electrical energy is converted into alternating current electricity via the first DC/AC inverter and transmitted to the mains supply [D1: par. [0023], [0035]];

wherein in a case that a withstand voltage of the direct current electrical appliance is in a voltage range of the first direct current output terminal of the energy gateway, the direct current electrical appliance is directly connected to the first direct current output terminal [D1: par. [0022], [0030], [0032], [0037]; Fig 2-4: certain DC loads are connected directly to the DC bus 224]; in a case that the withstand voltage of the direct current electrical appliance goes beyond the voltage range of the first direct current output terminal, the direct current electrical appliance is connected to the second direct current output terminal [D1: par. [0030], [0037]; Fig 3: power is supplied to the auxiliary power output 256 via UPS 356 which includes a DC/DC converter].

[99] In our view, proposed claims 5 and 7 contain similar limitations as proposed claim 1.

[100] With respect to the enablement requirement, it is our view that D1 sufficiently discloses the claimed energy gateway method and system in claims 1, 5 and 7 on file for the skilled person to practise the proposed invention without undue burden

[101] In the RPR, the Applicant submitted that neither D1 nor D3 discloses “wherein the first direct current output terminal is directly connected to the direct current input terminal” as recited in claim 1, or “connecting a direct current electrical appliance to a first direct current output terminal directly” as recited in claim 7.

[102] We respectfully disagree. As explained in detail in the Novelty section discussing the claims on file, it is our view that both D1 and D3 disclose the above features. It is therefore our view that proposed claims 1, 5 and 7 would lack novelty in view of D1.

[103] In our view, D1 does not explicitly disclose the limitations in proposed claims 2-4, 6 and 8, such as incorporating the claimed energy gateway in a household electrical appliance or supplying power to an AC appliance.

[104] In light of the above, it is our view that proposed claims 1, 5 and 7 would lack novelty in view of D1 and would not comply with paragraph 28.2(1)(b) of the *Patent Act*.

Obviousness

[105] In our view, the proposed claims would not overcome the obviousness defects identified above.

[106] We consider the combination of essential elements of the proposed claims to represent their inventive concepts. We consider proposed claim 1 as the representative claim and take the above identified essential elements of the proposed claims for the purpose of assessing their obviousness.

[107] As previously mentioned, we are of the view that D1 is the closest prior art to the subject matter of the proposed claims. In light of the above novelty assessment of the proposed claims, it is our view that, as there are no differences between the disclosure in D1 and the subject matter of proposed claims 1, 5 and 7, the subject matter these claims would have been obvious to a person skilled in the art.

[108] Regarding proposed claim 2, D1 does not explicitly disclose supplying power to an alternating current appliance. However, D3 discloses an alternating current output terminal configured to supply power to an external alternating current electrical appliance and a second DC/AC inverter, wherein the direct current input terminal is connected to the alternating current output terminal via the second DC/AC inverter [D3: par. [0032], [0054]; Fig 4: DC line 1 is connected to AC line 3 via DC/AC inverter 301, which in turn supplies power to AC loads 102 and AC socket 4100]. In our view, it would have been obvious to a person skilled in the art to incorporate a DC/AC inverter and an AC output terminal in the system of D1 in order to accommodate AC loads.

[109] Regarding proposed claims 3, 6 and 8, D1 does not explicitly disclose that the energy gateway is part of a household electrical appliance. However, D3 discloses a household electrical appliance, particularly an air conditioner, comprising the claimed energy gateway [D3: Abstract; par. [0002]]. In our view, it

would have been an obvious design alternative to a person skilled in the art to include the system of D1 in a household electrical appliance, such as an air conditioner.

[110] Regarding proposed claim 4, D1 does not explicitly disclose that the energy gateway is part of a direct drive variable-frequency air conditioner. However, D3 discloses that the household electrical appliance is a photovoltaic direct drive variable-frequency air conditioner [D3: par. [0063]; Figs 2, 4: the air conditioner direct current variable frequency compressor is connected to the first direct current bus 1, which is directly driven by the photovoltaic array 201 without the use of inverters and rectifiers]. Given that air conditioners consume large amounts of energy and are prime candidates to use solar energy in order to reduce their power intake from the main AC grid, in our view, it would have been an obvious design alternative to a person skilled in the art to include the system of D1 in a direct drive variable-frequency air conditioner.

[111] In the RPR, the Applicant submitted that neither D1 nor D3 discloses “wherein the first direct current output terminal is directly connected to the direct current input terminal” as recited in claim 1, or “connecting a direct current electrical appliance to a first direct current output terminal directly” as recited in claim 7. In the RPR at page 7, the Applicant also submitted that these features “are so that the structure of the energy gateway is simplified” compared to the “complex disclosure of D1”.

[112] We respectfully disagree. As explained in detail in the Obviousness section discussing the claims on file, it is our view that both D1 and D3 disclose the above features and the claimed simplified energy gateway structure. We also explained that, even if D1 and D3 were not considered to disclose the claimed features, the above features and simplified structure would have been obvious to person skilled in the art in view of the cited prior art and the relevant CGK.

[113] In light of the above, it is our view that claims 1-8 in proposed claim set-3 would have been obvious to the skilled person in view of the cited prior art and the relevant CGK, and would not comply with section 28.3 of the *Patent Act*.

Indefiniteness

[114] The PR letter identified indefiniteness defects with respect to proposed claim set-2. In our view, the claims in proposed claim set-3 would overcome those indefiniteness defects.

Conclusion regarding the proposed claims

[115] In light of the above, we conclude that, as proposed claim set-3 would not comply with *Patent Act*, the proposed claims are not considered necessary amendments in accordance with subsection 86(11) of the *Patent Rules*.

CONCLUSIONS

[116] The Panel is of the view that:

- claims 1-10 on file lack novelty in view of the cited prior art and do not comply with paragraph 28.2(1)(b) of the *Patent Act*,
- claims 1-10 on file would have been obvious to a person skilled in the art in view of the cited prior art and the relevant CGK, and do not comply with section 28.3 of the *Patent Act*,
- proposed claims 1, 5 and 7 would lack novelty and would not comply with paragraph 28.2(1)(b) of the *Patent Act*, and proposed claims 1-8 would have been obvious to a person skilled in the art and would not comply with section 28.3 of the *Patent Act*. Therefore, the proposed claims are not considered a necessary amendment under subsection 86(11) of the *Patent Rules*.

RECOMMENDATION OF THE BOARD

[117] In view of the above, we recommend that the application be refused on the grounds that:

- claims 1-10 on file lack novelty and do not comply with paragraph 28.2(1)(b) of the *Patent Act*, and
- claims 1-10 on file would have been obvious to a person skilled in the art and do not comply with section 28.3 of the *Patent Act*.

Mehdi Ghayour	Michael Ott	Lewis Robart
Member	Member	Member

DECISION OF THE COMMISSIONER

[118] I concur with the conclusions and recommendation of the Board that the application be refused on the grounds that:

- claims 1-10 on file lack novelty and do not comply with paragraph 28.2(1)(b) of the *Patent Act*, and
- claims 1-10 on file would have been obvious to a person skilled in the art and do not comply with section 28.3 of the *Patent Act*.

[119] Therefore, in accordance with section 40 of the *Patent Act*, I refuse to grant a patent for this application. Under section 41 of the *Patent Act*, the Applicant has six months within which to appeal my decision to the Federal Court of Canada.

Konstantinos Georgaras

Commissioner of Patents

Dated at Gatineau, Quebec

This 13th day of March, 2023