

Commissioner's Decision No. 1473
Décision du commissaire n° 1473

TOPICS: F-00 Novelty
F-01 Anticipation
O-00 Obviousness

SUJETS: F-00 Nouveauté
F-01 Antériorité
O-00 Évidence

Application No. 2,768,101
Demande n° 2 768 101

IN THE CANADIAN PATENT OFFICE

DECISION OF THE COMMISSIONER OF PATENTS

Patent application number 2,768,101, 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.

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INTRODUCTION

- [1] This recommendation concerns the review of rejected patent application number 2,768,101, which is entitled “Utilization of Distributed Generator Inverters as STATCOM”. The patent application is owned by R.K. Varma. The outstanding defects to be addressed in this review are that claims lack novelty and are obvious. 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 2,768,101, based on a previously filed Patent Cooperation Treaty application, is considered to have a filing date of September 15, 2010 and was made available to the public March 24, 2011.
- [3] The application pertains to the operation of a voltage inverter as a Static Synchronous Compensator (STATCOM) so as to provide reactive power to an electrical grid when the inverter is underutilized in its typical role of providing active power to the grid, for example, when used in a solar farm during nighttime.

Prosecution history

- [4] On September 8, 2015, 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 ground that the claims on file (i.e. claims 1 to 19) are obvious and do not comply with section 28.3 of the *Patent Act*.
- [5] In a December 8, 2015 response to the FA (“RFA”), the Applicant submitted arguments for allowance and provided a first set of proposed claims 1-20. As the Examiner considered the application still did not comply with the Act and 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.
- [6] With a letter dated June 21, 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. With its response on September 14, 2016, the Applicant

accepted an oral hearing but indicated that further submissions would be made at a later date in advance of a preliminary review by the Board.

- [7] 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 (“PR Letter”) dated December 14, 2017, we presented our preliminary analysis and rationale as to why, based on the record before us, the subject-matter of the claims on file were obvious and thus did not comply with section 28.3 of the *Patent Act*. With respect to the proposed claims provided with the RFA, we stated that our preliminary view with regard to the claims on file would not have changed if the proposed claims had been adopted.
- [8] In its response to the PR Letter (the “First Reply”) dated January 25, 2018, the Applicant provided arguments as to why the application conformed with the Act and Rules, and included a second set of proposed claims 1-20.
- [9] In an Addendum to our PR Letter dated February 12, 2018 (the “Addendum”), the Panel presented additional observations concerning its preliminary review that arose in light of a new piece of prior art that the Panel became aware of subsequent to the PR Letter. An additional defect of anticipation (lack of novelty) in view of the new prior art was also addressed by the Panel. The Applicant was offered an additional opportunity to respond to this additional information.
- [10] On March 27, 2018, the Applicant responded to the Panel’s additional observations with further submissions (the “Second Reply”) including a third set of proposed claims 1-20 and arguments as to why the application was both novel and non-obvious in view of both D2 and D3.
- [11] A hearing was held on April 6, 2018. The Inventor, Dr. R. Varma, attended the hearing by telephone and provided additional technical clarification on the claimed subject matter for consideration by the Panel.
- [12] As discussed at the hearing, documents related to awards and recognitions received by the Inventor were submitted by the Applicant on April 9, 2018 for consideration by the Panel in its assessment of the claimed subject matter.

ISSUES

[13] There are two issues to be addressed by this review:

- whether the claims on file define novel subject-matter as required by section 28.2 of the *Patent Act*, and
- whether the claims on file are non-obvious as required by section 28.3 of the *Patent Act*.

LEGAL PRINCIPLES AND PATENT OFFICE PRACTICE

Purposive construction

[14] In accordance with *Free World Trust v Électro Santé*, 2000 SCC 66, 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 v Camco*, 2000 SCC 67 at paras 49(f) and (g) and 52). In accordance with the *Manual of Patent Office Practice*, revised June 2015 (CIPO) 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.

Novelty/Anticipation

[15] Subsection 28.2(1) of the *Patent Act* requires claimed subject matter to be novel (not anticipated):

The subject-matter defined by a claim in an application for a patent in Canada (the “pending application”) must not have been disclosed

- (a) more than one year before the filing 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;

...

[16] In *Apotex Inc v Sanofi–Synthelabo Canada Inc*, 2008 SCC 61 [*Sanofi*] at paras 25–29 and 49, the Supreme Court of Canada concluded that the issue of whether an invention is anticipated by the prior art requires that the Court have regard to two questions:

- Was the subject matter of the invention disclosed to the public by a single disclosure?
- If there has been such a disclosure, is the working of the invention enabled by that disclosure?

Obviousness

[17] 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 more than one year before the filing 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.

[18] In *Sanofi* 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”;
- (b) Identify the relevant CGK 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?

ANALYSIS

Claim Construction

[19] Claim 1 on file is considered representative of the invention:

A distributed power generation source, for operatively connecting to a distributed power generation network at a point of common coupling, said distributed power generation source comprising:

- a voltage inverter for supplying active power and reactive power to said distributed power generation network; and
- a control means, operatively coupled to said voltage inverter, that operates said voltage inverter as a static synchronous compensator (STATCOM) to supply said reactive power to regulate a voltage at said point of common coupling;

wherein said control means operates said voltage inverter as a STATCOM only when said voltage inverter is operating at a capacity less than a rated capacity of said voltage inverter; said control means operating said voltage inverter as a STATCOM using an unutilized capacity of said voltage inverter; and

wherein said distributed power generation source and at least one additional distributed power generation source are connected to said network in close proximity.

[20] As stated in the PR Letter, a determination as to which claimed elements are essential and which are not (through a purposive construction of the claims) was not undertaken by the Panel in its preliminary review because in the Panel's view the result of its analysis under obviousness would not have been affected by the omission of any non-essential elements.

[21] The Applicant's First Reply did not object to this approach. However, with regards to the subsequently raised issue of anticipation, the Applicant's Second Reply did submit that the Panel had "not properly satisfied the legal test for establishing the present invention is anticipated" as required by *Sanofi* because in the Applicant's opinion the Panel failed to identify whether every essential element of the claims in question were disclosed in the cited prior art.

[22] We agree with the Applicant that implicit in the *Sanofi* approach for assessing anticipation is the principle that only the essential elements of a claim need to be disclosed in the relevant piece of prior art and non-essential elements can be omitted. Thus, as a precursor to an anticipation analysis, it is typically necessary to construe which elements are essential in the claim under review. However, the

Panel's analysis as presented in the Addendum considered all the elements of the claims under review in our preliminary assessment of anticipation, similar to the approach of considering all elements in the obviousness analysis. As such, the Panel did not explicitly identify non-essential elements.

- [23] We consider the above approach taken with regards to claim construction to be appropriate in this case and that the outcome for both the obviousness and anticipation analyses has not been improperly impacted.
- [24] At the hearing, the Applicant did not offer any further comments directed to the process of claim construction, but did address the meaning and significance of the term STATCOM as it would be understood by the skilled person in the art.
- [25] Prior to construing the meaning of the claimed term, we consider the person skilled in the art and the CGK.

Person skilled in the Art and Common General Knowledge

- [26] In the PR Letter, the notional skilled person was identified as an electrical engineer specialized in the field of electric power transmission and distribution. The Applicant did not object to this characterization and we adopt it here.
- [27] In the PR Letter, the relevant CGK of the skilled person was identified as including:
 - knowledge of general theory of electric power systems, particularly distributed power generation;
 - knowledge that a distributed generation (DG) power source utilizes an inverter to deliver active power to a network;
 - knowledge of DG wherein many distributed power sources (e.g., renewable power sources) are connected to the traditional power grid;
 - knowledge of a STATCOM, "a solid-state switching converter that is capable of independently generating or absorbing controllable real and reactive power at its output terminals when it is fed from an energy source or an energy storage device at its input terminals";
 - knowledge that a STATCOM can provide voltage support by generating or absorbing reactive power at the point of common coupling (PCC);

- knowledge that a STATCOM can improve power system performance in areas such as: voltage control; the increase and control of power transmission capacity in a line; preventing loop flows; improvement of system transient stability limit; enhancement of system damping; mitigation of sub-synchronous resonance; alleviation of voltage instability; limiting short circuit currents; improvement of HVDC converter terminal performance; grid integration of wind power generation systems; voltage flicker control; and the control of active and reactive power in the connected line; and
- knowledge that when solar and wind power generation systems are connected as part of a DG system, each have variable outputs based on the level of solar radiation and wind speed, respectively, varying throughout the course of the day. In particular, solar radiation falls to zero at night or near-zero in cloudy weather, and thus, at these times, both active power generation and system utilization is low for solar DG systems.

[28] In its First Reply, while not disagreeing with any of the above CGK, the Applicant did propose two additional clarifications to the CGK. In particular, the Applicant argued that the CGK of the skilled person must necessarily include knowledge that:

- absent any modifications or additional resources, STATCOMs can only exchange reactive power with the power grid; and
- inverters in solar and wind power generation systems only provide real power to the grid.

[29] On the first point of clarification, the Panel agrees that the CGK of the skilled person would include that STATCOMs, as designed, generate or absorb reactive power. However, as cited by the Panel above and as stated in the Applicant's own background, it is CGK that STATCOMs are solid state devices "capable of independently generating or absorbing controllable real and reactive power at its output terminals when it is fed from an energy source or an energy storage device at its input terminals". Thus the skilled person would know that when an energy source is connected to a STATCOM, active (real) power can also be generated.

[30] On the second point, the Panel would agree that the typical use of inverters in solar or wind power DG systems is the provision of active power. As to whether or not it was CGK that said inverters could not also produce reactive power in solar or wind DG systems, there is no evidence on file to either confirm or refute this statement.

However, as it will be seen below, this question does not affect the outcome of our obviousness analysis.

Meaning of the term “STATCOM”

- [31] As described in the application, a STATCOM is a solid-state switching converter capable of independently generating or absorbing reactive power and whose output can be varied to control specific parameters of electrical power systems. It can provide voltage support to a transmission system without the need for large external reactors or capacitor banks. A STATCOM can provide many improvements to a power system, including: voltage control; increase in transmission capacity; improved system stability; enhanced system damping; mitigation of sub-synchronous resonance; and other functions.
- [32] As stated above, these operating characteristics of STATCOMs were identified as part of the CGK of the skilled person and the Applicant did not object to their inclusion.
- [33] However, at the hearing, the Applicant further emphasized that the person skilled in the art would appreciate that, in providing these operating characteristics, a STATCOM operates dynamically and independently (or autonomously) in response to local changes in the power system. This dynamic and independent operation becomes pertinent to the discussion regarding novelty and obviousness of the claims in view of the cited art.
- [34] Generally, the “dynamic” operation inherent in a STATCOM is understood by a skilled person to mean the ability to react quickly to local changes at the point of connection, i.e. at a response times of milliseconds, unlike those of conventional compensation systems whose response times are measured in seconds. The “independent” operation inherent in a STATCOM is understood by a skilled person to mean the ability to operate autonomously at a local connection point in order to make decisions on the needed power conditioning without any additional direction or active control from a centralized control station or generation site.
- [35] The Panel notes that given the passages in the description at para [0083] and the matter of dependent claim 19, and considering the principle of claim differentiation, the “independent” operation as envisioned in this application may entail the use of signal inputs from either local or remote measurements. Nevertheless, the STATCOM makes the required grid compensation controls and

decisions at the local installation (or point of connection), independent of any remote control.

- [36] Upon review of the submissions at the hearing, the written prosecution, and the statements in the description, the Panel accepts that the skilled person would understand STATCOMs, as defined in the instant application, to operate dynamically and independently (or autonomously), albeit with the possibility of remote signal inputs.
- [37] The meanings of the remaining terms in the claims were not at issue and would be easily understood by the person skilled in the art.

Novelty/Anticipation

- [38] The Addendum indicated that claims 1, 2, 4, 5, 10 to 16, and 18 on file are anticipated and therefore do not comply with the requirements of section 28.2 (1)(b) of the *Patent Act* in view of the disclosure of the following Canadian patent:

D3: CA 2715340 Fornage published August 20, 2009
(equivalent to US 2009/200994 cited in corresponding European prosecution)
- [39] D3 discloses a method and apparatus for generating both real and reactive power in a DG system connected to the power grid. The DG system may be comprised of a plurality of renewable energy sources including solar, wind or hydro sources connected through a plurality of inverters or micro-inverters. The inverters operate to provide both active and reactive power to the utility grid. By providing VAR (Volt-Ampere reactive) compensation, the system can reduce the negative effects of reactive loads which can degrade the power grid, including line losses, stability problems and voltage control deviations.
- [40] The system of D3 accommodates the generation/absorption of reactive power independent of the real power generated, i.e., even when no active power is being generated by the DG system. As disclosed in D3, reactive power generation is limited by the total capacity (e.g. current rating) of the inverters to provide power (real or reactive) and that rating cannot be exceeded. Therefore, the skilled person would understand D3 to teach that the inverters provide reactive power based on an unutilized capacity for active power generation up to the maximum total capacity limit of the inverters.
- [41] With regard to claim 1, the Addendum indicated how in the Panel's view the single reference of D3 discloses and enables the claimed features of:

- a large capacity distributed power generation source;
- a voltage inverter for supplying both active and reactive power to the distributed power generation network;
- operation of the voltage inverter as a STATCOM only when the capacity of the voltage inverter is below a rated capacity;
- control means for operating the voltage inverter as a STATCOM using the unutilized capacity of the voltage inverter; and
- at least one additional generation source connected in close proximity.

- [42] The Addendum further explained how D3 discloses the additional features of claims 2, 4, 5, 10 to 16, and 18.
- [43] In response, in addition to arguing that the Panel did not follow the proper test for anticipation (which we have addressed above), the Applicant argued that D3 does not disclose all the essential features of the abovementioned claims.
- [44] At the hearing, the Inventor, Dr. R. Varma, articulated the differences in operation between the inverters claimed in the instant application and the operation of the inverters disclosed in D3. Of note is the claimed feature of “operation of the voltage inverter as a STATCOM” contrasted with the inverter in D3 operating in an on-demand VAr compensation network. As argued by Dr. Varma, the inverters in D3 do not provide STATCOM functionality in at least the sense that they do not operate independently (or autonomously) at the local connection point to provide reactive power and voltage control, as STATCOMs are known to do so.
- [45] Turning to the relevant passages and figures in D3, the skilled person would understand that the system as disclosed and enabled in D3 relates to a plurality of inverters connected via a plurality of inverter controllers to a commercial power grid which is headed by a commercial power plant. Additionally, the plurality of inverters are connected to a communication network headed by a gateway and/or Network Operations Centre (NOC) located at a remote location.
- [46] In operation, the system of D3 provides on-demand VAr compensation when the power utility (plant and grid) requests VAr support from the NOC. The NOC then determines the appropriate number of inverters to provide control signals to instruct the inverters to provide the necessary VAr compensation. The NOC controls the individual inverters via the communications network so as to operate the inverters to provide or absorb reactive VAr.

- [47] In the Panel's opinion, the skilled person would understand that D3 discloses a system based on both the remote demand for VAr compensation and the remote control (by a centralized NOC) of the individual local inverters to provide said VAr compensation needed for the grid voltage stability and control.
- [48] However, the skilled person would understand that at least one essential element of the present invention is the claimed inverter operating as a STATCOM by independently providing reactive power to the connected grid based on the control decisions made at the point of common coupling, independent of any remote determination or control. For at least this reason, the skilled person would understand that the inverter arrangement in D3 is not operating as an independent STATCOM as understood in relation to the instant application.
- [49] Accordingly, the essential feature of "operating the inverter as a STATCOM" is not disclosed and enabled in the single reference of D3. For the same reasons, the remaining independent claims 6, 10 and 14 are also novel in view of the disclosure of D3.
- [50] As the dependent claims all flow from novel independent claims, all claims 1-19 on file are considered to meet the requirement for novelty as set out in section 28.2 of the *Patent Act* with regard to prior art document D3.

Obviousness

Step 1 - Identify the notional skilled person and the relevant CGK

- [51] We have addressed the characterization of the person skilled in the art and the CGK under "Claim Construction" above, and therefore adopt it here for our obviousness analysis.

Step 2 - Identify the inventive concept

- [52] The PR Letter stated that, having considered the application, the FA and the RFA, the inventive concept of the independent claims "includes operating the inverter as a STATCOM to provide reactive power when the inverter has unutilized capacity". This inventive concept reflected the focus of the obviousness question during prosecution of the application at the time of the FA, i.e., the use of unutilized capacity of the inverters to provide reactive power when not providing full active power output.

- [53] In its First Reply, the Applicant clarified this inventive concept to align with the claimed features and distinguish the invention from the prior art. The Applicant submitted that the inventive concept includes:
- (a) a distributed power generation source;
 - (b) a voltage inverter for supplying both active and reactive power to the distributed power generation network;
 - (c) operation of the voltage inverter as a STATCOM only occurs when the capacity of the voltage inverter is below a rated capacity; and
 - (d) the control means operates the voltage inverter as a STATCOM using the unutilized capacity of the voltage inverter.
- [54] In the Addendum, we accepted the Applicant's characterization of the inventive concept as including the four main features above and we used these features for our obviousness analysis as representing the differences between the independent claims and the cited prior art. We also addressed any additional features in the independent claims and the further limitations of each dependent claim.
- [55] In its Second Reply, the Applicant did not propose any change to its inventive concept but instead argued that the inventive concepts in its First Reply (as above) "were not exhaustive; these inventive concepts were the features that were *non-obvious* in view of the D2 reference". The Applicant further submitted that the "inventive concepts identified in the [First] Reply with regards to the D2 obviousness rejection have no bearing on the Panel's new D3 obviousness rejection". The Applicant also urged the Panel to conduct its obviousness analysis on all claims using inventive concepts for each claim.
- [56] At the hearing, the Panel clarified that it adopts the above differences set out by the Applicant in its First Reply as the inventive concept of the independent claims. Based on the Panel's assessment, we agree that the skilled person would understand these four essential features to be the inventive concept, and likewise would not consider the remaining features of the independent claims to be part of the inventive concept. In any case, even if the remaining features were included in the inventive concept, they would not be differences at *Sanofi* Step 3, as they are disclosed in D2 and D3. Furthermore, the Panel agrees that according to the *Sanofi* framework, the inventive concepts are determined for each and every claim, as reiterated by the Applicant at the hearing.
- [57] However, the Panel does not agree that the inventive concepts change based on which piece of prior art is being considered. In accordance with the *Sanofi* framework, the inventive concept(s) of the claims is/are identified in Step 2,

following which in Step 3 the relevant prior art is compared to the inventive concept(s) and the differences are identified.

Step 3 - Identify what, if any, differences exist between the matter cited as forming part of the “state of the art” and the inventive concept

[58] In addition to the document D3 which has been summarized above, the following document was considered by the Panel as relevant with regards to the “state of the art”:

D2: US 2007/0135970A1 Zhou, et al. published June 14, 2007

[59] D2 discloses a reactive power compensation system including a distributed energy resource (such as a photovoltaic power generation system) at a local location configured to receive power from a remote power source by a distribution feeder line. The distributed energy resource includes an inverter and controller to provide reactive power (VAR) support to the distribution feeder line, thereby acting to improve voltage stability, reducing or eliminating the need for costly remote capacitor banks.

[60] In operation, the system of D2 provides reactive power support and voltage stability to the distribution feeder line at the local location, independent of any other control. An inverter controller is configured to use the sensed voltage of the incoming grid power feeder to calculate an inverter output voltage adjustment designed to provide the reactive power support. The inverter monitors voltage and adjusts VAR generation to attempt to control voltage and line stability. Additionally, the system of D2 can accommodate increased demand for reactive power conditioning based on the feeder line conditions and the capacity of available inverters.

Differences regarding D2

[61] In the PR Letter, we considered that the skilled person would understand that D2 does not explicitly disclose operating the voltage inverter as a STATCOM only when said voltage inverter is operating at less than a rated capacity of the inverter, i.e., using an unutilized capacity of the inverter. At the time of the PR Letter, this unutilized capacity feature was the focus of the obviousness question during prosecution of the application.

- [62] In its two reply letters and at the hearing, the Applicant refined its argument regarding the differences over the disclosure of D2. In addition to arguing that D2 does not disclose the feature of using “unutilized capacity”, the Applicant also argued that D2 does not disclose an inverter that provides active power to the grid and that D2 does not disclose operation of an inverter as a STATCOM to provide dynamic voltage support.
- [63] With regards to the first additional difference, we agree that the skilled person would find that D2 does not explicitly disclose that the inverter provides active power to the grid.
- [64] With regards to the second additional difference, the Panel does not agree that the skilled person would see the inverter in D2 as operating any less dynamically than the claimed inverters. At the hearing, the Applicant argued that D2 discloses reactive power being provided at a response time in the order of seconds like older, conventional capacitor-bank compensation systems and not dynamically like a STATCOM, with a response time in the order of milliseconds.
- [65] However, in the Panel’s view, the skilled person would read D2 as utilizing modern PV inverter technology, utilizing the faster response times of power semi-conductors in the inverters to achieve dynamic and independent voltage control and compensation. The system in D2 would be understood as replacing the older technology compensations such as capacitor banks. This is the equivalent to the instant application: utilizing modern inverter technology to provide dynamic and independent STATCOM operation.
- [66] Therefore, contrary to the Applicant’s arguments, the Panel considers that dynamic operation as a STATCOM would not be considered a difference by the skilled person.

Differences regarding D3

- [67] Given our analysis of D3 regarding novelty/anticipation (above), we agree with the Applicant’s position as presented at the hearing that the skilled person would understand that D3 does not explicitly disclose the inverter as an independent functioning STATCOM.
- [68] The skilled person would however understand that D3 discloses the remaining features of the inventive concept of the independent claims, namely, a distributed generation system, the provision by the inverters of real and reactive power, and

the use of unutilized capacity of inverters in order to provide reactive power support to the grid (see our discussion of D3 under Novelty, above). With regard to dynamic operation of the inverters (i.e. response times of milliseconds not seconds), the skilled person would understand that the disclosed solid state Insulated-Gate Bipolar Transistor (“IGBT”) inverter architecture of D3 operates at faster response times than conventional capacitor banks or static VAR compensators. Accordingly, these features are not considered to be differences between the inventive concept of the independent claims and D3.

[69] In summary, the following differences between the matter cited as forming part of the “state of the art” and the inventive concept of the independent claims will be considered at Step 4:

- the claimed inverter provides real power to the grid as a DG system, different from the operation of the inverter in the system of D2;
- the claimed inverter provides reactive power to the grid when said voltage inverter is operating at less than a rated capacity of the inverter using an unutilized capacity, different from the operation of the inverter in the system of D2; and separately
- the claimed inverter operates as an independent functioning STATCOM, different from the disclosed operation of the inverter in the system of D3.

[70] The additional differences between the inventive concepts of the dependent claims and the cited art will be considered in Step 4 following the analysis of the inventive ingenuity of the independent claims.

Step 4 - Do those differences constitute steps which would have been obvious to the skilled person or do they require any degree of invention

- Providing real power to the grid as a DG system

[71] In D2, a similar PV distributed power architecture provides dynamic VAR compensation to an electrical grid using an independently functioning inverter without centralized control. Although the Applicant has pointed to the lack of explicit disclosure in D2 of provision of real power to the grid (i.e., a consumer of active power and not a provider), D2 does disclose use of “emerging distributed energy resources” such as residential PV systems where “bi-directionality is becoming more important”, in contrast to the conventional power flow which was “unidirectional from the substation to the residence”.

- [72] We note also that D2 discloses the conventional arrangements for interconnections (e.g., suitable wiring, lockable disconnects, circuit breakers, distribution panels, etc.) between the supply grid entering the residence and the local distributed PV resource, such as would enable such bidirectional real power flow as discussed above.
- [73] In our view, the skilled person would read these statements collectively in light of the CGK of inverters providing real or active power to a network (e.g., grid) and CGK of DG systems wherein many distributed power sources (e.g., renewable power sources) are connected to the grid and would consider it an obvious option of the system in D2 to likewise supply active power to an interconnected grid.
- Providing reactive power to the grid when said voltage inverter is operating at less than a rated capacity of the inverter using an unutilized capacity
- [74] As noted by the Panel, while not explicitly defining using an unutilized capacity of the inverters, D2 nevertheless teaches that “inverter capacity” is one factor in determining how to manage and achieve the necessary reactive power generated by the system in D2. The Applicant, in its submissions, argues that this feature teaches away from using the unutilized capacity of the inverters to provide reactive power, since it is unclear what “inverter capacity” in D2 refers to.
- [75] However, the skilled person using his or her CGK of general theory of electrical power systems understands that inherent in any voltage inverter, as in other electric devices, is a maximum rated capacity. The skilled person would understand on the claim date that in the system of D2, that “the inverter capacity” would at least in part refer to the total amount of power that the inverter can provide including real and reactive power. Given that the inverter in D2 is primarily configured to supply real power from the PV array to its local connection point and that any reactive power generation is using the same inverter, it would be an obvious limitation that the reactive power being generated would only be in view of the unutilized capacity of the inverter apart from real power generation.
- [76] Similarly, the skilled person would have known from his or her CGK that the active power generation of an inverter in a solar DG system varies throughout the day and reduces to zero or near-zero at night. Therefore, it would be obvious to the skilled person that the voltage inverter would, over the course of the day, be operating at less than a rated capacity. Accordingly, it would be an obvious constraint that the claimed inverter would be limited to only provide reactive power when said

voltage inverter is operating at less than a rated capacity of the inverter using an unutilized capacity.

[77] The Panel also considers that to the skilled person, these differences in combination also would not accrue any degree of invention over the prior art document of D2. As the provision of active power to a grid from a PV inverter is well known and not by itself inventive, the combination of using the unutilized capacity of said inverter to also provide reactive power to the grid would not require inventive ingenuity.

[78] Accordingly, the differences between the inventive concept of the independent claims and the state of the art as seen from D2 are not steps which require any degree of invention.

- the claimed inverter operates independently as a STATCOM

[79] From the disclosure of D3, the skilled person would be aware of the use of solid state IGBT voltage inverters in a distributed generation system, such as a solar PV installation, to provide both real and reactive power to a point of common connection of an electrical grid, using an unutilized capacity not otherwise used for real power generation. However, the skilled person would recognize the absence in D3 of inverters operating as independent functioning STATCOMs: D3 discusses the arrangement of centralized control, wherein decisions to determine the needed STATCOM inverter voltage control or compensation are done remotely and not at the inverter's point of local connection.

[80] However, given the CGK of STATCOMs and their capability for “independently generating or absorbing controllable real and reactive power”, in our view, the skilled person would consider it an obvious choice to modify the system of D3 to operate locally and independent of the NOC/gateway control signals. The skilled person is an engineer specialized in the field of electric power transmission and distribution and has knowledge of distributed power generation and knowledge of distributed power sources (e.g., renewable power sources) connected to the traditional power grid. An obvious alternative inverter control system would be to have the inverters operate as independent STATCOMs with control based locally. The skilled person would understand that in many distributed renewable systems, at long distances from the main grid control centre and of a variety of generation sizes, providing interconnection with a remote control system would not always be feasible or cost effective. Therefore, the other obvious option would be local autonomous operation.

- [81] Although, as the Applicant pointed out at the hearing, D3 addresses a need for providing “on-demand” VAr compensation by utilizing remote decisions to command the local inverters, the stipulation in D3 of “on-demand” does not preclude to the skilled person the obvious alternative of a local and independent STATCOM inverter providing equivalent VAr compensation as demanded by the grid at the point of connection.
- [82] Accordingly, the difference between the inventive concept of the independent claims and the state of the art as taught by D3 is not a step which requires any degree of invention.
- [83] Regarding claim 6, although not identified by the Applicant as a separate inventive limitation, the claim defines the additional feature of a damping controller to control oscillations in the power transmission system. However, oscillation and stability control is one of the CGK functions known for STATCOMs, and as such the use of a damping controller to achieve operation “as a STATCOM” would have been obvious to the skilled person. Therefore, the additional feature of claim 6 is not considered to impart any degree of invention.
- [84] Regarding claims 10 and 14, although not identified by the Applicant as a separate inventive limitation, they define the additional feature of charging users of the transmission system for using the inverter as a voltage regulating device. This is an obvious administrative function, as commercial power generation is based on charging users, wherein power and capacity are bought, sold and traded as commodities. Furthermore, D3 discloses the known business model to charge additional money for the improvement in capacity or reactive power compensation, for example where the NOC bills the utility company for the VAr compensation service provided. Therefore, this additional feature of claims 10 and 14 is not considered to impart any degree of invention.

Additional material provided after hearing

- [85] Following the hearing, the Applicant submitted to the Panel material related to awards and recognition which the Inventor received related to his developments in the field. The Panel had asked that copies of any such material be provided for consideration in its Obviousness assessment.
- [86] Secondary indicia such as commercial successes or meritorious awards are two secondary factors that may be relevant in an obviousness inquiry (see for example

Novopharm Limited v. Janssen-Ortho Inc., 2007 FCA 217 [*Novopharm*] at para 25). In particular:

...

7. Commercial Success

Was the subject of the invention quickly and anxiously received by relevant consumers? This may reflect a fact that many persons were motivated to fill the commercial market, which may suggest inventive ingenuity. However, it may also reflect things other than inventive ingenuity such as marketing skills, market power and features other than the invention.

- Meritorious awards

Awards directed to the alleged invention may be recognition that the appropriate community of persons skilled in the art believed that activity to be something of merit. That may or may not say anything about inventive ingenuity.

[87] However, as cautioned by the court in *Novopharm*, “[t]hese factors may be relevant but generally bear less weight because they relate to facts arising after the date of the alleged invention.”

[88] The submitted material includes:

- A page indicating an IEEE Technical Committee Prize Paper Award for the paper “Novel nighttime application of PB [sic] Solar Farms as STATCOM (PV-STATCOM)” dated 2013;
- A page indicating a First Place Poster Award from the 7th International Conference on Integration of Renewable and Distributed Energy Resources for the paper “PV Statcom: A Novel Smart Inverter for Transmission and Distribution System Applications” dated October 2016;
- A news article from the Sarnia Observer titled “Western Engineering research demonstrated in Sarnia” dated December 2016;
- A news article from Blackburnnews.com titled “New Technology Awakens Sleeping Solar Farms” dated December 2016;
- A news article from the Sarnia Journal titled “New device could put sleeping solar farms to work” dated December 2016;

- A news article from the Western Engineering News titled “ECE professor Rajiv Varma demonstrates new technology to 'wake up' solar farms at night” dated December 2016; and
- A technical report from the National Renewable Energy Laboratory titled “Demonstration of Essential Reliability Services by a 300-MW Solar Photovoltaic Power Plant” dated March 2017.

- [89] The Panel has carefully reviewed each of the submitted documents and have assessed the relevance of the documents to the claimed subject matter.
- [90] Regarding the two awards given to Dr. Varma for the conference paper and poster, these are not considered to provide any clear support to the non-obviousness of the claimed subject matter as there is no link regarding the content of the paper or poster to the claimed matter. While the awards appear to be related to the same field and technology as the current application and they appear to indicate that the Inventor was active in this field and deserved merit, the documents provide no details that could be compared with the claimed subject-matter and therefore do not in the Panel’s opinion directly address any possible inventive ingenuity in the claimed subject matter.
- [91] Regarding the four news articles, these articles appear to relate to the use of a PV inverter as a STATCOM and the potential cost savings that utilities may be expected to realize from the use of such systems, but the articles do not provide any further information regarding the nature of any unexpected results, inventive ingenuity or commercial success directly related to the claimed subject matter.
- [92] Finally, regarding the technical report, the Panel notes that the report provides a discussion on a similar but unrelated system design deployed as a test bed for PV STATCOM systems in California and operated by other agents not related to the Applicant. Although informative as to other work carried on in the field, the Panel does not see any direct relation to, or support for, the non-obviousness of the claimed subject matter.
- [93] Accordingly, as the differences between the inventive concept of the independent claims and the state of the art do not require any degree of invention, claims 1, 6, 10 and 14 are considered to be obvious to the skilled person in view of D2 and the CGK, and in view of D3 and the CGK.

Dependent claims

[94] Regarding claims 2-5, 7-9, 11-13 and 15-19, as outlined in the PR Letter and the Addendum, the Panel does not consider that any of the additional features that form the inventive concepts for these claims render the independent claims non-obvious. The Applicant, in its response letters and at the hearing, did not identify any further inventive features.

[95] We summarize our analysis on the obviousness of the additional essential features defined in the dependent claims as follows:

- Claim 2 defines the source as a solar farm. D2 and D3 both disclose the application to a solar installation;
- Claim 3 defines the idea of retrofitting the inverter control onto a pre-existing DG power source. The concept of retrofitting a system such as the one disclosed in D3 to an existing DG source, as opposed to constructing a new system is considered an uninventive choice since the considerations for doing so are predominantly economic rather than technical. Additionally, the instant application does not disclose any particular manner of the performing or implementing the claimed “retrofitting” feature and therefore, it must assumed to lie within the ability of the skilled person;
- Claim 4 defines that the rated capacity of said solar farm is not fully utilized for generating active power. However, as discussed above, D3 discloses that the inverter rating determines available power for real and reactive power;
- Claim 5 defines the source as a wind farm. D3 includes the use of wind farms;
- Claim 7 defines the damping controller as including a washout filter and compensator. The use of a washout filter and compensator would be a known option for the skilled person to implement in any damping controller to minimize oscillations;
- Claims 8 and 9 define the system of claim 6 with a solar or wind farm DG source. As we noted above, D3 discloses the applicability of its system to solar, wind and hydro installations;
- Claim 11 defines the inverter as producing less active power than its rated capacity. However, as discussed, the systems of D2 and D3 both operate using unutilized capacity of the inverters. From D3, for example, the skilled person

would know it is inherent that the total of the active and reactive power cannot exceed the inverters current or power rating limit;

- Claim 12 defines increasing transient stability on transmission lines. However, D3 discusses the problems with uncontrolled VAr power including stability problems. It is inherent in the design of a transmission system that capacity can be affected by stability problems such as transients;
- Claim 13 defines that at least one other energy farm is connected. This is an obvious choice given that D3 discloses that a plurality of distributed solar generation sites can be connected;
- Claims 15 and 16 define the same obvious features as per claims 5 and 4, respectively, above;
- Claim 17 defines the feature of voltage control in a DG system to prevent excessive voltage when multiple DG sources are connected. Voltage control is a known feature of a STATCOM. Furthermore, D3 addresses the problem that the lack of reactive compensation can have on grid voltage. It would be obvious to the skilled person that an inverter operating like a STATCOM for reactive power control would also be used to control grid voltage problems;
- Claim 18 defines operating the voltage inverter to dampen oscillations in said power transmission network. As discussed, D3 discusses known problems of excess reactive power on the utility grid, including losses and stability problems. The system of D3, by compensating for reactive power, inherently dampens and limits voltage transients and oscillations; and
- Claim 19 defines the damping controller utilizing local and remote signals. D2 and D3 both disclose the option of using a communications link from remote stations to communicate with the local inverters. It would therefore be an obvious choice to provide input signals to a damping controller when such a damping controller is implemented in the inverter of D2 or D3.

[96] Therefore, we do not consider that any of the dependent claims 2-5, 7-9, 11-13 and 15-19 provides any inventive limitation to the subject matter of the obvious independent claims.

Conclusion on obviousness

[97] We consider the subject-matter of claims 1 to 19 on file as obvious from the disclosure of D2 or D3 in view of the skilled person's CGK and therefore not in compliance with section 28.3 of the *Patent Act*.

Proposed claims

[98] As stated above, the Applicant submitted a third set of proposed claims 1- 20 with its Second Reply. The proposed claims differ primarily in regards to the features of the independent claims to specifically define the control means as independently and directly controlling the inverter, and that the inverter operates at a capacity greater than zero.

[99] For example, in claim 1, the amended passages (underlined) read as follows:

...

- a control means, operatively coupled to said voltage inverter, for only operating said voltage inverter, said voltage inverter being operated as a static synchronous compensator (STATCOM) to supply said reactive power to regulate a voltage at said point of common coupling; said control means also being for independently and directly operating said voltage inverter;

... only when said voltage inverter is operating at a capacity less than a rated capacity of said voltage inverter, and when said capacity is greater than zero... ;

[100] Additionally, the proposed claims introduce a new independent claim 20, which contains the subject matter of previous claim 7 on file drafted as an independent claim, with the addition of the same control means limitations as stated above.

[101] We agree with the Applicant that the proposed claim amendments find support in the originally filed specification and thus do not raise any concern regarding unacceptable new subject matter.

[102] Regarding the addition of the features defining that the control means only controls the inverter, directly and independently, the skilled person familiar with inverters and STATCOMs would consider this arrangement to be an obvious choice in order to ensure that the inverter can operate independently of any remote control entity or signal, just as a STATCOM inherently is known to function (see Claim Construction, above). Therefore, the added limitations in the proposed claims do not add any degree of inventive ingenuity to the features of the claims on file, and thus would similarly be considered obvious.

- [103] Regarding the addition of the feature “said capacity is greater than zero”, this feature defines a narrower operating range for the inverter to operate as a STATCOM, thereby clarifying the relationship between the rated capacity of the inverter, the capacity used for active power and the resultant unutilized capacity for providing reactive power when operating as a STATCOM. In the Panel’s view, there is no inventive ingenuity in defining that the capacity is greater than zero, as this condition is also within the scope of the operation of the system disclosed in D3. It is also CGK that solar radiation and inverter utilization will vary throughout the day. Therefore, operation of an inverter as a STATCOM when underutilized (including the range from zero capacity to rated capacity) would be an obvious range of operation to the skilled person.
- [104] Given that 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*.

RECOMMENDATION OF THE BOARD

- [105] In view of the above, the Panel recommends that the application be refused on the basis that claims 1 to 19 define subject-matter that is obvious and thus do not comply with section 28.3 of the *Patent Act*.
- [106] We do not consider the claims proposed on March 27, 2018 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
Member

Stephen MacNeil
Member

Leigh Matheson
Member

DECISION OF THE COMMISSIONER

- [107] 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 28.3 of the Patent Act.
- [108] 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 28th day of December, 2018.