UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

UNIFIED PATENTS, LLC,
Petitioner

v.

CHARGE FUSION TECHNOLOGIES, LLC,
Patent Owner

IPR2022-00519

DECLARATION OF SCOTT ANDREWS IN SUPPORT OF PETITION FOR *INTER-PARTES* REVIEW

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I, Scott Andrews, declare as follows:

I. INTRODUCTION

1. I have been asked to submit this declaration on behalf of Unified Patents, LLC ("Petitioner") in connection with a Petition for *inter partes* review of U.S. Patent No. 9,853,488 ("the '488 Patent," EX1001). Specifically, I have been retained as an independent expert consultant by Petitioner to provide my opinions on the technology claimed in, and the patentability or unpatentability of claims 13-15 of the '488 Patent ("the Challenged Claims"). Although I am being compensated at my usual rate of $500 per hour for the time I spend on this matter, no part of my compensation depends on the outcome of this proceeding, I have no financial interest in any of the parties, and I have no other interest in this proceeding.

2. I have reviewed, had input into, and endorse the discussions in the Petitioner's Petition for *Inter Partes* Review for the '488 Patent (the "Petition"), including the statements in the Petition regarding the '488 Patent and its prosecution history, the scope of the claims, the prior art's disclosure of the claims, and the statements throughout the Petition regarding a POSITA's knowledge and understanding.

3. In addition to endorsing the Petition, this declaration is a statement of my opinions on issues related to the patentability of the Challenged Claims.

II. QUALIFICATIONS

4. In formulating my opinions, I have relied on my knowledge, training, and experience in the relevant field, which I have summarized below.

5. I have over 30 years of professional experience in the field of electronics, mobile information technology, and communication systems. Further, I have authored numerous published technical papers and am a named inventor on 13 U.S. and foreign patents.

6. I received a Bachelor of Science degree in Electrical Engineering from University of California, Irvine in 1977 and a Master of Science degree in Electronic Engineering from Stanford University in 1982.

7. From 1977 to 1979, I worked at Ford Aerospace where I designed, tested and delivered microwave radar receiver systems. From 1979 to 1983, I worked at Teledyne Microwave, where I developed high reliability microwave components and developed CAD tools. From 1983 to 1996, I worked at TRW, Inc., having held various positions. From 1983 to 1985, I was a Member of the technical staff and a Department Manager in the Space Electronics sector. Between 1985 and 1990 I was a project manager working on various communications systems projects including the US DoD Advanced Research Projects Administration (ARPA) MIMIC Program. Between 1990 and 1993 I was the Manager of MMIC (monolithic-microwave-integrated-circuit) Products Organization. In this role, I developed business strategy

and managed customer and R&D programs. During this time, I also developed the first single chip 94 GHz Radar, used for automotive cruise control and anti-collision systems. In 1993, I transferred to the TRW Automotive Electronics Group, and managed about 30 engineers in the Systems Engineering and Advanced Product Development organization. In this role, I managed advanced development programs such as electronic and electrohydraulic steering systems, automotive radar, adaptive cruise control, occupant sensing, automatic crash notification systems, in-vehicle information systems, vehicle user interfaces, and other emerging transportation products.

8. I was employed as a Project General Manager in the Electronics Division of Toyota Motor Corporation at Toyota headquarters in Toyota City, Japan from April 1996 to around April 2000. In this position, I was responsible for leading the development of vehicle telematics systems, infotainment systems, including onboard and off-board navigation systems, traffic information systems, vehicle communications systems, safety applications, and automated vehicle control systems. This work also included advanced parking management systems wherein parking lot sensors would be used to identify open parking places that could then be communicated to drivers via the connected vehicle information system.

9. I am currently a consultant for Cogenia Partners, LLC, focusing on systems engineering, business development and technical strategy supporting

automotive and information technology. I have been in this position since 2001. In one of my active engagements, I serve as the technical lead on a project funded by the National Highway Traffic Safety Administration (NHTSA) to develop requirements for connected vehicle safety systems in preparation for NHTSA regulations governing such systems. I also serve as a technical consultant on multiple projects sponsored by the Federal Highway Administration (FHWA) related to connected vehicle technology research. One project on which I was the chief systems engineer was a truck parking information and reservation system. In this system, truck drivers were provided information on available parking at truck stops along the road ahead of their current location. The system would identify their hours of service, and recommend where they should stop to rest based on parking availability. The system included various techniques for sensing open truck parking places (including ultrasonic (sonar), infrared, and camera sensors), and allowed the driver to also potentially reserve a space. This project also explored mechanisms for truck electrification which is a technique for providing electric power to parked trucks to minimize the use of diesel fuel while parked and idling.

10. In 2003, working with two colleagues, I designed a prototype electric vehicle with the aim of providing a high-performance vehicle with extensive electronic features such as electronically controlled steering, suspension, in vehicle information systems and such. As part of this development effort, I also developed

a patent related to how information in a highly integrated vehicle would be shared among the various electronic control units. This invention is described, in, among various other patents, U.S. Patent 7,802,263. Many of the features envisioned for this vehicle are now found in commercially available electric vehicles. As a result of this activity, I have a deep understanding of the architecture of electric vehicles, the limitations and characteristics of the powertrain and energy sources, and the various considerations associated with charging these vehicles.

11. In the various positions mentioned above, I was responsible for research and development projects relating to numerous mobile and vehicle information systems, hybrid vehicles systems, vehicle networks, user interface systems, sensory systems, communications systems, control systems and safety systems, and also had the opportunity to collaborate with numerous researchers and suppliers that are involved in the field of automotive control systems. I therefore believe that I have a detailed understanding of the state of the art during the relevant period, as well as a sound basis for opining how persons of skill in the art at that time would understand the technical issues in this case.

12. Additional details about my employment history, fields of expertise, and publications are included in my curriculum vitae (attached as EX1004).

III. MATERIALS CONSIDERED

13. In forming my opinions expressed in this declaration, I have considered, among other things, the following documents. I understand the documents have been given the following exhibit numbers in this proceeding:

EX1001	U.S. Patent 9,853,488
EX1002	File History of U.S. Patent Application 12/502,041
EX1006	U.S. Patent 8,531,162 to Hafner et al. ("Hafner")
EX1007	U.S. Patent 7,956,570 to Lowenthal et al. ("Lowenthal")
EX1008	U.S. Patent 7,849,944 to DeVault ("DeVault")
EX1009	U.S. Patent Publication 2009/0030712 to Bogolea et al. ("Bogolea")
EX1010	File History of U.S. Patent Application 15/848,017
EX1011	File History of U.S. Patent Application 17/012,325
EX1013	U.S. Publication 2009/0313174 to Hafner et al.
EX1014	U.S. Publication 2011/0148356 to Lowenthal et al.
EX1015	U.S. Patent 6,421,600 to Ross ("Ross")

14. In forming my opinions, I have also relied on my education and experience.

IV. THE '488 PATENT

A. Overview of the '488 Patent and Prosecution History

15. An overview of the '488 Patent and its prosecution history is provided in the Petition, which I have reviewed and adopt herein by reference.

B. Level of Ordinary Skill in the Art

16. I have been asked to provide an opinion about who a person of ordinary skill in the art ("POSITA") in the field of the '488 Patent would have been as of July 2008. The '488 Patent relates to systems and methods for intelligently charging electric vehicles. EX1001, Abstract, 1:61-2:38. The patent describes an electrical charging system that may include: a vehicle sensor (e.g., for sensing a vehicle is in a parking space), a communication device that can send identifier information about the electric vehicle, user preferences for charging the electric vehicle, and a processor for determining a charging schedule based on a user's charging preferences and other attributes relevant to charging an electric vehicle (e.g., the cost of electricity at any given time). *Id.*, 1:61-2:38, 9:57-10:50.

17. I understand and have been informed that the factors I should consider in determining the ordinary level of skill in the art include: (i) the levels of education and experience of persons working in the field; (ii) the types of problems encountered in the field; and (iii) the sophistication of the technology. I understand that a person of ordinary skill in the art is not a specific real individual, but rather a

hypothetical individual having the qualities reflected by the factors above. This hypothetical person has knowledge of all prior art in the relevant field as if it were arranged on a workshop wall and takes from each reference what it would teach to a person having the skills of a person of ordinary skill in the art.

18. In my opinion, as of the claimed priority date of the ’488 Patent, a person of ordinary skill in this art (“POSITA”) would have had a Bachelor’s of Science in electrical or mechanical engineering or a related subject and two or more years of experience working with automotive systems, including vehicle information systems, vehicle sensors, and vehicle controllers (ECUs).

19. I base this opinion on the level of technical training I believe is required to reduce to practice the concepts described in the ’488 Patent and the relevant prior art at and prior to the time of the ’488 Patent application filing, and on my own experience in hiring and supervising about 30 engineers engaged in development of these types of systems prior to the filing date of the ’488 Patent, as described above.

20. I understand that a person of ordinary skill in the art is presumed to have knowledge of all relevant prior art. Therefore, a person of ordinary skill in the art would have been familiar with each of the references discussed in this declaration. A person of ordinary skill in the art would have reviewed the various materials I discuss herein at least because these prior art references relate to charging

methods for electric vehicles, including various user preferences and attributes that are considered when charging the electric vehicle

21. As of July 2008, I had more than ordinary skill in the field of the ’488 Patent. But, I am familiar with the skills and knowledge possessed by those I would have considered to be of ordinary skill in the art at this time because I considered the backgrounds of the engineers and technicians that worked under me during development of techniques for use in, for example, electric vehicle design, vehicle information systems, vehicle networking, and various types of parking lot sensing systems. This would have included engineers with backgrounds relevant to the automotive systems used in the ’488 Patent.

V. RELEVANT LEGAL STANDARDS

22. I have been informed by counsel for Petitioner that the following legal principles apply to an analysis of patentability based on 35 U.S.C. § 103 for obviousness. I have also been informed that, in an *inter partes* review proceeding such as this proceeding, a patent claim is unpatentable if it is shown by a preponderance of the evidence that the claim would have been rendered obvious by one or more properly-combined prior art patents or publications.

A. Obviousness

23. I have been told that under 35 U.S.C. § 103(a), "[a] patent may not be obtained through the invention is not identically disclosed or described as set forth in Section 102, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains."

24. When considering the issues of obviousness, I have been told that I am to do the following:

(a) determine the scope and content of the prior art;

(b) ascertain the differences between the prior art and the claims at issue;

(c) resolve the level of ordinary skill in the pertinent art; and

(d) consider evidence of secondary indicia of non-obviousness (if available).

25. I have been told that the relevant time for considering whether a claim would have been obvious to a POSITA is the time of alleged invention. I have been asked to assume a priority date for the challenged claims of March 4, 1998. My analyses set forth herein are from the perspective of a person of ordinary skill in the art, as set forth above, as of this priority date.

26. In determining whether a prior-art reference could have been combined with another prior-art reference or other information known to a person having

ordinary skill in the art, I have been told that the following principles may be considered:

(a) a combination of familiar elements according to known methods is likely to be obvious if it yields predictable results;

(b) the substitution of one known element for another is likely to be obvious if it yields predictable results;

(c) the use of a known technique to improve similar items or methods in the same way is likely to be obvious if it yields predictable results;

(d) the application of a known technique to a prior art reference that is ready for improvement is likely obvious if it yields predictable results;

(e) any need or problem known in the field and addressed by the reference can provide a reason for combining the elements in the manner claimed;

(f) a person of ordinary skill often will be able to fit the teachings of multiple references together like a puzzle; and

(g) the proper analysis of obviousness requires a determination of whether a person of ordinary skill in the art would have a "reasonable expectation of success"—not "absolute predictability" of success—in achieving the claimed invention by combining prior art references.

27. I have been told that whether a prior art reference renders a patent claim unpatentable as obvious is determined from the perspective of a POSITA. Further, I

have been told that while there is no requirement that the prior art contain an express suggestion to combine known elements to achieve the claimed invention, a suggestion to combine known elements to achieve the claimed invention may come from the prior art as a whole or individually, as filtered through the knowledge of one skilled in the art. I have also been told that the inferences and creative steps a person of ordinary skill in the art would employ are also relevant to the determination of obviousness.

28. I have been told that when a work is available in one field, design alternatives and other market forces can prompt variations of it, either in the same field or in another. If a POSITA can implement a predictable variation and would see the benefit of doing so, that variation is likely to be obvious. In many fields, there may be little discussion of obvious combinations, and in these fields market demand—not scientific literature—may drive design trends. When there is a design need or market pressure and there are a finite number of predictable solutions, a POSITA has good reason to pursue those known options.

29. I have been told that there is no rigid rule that a reference or combination of references must contain a "teaching, suggestion, or motivation" to combine references. But I also have been told that the "teaching, suggestion, or motivation" test can be a useful guide in establishing a rationale for combining elements of the prior art. This test poses the question whether there is an express or

implied teaching, suggestion, or motivation to combine prior art elements in a way that yields the claimed invention and avoids impermissible hindsight analysis.

VI. CLAIM CONSTRUCTION

30. In my opinion, none of the terms in the Challenged Claim require express construction.

VII. GROUND 1: HAFNER IN VIEW OF LOWENTHAL AND THE KNOWLEDGE OF A POSITA RENDERS CLAIMS 13-15 OBVIOUS

31. It is my opinion that Hafner in view of Lowenthal, together with the knowledge of a POSITA, disclose or render obvious claims 13-15 of the ’488 Patent. In addition to the opinions expressed in this declaration, I have reviewed, had input into, and endorse the discussions in the Petition regarding this ground.

32. I have been asked to assume that Hafner (EX1006) and Lowenthal (EX1007) are prior art. I have done so.

A. Overview of Hafner

33. An overview of Hafner is provided in the Petition, which I have reviewed and with which I agree.

34. In my opinion, a POSITA would have considered Hafner because it is analogous to the ’488 Patent. It is from the same field of endeavor (e.g., charging

transactions for an electric vehicle) and is reasonably pertinent to the particular problem the '488 Patent was trying to solve (e.g., how to effectively manage and optimize the charging transactions to meet user preferences and minimize costs). EX1006, Abstract, 2:15-18, 8:20-30, 13:59-14:6, Figs. 1-4.

B. Overview of Lowenthal

35. An overview of Lowenthal is provided in the Petition, which I have reviewed and with which I agree.

36. In my opinion, a POSITA would have considered Lowenthal because it is analogous to the '488 Patent. It is from the same field of endeavor (e.g., charging transactions for an electric vehicle) and is reasonably pertinent to the particular problem the '488 Patent was trying to solve (e.g., how to effectively manage and optimize the charging transactions to meet user preferences and minimize costs). EX1007, Abstract, 3:28-31, 4:44-57, 5:31-58.

C. Motivation to Combine Hafner and Lowenthal

37. A POSITA would have considered Hafner and Lowenthal because they are analogous art to the '488 Patent, as discussed previously.

38. In my opinion, a POSITA implementing the system of Hafner would have also been aware of Lowenthal, because both disclose using user preferences (Hafner) or a user profile (Lowenthal) to manage charging of an electric vehicle. In my opinion, a POSITA would have been motivated to incorporate the teachings of

Lowenthal's vehicle detector into Hafner's electrical charging system to provide an enhanced charging system capable of detecting the presence of a vehicle in a parking space for a variety of reasons, including being able to identify available charging spaces, identifying vehicles that are occupying charging spaces but are either not electric vehicle or are not actively charging, etc.

39. A POSITA would have recognized Hafner as providing the framework for a versatile charging system that already included user-definable preferences for charging electrical vehicles, ready for improvement with Lowenthal's vehicle detector. Implementing Lowenthal's vehicle detector would have enhanced Hafner's charging system, e.g., by providing functionality that would allow Hafner's system to determine the availability of parking spots at a charging station (or any other suitable charging location). For example, Hafner's charging station may be "any station, kiosk, garage, power outlet, or other facility for providing electricity to electric vehicle 116." EX1006, 4:63-65. Hafner also discloses the use of location preferences, e.g., where "the user may specify that any time the electric vehicle is parked at a charging station that is at a specified location, the electric vehicle is not to be charged at all, to be charged to a particular charge level, or charged fully." *Id*., 18:29-38. Thus, while Hafner's system describes functionality for determining that a vehicle is in a certain location (e.g., parked a charging station), it does not explicitly provide the implementation details as to how this may be accomplished. Lowenthal,

however, provides explicit disclosure of a vehicle detector that "is used to detect the presence of a vehicle in [a] parking space." EX1007, 7:61-8:12, 11:39-42, 4:63-64. Lowenthal's vehicle detector is a "detector such as a sonar sensor array, a camera, or an induction coil." *Id.*, 7:61-8:11. This detector can determine the availability of charging outlets, e.g., by determining whether the parking space corresponding to the charging outlet is available. *Id*., 9:38-44.

40. A POSITA would have understood the benefits of incorporating Lowenthal's vehicle detector into the charging stations of Hafner (or, implemented as a separate component to Hafner's system), and this would allow for the combined system to detect vehicles, detect availability of parking spaces, and detect available outlets at charging locations. EX1007, 9:38-44.

41. For example, incorporating Lowenthal's sensor would allow for, as Lowenthal explains, "detect[ing] the presence of a vehicle" in an example scenario where a vehicle "is parked without proper payment." EX1007, 11:39-43. Hafner itself considers several preferences that would benefit from Lowenthal's vehicle detector. First, Hafner describes operator preferences, which may permit only "identified individuals to charge the vehicle," so that "a thief would not be permitted to recharge the electric vehicle. EX1006, 18:57-19:2. A POSITA would have understood that Lowenthal's vehicle detector (e.g., implemented as a camera) would further benefit Hafner's anti-theft goals by taking a picture of a potential thief.

42. In addition, Hafner describes location preferences, where "the user may specify that any time a vehicle is parked at a charging station that is at a specified location," a certain action should be taken (e.g., to charge the vehicle, or not). EX1006, 18:29-38. A POSITA would have understood that Lowenthal's vehicle detector would provide additional functionality to Hafner's preferences by allowing for specific preferences based on different parking spots within a charging station, for example specific charging rates available at different charging locations.

43. Furthermore, a POSITA would have understood that such a vehicle detector would determine when a non-electric vehicle is parked in a parking spot corresponding to a charge outlet, thereby preventing an electric vehicle from utilizing the charge outlet.

44. Finally, a POSITA would have recognized the benefits of being able to detect the presence of a vehicle where a parking space is occupied, but charging is not occurring (i.e., where a charging-enabled parking spot may be occupied by a non-electric vehicle, or an electric vehicle that is no longer charging) such that the driver could be notified (a commonly known feature of automated charging systems).

45. In this combination, both Hafner's system and Lowenthal's vehicle detector would be performing the same functions they previously disclosed—but Hafner's charging system would now include the additional functionality and

benefits described above. A POSITA would have understood that including Lowenthal's sensor would require no unusual modification to the system of Hafner—specifically, Hafner already disclosed that its various computing devices (e.g., the electric vehicle, charging station, energy preference server, etc.) can communicate wirelessly over the network; similarly, Lowenthal's vehicle detector is also capable of wireless communications (or otherwise is in communication with the charging system). EX1006, 4:30-49, 5:22-46, 10:11-24, 12:28-40, 12:63-13:15, FIG. 1; EX1007, 7:61-8:11.

46. In addition, the use of vehicle detectors in the context of electrical vehicle charging was well known in the art well before the '488 Patent. For example, U.S. Patent 6,421,600 describes as early as 2000: "sensor 50 senses the presence of RPEV [roadway-powered electric vehicle] 12, and in response to such sensing, activates the power converter 28 to energize the embedded coil 40." EX1015, 13:23-45. Examples provided in this patent include "a conventional vehicle sensor that senses the presence of any vehicle . . . e.g., a pressure switch sensitive to weight, an inductive strip or loop, a magnetic or an optical sensor, as are commonly used in the art to sense vehicles and other large objects." *Id.*

47. The proposed combination would be to implement the teaching of Lowenthal's vehicle detector into Hafner's charging system to provide an improved system that can detect the presence of a vehicle in a parking space in Hafner's

system. This would have required minimal modifications to Hafner's system (simply modifying Hafner's sensors to further include a sensor like that of Lowenthal to provide ability to detect a vehicle using a weight sensor, camera, etc.), and the combination would have led to a predictable result (a system based on Hafner that performs electrical charging, but with the additional functionality described regarding Lowenthal's vehicle detector).

D. Disclosures for Claim 13

48. In addition to the explanation provided in the Petition regarding how Hafner in view of Lowenthal renders obvious the elements of claim 13—which I have reviewed, had input into, and endorse—I provide the following explanations.

1. [13.1] a vehicle sensor; a communication device;

49. I have reviewed, had input into, and endorse the Petition's explanation of why Hafner in view of Lowenthal discloses, or renders obvious, this claim limitation.

2. [13.2] a processor in communication with the vehicle sensor and the communication device; and

50. In addition to the explanation provided in the Petition, a POSITA would have understood that the energy preference server 402 of Figure 4 is an illustrative embodiment of the energy preference server 104 of Figure 1, annotated below. This is so because Hafner explains the energy preference server 402 of Figure 4 provides

services "to users on a network, such as network 102 in FIG. 1." EX1006, 5:49-53. Hafner further provides numerous references to Figure 1 in its discussion of Figure 4 (*see id.*, 12:10-17:58) and its statement that Figure 1 is the system "in which illustrative embodiments may be implemented" (*see id.*, 2:31-33, 2:38-39). In addition, Hafner's energy preference server 104 and energy preference server 402 each contain a processor unit 204, because Hafner describes FIG. 2 as "an example of a computer, such as server 104 or client 110 in FIG. 1." *Id.*, 5:49-53.

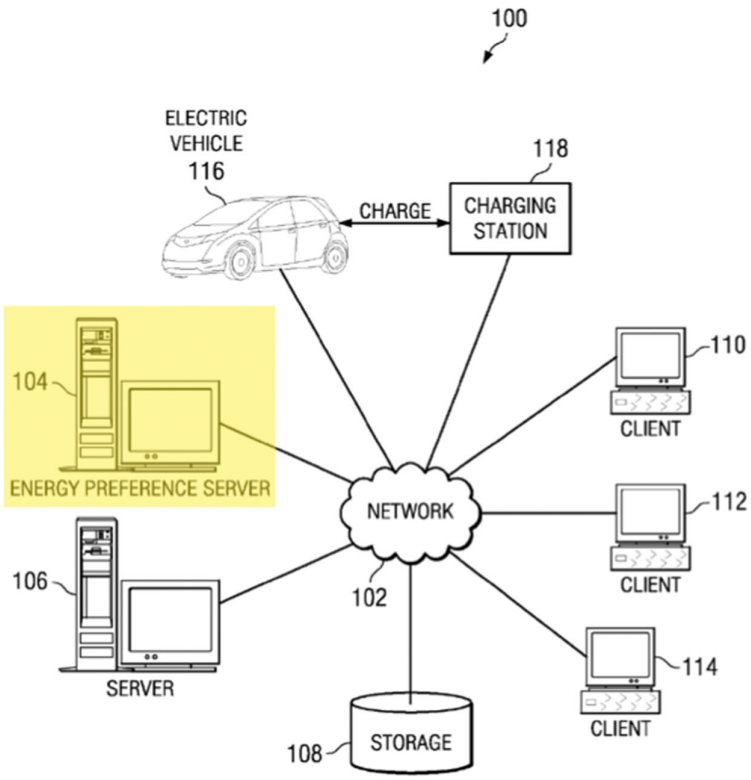

FIG. 1

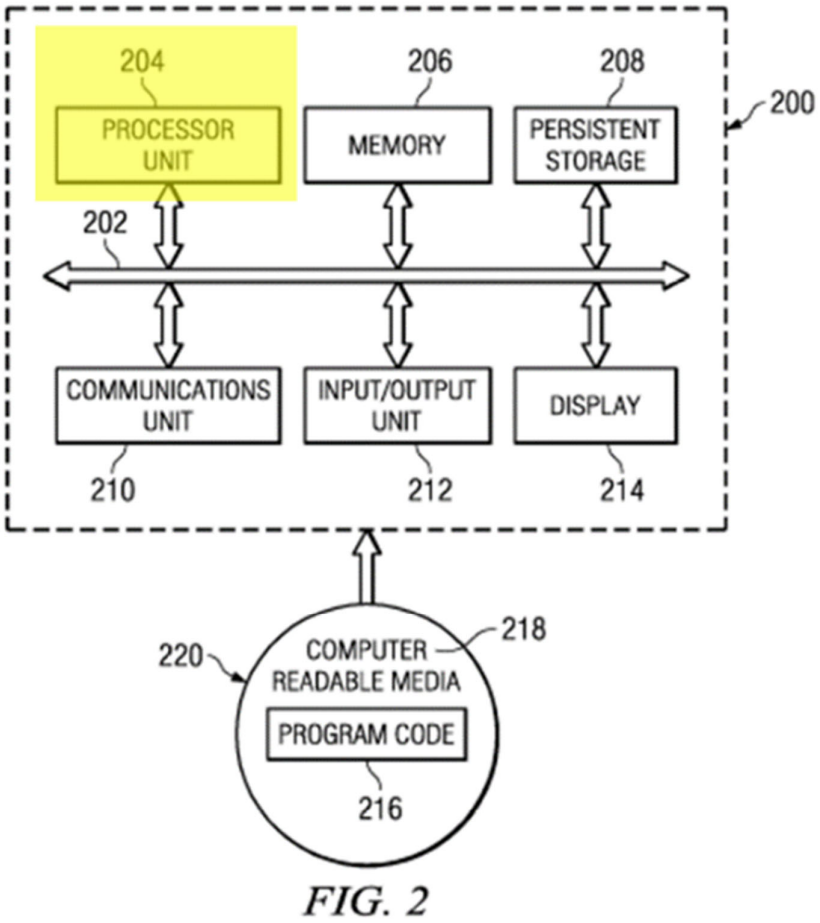

FIG. 2

51. A POSITA would have also understood that Hafner's energy preference server 104 (i.e., hardware containing processor unit 204) and energy preference service 400 (i.e., software containing processing unit 414) disclose the claimed *processor*. In reference to Figure 4, Hafner explains that "[n]etwork based energy preference service 400 is a software application for creating, managing, storing, and retrieving electric vehicle charging preferences for utilization in creating an energy transaction plan for electric vehicle 401." EX1006, 12:10-27. Hafner notes that this energy preference service "is located on energy preference server 402," as

shown in Figure 4 below. *Id.*, 12:28-40. The service includes a "processing unit 414," which "provides the overall coordination of the components associated with the network based energy preference service 400." *Id.*, 13:16-22.

52. Regarding Lowenthal's vehicle detector, a POSITA would have understood that in the combined system of Hafner and Lowenthal, a vehicle detector as taught by Lowenthal would be in communication with the processor. For example, in the scenario where the vehicle detector is implemented into Hafner's charging station 118, Hafner is explicit that the "charging station 118" may be "connected to network 102," and may "send and receive data associated with the charging of the electric vehicle . . . and/or any other data relevant to charging or de-charging electric vehicle 116 over network 102." EX1006, 5:11-46. Furthermore, Lowenthal itself depicts the vehicle detector 115 as sending information to the controller 111 in Figure 3:

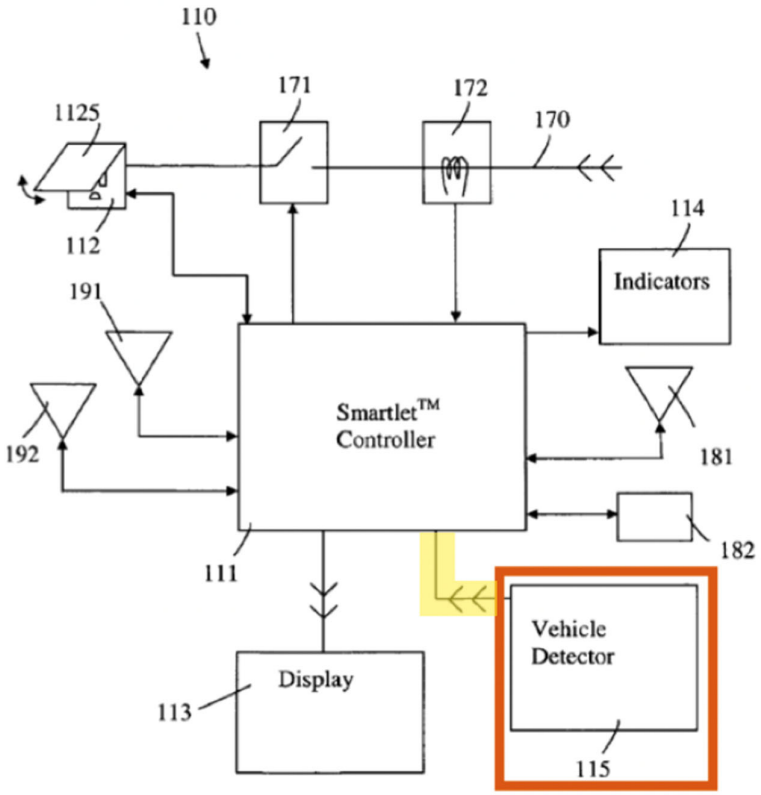

FIGURE 3

3. [13.3] a memory in communication with the processor, the memory storing instructions that when executed by the processor cause the processor to:

53. I have reviewed, had input into, and endorse the Petition's explanation of why Hafner in view of Lowenthal discloses, or renders obvious, this claim limitation.

4. [13.4] [cause the processor to . . .] receive, from the vehicle sensor, information indicative of a presence of a vehicle in a parking space;

54. In addition to the explanation provided in the Petition, a POSITA would have understood that Lowenthal describes *information indicative of a presence of a vehicle in a parking space* being received by a processor. For example, Lowenthal describes that its vehicle detector is "controlled by the controller 111," and as shown in Figure 3 of Lowenthal, information flow is depicted from the vehicle detector 115 to the controller 111.

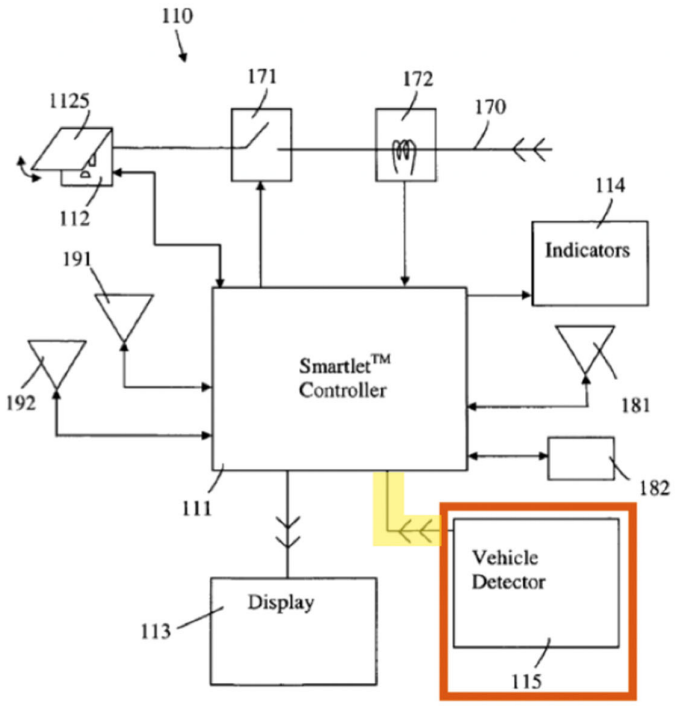

FIGURE 3

55. Because Lowenthal's vehicle detector sends data to the controller 111 (i.e., where controller 111 corresponds to Hafner's processor) regarding the presence or availability of a vehicle in a parking spot, a POSITA would have understood that if such a sensor were implemented into the combined system of Hafner and Lowenthal, the vehicle detector would similarly transmit information to the processor in the combined system, as shown in annotated Figure 1 of Hafner. EX1006, FIG. 1 (annotated); EX1007, 7:61-8:11.

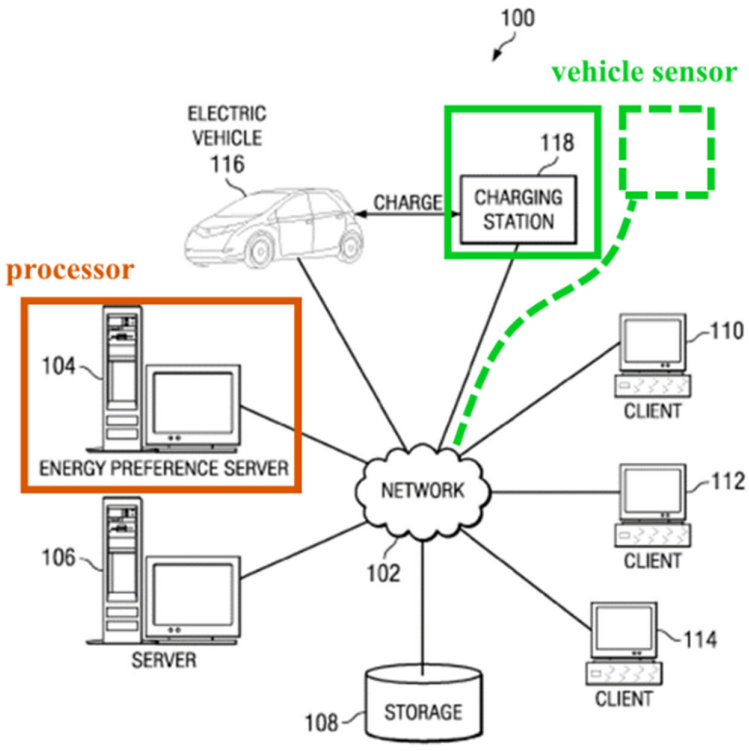

FIG. 1

56. Indeed, for such a vehicle sensor to accomplish this explicitly disclosed functionality from Lowenthal, a POSITA would have understood the need for it to

communicate with the energy preference server in the combined system. EX1007, 7:61-8:11. Further, this aligns with Hafner, which already describes its energy preference server in communication with the charging station 118 (EX1006, 5:11-46, 13:59-14:48, 18:29-38, FIG. 1), and a POSITA would have understood the benefits of doing so for the reasons I discuss above in ¶¶ 37-47.

5. [13.5] [cause the processor to . . .] receive, from the communication device, information indicative of one or more charging preferences corresponding to a desired charging of the vehicle, wherein the one or more charging preferences are defined by an operator of the vehicle;

57. I have reviewed, had input into, and endorse the Petition's explanation of why Hafner in view of Lowenthal discloses, or renders obvious, this claim limitation.

6. [13.6] [cause the processor to . . .] determine, based at least on the one or more charging preferences and at least one current value of a dynamic attribute of an electric charge provider, a charging schedule for the vehicle; and

58. In addition to the explanation provided in the Petition, a POSITA would have understood a *charging schedule* to be broad enough to include a plan for charging the vehicle that takes user preferences and/or outside attributes (e.g., the cost of electricity) into account. For example, in reference to Figure 8 of the '488 Patent, which is "a flow diagram" with steps similar to those found in claim 13, the method at step 806 determines a charging schedule. EX1001, 16:14-62, Figure 8.

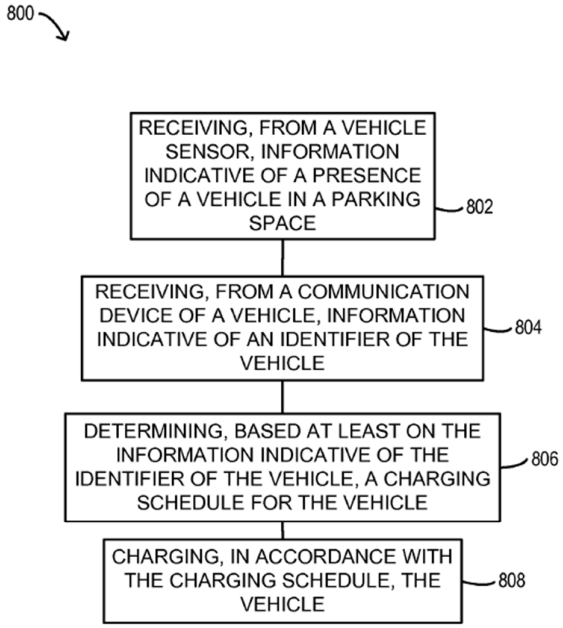

FIG. 8

59. In the paragraph of the ’488 Patent’s specification describing step 806, the patent explains that “an ECS and/or control system may calculate, based on the charging parameters and or/preferences, how much energy the vehicle needs, how much energy is desired for the vehicle, when the needed and/or desired charge levels should be reached by, desired charging rate cost thresholds, etc.” *Id.*, 16:43-56. A POSITA would have understood that the *charging schedule* includes these factors—

i.e., how much energy the vehicle needs, how much energy is desired, and when the needed and/or desired charge levels should be reached by. The '488 Patent further states that the "ECS [Electrical Charging System] 340 and/or the processor 346 thereof may then, for example, utilize the time-of-day rate information to determine a schedule for charging the one or more vehicles 360, such that the schedule results in the lowest estimated cost for charging the one or more vehicles 360." *Id.*, 8:13-25. Furthermore, the '488 Patent also uses the term "regimen" interchangeably with "schedule" in certain portions of the specification. *Id*., 16:57-17:8 ("in accordance with the determined schedule and/or regimen"), 19:64-20:52 ("computing and implementing a charging regimen to meet the user specified parameters").

60. In my opinion, Hafner discloses *determin[ing] . . . a charging schedule for the vehicle* because it discloses utilizing user preferences and costs of electricity to create a "transaction plan" for charging the vehicle. EX1006, 9:4-36. As discussed above, these preferences are for "managing, governing, and controlling the manner in which electric vehicle 401 is charged at a charging station," and specifying "a parameter of the charging transaction that is to be minimized, maximized, or optimized." *Id*., 13:59-14:6, 2:15-18. And based on these preferences, Hafner's system uses an energy transaction planner (e.g., energy transaction planner 426), which is a software component in communication with (or located on) the energy preference server, to create a "transaction plan" for the charging transaction. *Id.*,

15:8-27, 9:4-36. Hafner explains that "[e]nergy transaction planner 426 is a component for generating an energy transaction plan to manage the charging of electric vehicle 401 connected to an electric grid in accordance with the preferences of one or more principals to the electric vehicle charging transaction." *Id.* Furthermore, Hafner notes that, in the Figure 4 embodiment, "energy transaction planner 426 is located on electric vehicle 401," but that in other embodiments, "energy transaction planner 426 may be located on energy preference server 402 with network based energy preference service 400." *Id.*, 17:22-34. In either scenario, the energy transaction planner is responsible for "generating an energy transaction plan." *Id.*, 15:8-27.

61. In view of this disclosure from Hafner, a POSITA would have understood that the resulting "transaction plan" described in Hafner is described in the same way and serves the same purpose as the *charging schedule* of the '488 Patent. For example, Hafner's "[p]references may include, without limitation, a maximum price per kilowatt hour of electricity to be paid by a party, a location where charging may occur, a location where charging may not occur, a rate of charging the electric vehicle, a minimum amount of charge, or any other preferences associated with charging an electric vehicle." EX1006, 8:20-30. Accordingly, a POSITA would have understood the transaction plan of Hafner to include a list of preferences, set by a user, that govern the charging transaction—in the same way that the '488

Patent's *charging schedule* "may calculate, based on the charging parameters and or/preferences, how much energy the vehicle needs, how much energy is desired for the vehicle, when the needed and/or desired charge levels should be reached by, desired charging rate cost thresholds, etc." EX1006, 9:4-18, 15:8-27; EX1001, 16:43-56.

62. As another more specific example of how Hafner's transaction plan discloses a *charging schedule*, Hafner discloses that "if a price of energy exceeds a predefined threshold in violation of a user-selected preference, energy transaction interrupt monitor 320 detects this interrupt condition and initiates appropriate actions" to handle cessation of electric power flow to the vehicle. EX1006, 9:19-36. In another example, Hafner notes that a preference may be "time," and that "[t]ime 512 preferences may specific, without limitation, time of day 530 for charging the vehicle, time of day to stop charging the vehicle," among other things. *Id.*, 18:17-42. These kinds of preferences are mirrored in the '488 Patent, which discloses that a user may "specify a time by which the car is to be a certain percent charged," or "may have specified that the car is not to be charged if the cost of electricity is over $0.10/kWh." EX1001, 19:24-27.

63. Accordingly, Hafner's described use of the energy transaction planner 426 discloses *determin[ing] . . . a charging schedule for the vehicle*, because it discloses "generating an energy transaction plan to manage the charging of [the]

electric vehicle . . . in accordance with the preferences of one or more principals to the electric vehicle charging transaction." EX1006, 15:8-27. Furthermore, Hafner considers and adjusts for the same things as the '488 Patent does when it describes a *charging schedule*—e.g., "how much energy the vehicle needs, how much energy is desired for the vehicle, when the needed and/or desired charge levels should be reached by, desired charging rate cost thresholds, etc." EX1001, 16:43-56. In summary, a POSITA would have understood that in Hafner, the transaction plan is specifically aimed at when and under what conditions charging transactions (i.e., the purchase of electrical energy for the vehicle) are to be undertaken—in the same way that the claimed *charging schedule* also does.

64. Also like the '488 Patent, Hafner's charging transaction is *based at least on the one or more charging preferences* because Hafner's preferences "may include, without limitation, . . . a location where charging may occur, a location where charging may not occur, a rate of charging the electric vehicle, a minimum amount of charge, or any other preferences associated with charging an electric vehicle." EX1006, 8:20-30. These preferences are used by the energy transaction planner 310 to create "a transaction plan governing the electric charging transaction based on preferences of one or more principals." *Id.*, 9:4-18.

65. As to the claimed phrase *at least one current value of a dynamic attribute of an electric charge provider*, the term *dynamic attribute* is also not

explicitly defined in the '488 patent. However, in view of the claims and specification, a POSITA would have understood *dynamic attribute* to broadly include a changing attribute of an electric charge provider, such as the cost or availability of electricity. For example, the specification explains that the processor may retrieve other information relevant to the charging transaction, such as "available market rates (e.g., a time-of-day and/or usage-based rate schedule) for purchasing electrical energy from the PSE [Power Supplying Entity] supply 404." EX1001, 10:34-50. Other characteristics obtained from the power supplying entity may be "voltage, amperage, available quantity, consistency of generation, cost, generation type, and/or distance to the load." *Id.*, 17:43-52.

66. I also note that the prosecution history leads to the same conclusion as to the understanding of a *dynamic attribute of an electric charge provider*. *See* EX1002, 430-435. There, the applicant acknowledged that although the phrase is not mentioned in the specification, "[i]t's descriptive of the numerous instances in which we refer to the price per kilowatt hours changing and very explicitly changing the charging schedule based on that attribute." *Id*. In the appeal decision during prosecution, the Board also stated that, "[a]ssuming *arguendo* that McLeod's disclosed 'energy rate ($kWh) information for on-peak and off-peak utility rates' is encompassed by the claim phrase 'dynamic attribute' as that claim phrase is reasonably broadly construed . . . ." *Id.*, 443.

7. [13.7] a memory in communication with the processor, the memory storing instructions that when executed by the processor cause the processor to:

67. I have reviewed, had input into, and endorse the Petition's explanation of why Hafner in view of Lowenthal discloses, or renders obvious, this claim limitation.

E. Disclosures for Claim 14

68. I have reviewed, had input into, and endorse the Petition's explanation of why Hafner in view of Lowenthal discloses, or renders obvious, claim 14.

F. Disclosures for Claim 15

69. In addition to the explanation provided in the Petition regarding how Hafner in view of Lowenthal renders obvious the elements of claim 15—which I have reviewed, had input into, and endorse—I provide the following explanations.

1. [15.2] wherein the dynamic attribute comprises at least one of: (i) a present electrical provider system load and (ii) an expected future electrical provider system load.

70. In addition to the explanation provided in the Petition, a POSITA would have been motivated to incorporate Lowenthal's consideration of grid load into Hafner, because it would provide an enhanced charging system capable of using grid load as an attribute to create a transaction plan for a vehicle.

71. For instance, Lowenthal explains that a "user profile may include information such as whether the vehicle operator wants to: . . . not charge the vehicle

during periods of high power grid load." EX1007, 4:44-57; *see also id.*, claim 66. A POSITA would have understood that a user of an electric vehicle would naturally find such a feature desirable in a charging system (e.g., to be "grid friendly" and lessen any negative environmental impact).

72. Additionally, Hafner provides express motivation to combine, as it discloses using user preferences to create a transaction plan where the parameters are "minimized, maximized, or optimized," and include "price per kilowatt hour." EX1006, 13:59-14:6, 8:20-30. A POSITA would have recognized Lowenthal's additional disclosures related to the power grid serve this purpose.

73. Finally, a POSITA would have had a reasonable expectation of success in incorporating Lowenthal's disclosures on this point, as doing so would have required minimal modifications to Hafner's system (simply adding a user preference based on grid load), and the combination would have led to a predictable result (Hafner's existing system, but with the additional functionality to control charging based on a grid load).

VIII. GROUND 2: HAFNER IN VIEW OF LOWENTHAL, BOGOLEA, AND THE KNOWLEDGE OF A POSITA RENDERS OBVIOUS CLAIM 14

74. It is my opinion that Hafner in view of Lowenthal, Bogolea, and the knowledge of a POSITA, disclose or render obvious claim 14 of the ’488 Patent. In addition to the opinions expressed in this declaration, I have reviewed, had input into, and endorse the discussions in the Petition regarding this ground.

75. I have been asked to assume that Bogolea (EX1009) is prior art. I have done so.

A. Overview of Bogolea

76. An overview of Bogolea is provided in the Petition, which I have reviewed and with which I agree.

77. In my opinion, a POSITA would have considered Bogolea because it is analogous to the ’488 Patent. It is from the same field of endeavor (e.g., charging transactions for an electric vehicle) and is reasonably pertinent to the particular problem the ’488 Patent was trying to solve (e.g., how to effectively manage and optimize the charging transactions by minimizing costs). EX1009, Abstract, FIG. 1., [0046]-[0056].

B. Motivation to Combine Hafner, Lowenthal, and Bogolea

78. A POSITA would have considered Hafner, Lowenthal, and Bogolea because they are analogous art to the ’488 Patent, as discussed previously.

79. In my opinion, a POSITA would have been motivated to incorporate the teachings of Bogolea (considering the forecasted cost of electrical power) into Hafner's electrical charging system to provide an enhanced charging system capable of using the forecasted cost of electrical power to create an improved transaction plan for charging a vehicle.

80. A POSITA would have recognized Hafner as providing the framework for a versatile charging system that already included cost-based preferences for charging electrical vehicles, ready for improvement with Bogolea's teaching. Implementing Bogolea's teaching would have enhanced Hafner's charging system, e.g., by providing additional functionality that would allow Hafner's transaction plan to be adjusted and optimized in view of the expected future cost of electricity.

81. Hafner already discloses considering the current cost of electricity, because it states charging preferences may include "a maximum price per kilowatt hour of electricity to be paid by a party" and "a rate of charging the electric vehicle." EX1006, 8:20-30. Hafner further provides an example where "preferences may indicate that charging when the price per kilowatt hour is less than thirteen cents is to be maximized and charging when prices are higher than thirteen cents per kilowatt hour is to be minimized or prohibited all together." *Id.*, 14:7-21.

82. A POSITA would have recognized the benefit of Bogolea's disclosure of the "forecasted cost of electrical power," (EX1009, [0048]), because it would

allow Hafner's energy transaction planner to make better decisions about when and how to charge the electric vehicle to save costs. For example, if the forecasted cost of electrical power was expected to rise sharply, the combined system could decide to charge the electric vehicle at a faster rate before costs rise. *Id.* Conversely, if the forecasted cost of electrical power was expected to decrease, the combined system could decide to postpone the charging to a later time.

83. In this combination, implementing Bogolea's forecasted costs of electrical power would at most require minor modifications to Hafner's energy transaction planner software component. As mentioned, Hafner's system already receives information from a charging station about the price of electricity, e.g., Hafner's "[e]nergy data services 308 may include, without limitation, . . . charging station price information sources." EX1006, 8:64-9:3. Similarly, Bogolea describes "exchanging information with at least one utility company," where such information may include "the cost of electrical power." EX1009, [0048]. And Hafner already notes that a preference may be "time," and that "[t]ime 512 preferences may specific, without limitation, time of day 530 for charging the vehicle, time of day to stop charging the vehicle," among other things. EX1006, 18:17-42. Thus, using charging times that are based on Bogolea's forecasted energy pricing would simply involve replacing the fixed time preferences of Hafner with the dynamic time preferences of Bogolea.

84. A POSITA would have had a reasonable expectation of success in combining Hafner and Bogolea because they both relate to charging electric vehicles, and both already consider receiving information from power-supplying sources about the cost of electricity. EX1006, 8:64-9:3; EX1009, [0048]. Accordingly, the combination would be to implement Bogolea's additional teaching of receiving the forecasted cost of electricity into Hafner's charging system, to provide an improved system that can create transaction plans in consideration of forecasted costs. This would have required minimal modifications to Hafner's system (simply optimizing Hafner's transaction plan in view of the forecasted cost) and the combination would have led to a predictable result (Hafner's existing system, but with the additional functionality to receive forecasted costs of electricity).

C. Disclosures for Claim 14

85. In addition to the explanation provided in the Petition regarding how Hafner in view of Lowenthal, Bogolea, and the knowledge of a POSITA renders obvious the elements of claim 14—which I have reviewed, had input into, and endorse—I provide the following explanations.

1. [14.2] wherein the dynamic attribute comprises at least one of: (i) a cost of providing electricity and (ii) an, expected future cost of providing electricity.

86. I have reviewed, had input into, and endorse the Petition's explanation of why the combination of Hafner, Lowenthal, Bogolea, and the knowledge of a POSITA discloses, or renders this obvious, this claim limitation.

87. In addition, Bogolea discloses that its "user module is also capable of exchanging information with at least one utility company," and that "[s]uch information may include, cost of electrical power, energy supply information, status information and user notifications," and most relevant for this limitation, Bogolea is explicit that the "cost of electric power includes both, the current cost and the forecasted cost of electrical power." EX1009, [0048]. Given that Hafner already discloses taking the current cost of providing electricity into account when performing a charging transaction, a POSITA would have understood the benefits of implementing Bogolea's teaching of considering "the forecasted cost of electrical power," because doing so would have led to an improved system for the reasons I discussed above in ¶¶ 78-84.

IX. GROUND 4: HAFNER IN VIEW OF LOWENTHAL, DEVAULT, AND THE KNOWLEDGE OF A POSITA RENDERS OBVIOUS CLAIM 15

88. It is my opinion that Hafner in view of Lowenthal, DeVault, and the knowledge of a POSITA, disclose or render obvious claim 15 of the ’488 Patent. In addition to the opinions expressed in this declaration, I have reviewed, had input into, and endorse the discussions in the Petition regarding this ground.

89. I have been asked to assume that DeVault (EX1008) is prior art. I have done so.

A. Overview of DeVault

90. An overview of DeVault is provided in the Petition, which I have reviewed and with which I agree.

91. In my opinion, a POSITA would have considered DeVault because it is analogous to the ’488 Patent. It is from the same field of endeavor (e.g., charging events for an electric vehicle) and is reasonably pertinent to the particular problem the ’488 Patent was trying to solve (e.g., how to effectively manage and optimize the charging events). *E.g.*, EX1008, Abstract, 1:24-30, 7:58-8:9, 20:65-21:20.

B. Motivation to Combine Hafner, Lowenthal, and DeVault

92. A POSITA would have considered Hafner, Lowenthal, and DeVault, because they are analogous art to the ’488 Patent, as discussed previously.

93. In my opinion, a POSITA would have been motivated to incorporate the teachings of DeVault (considering the present and future grid load) into Hafner's electrical charging system to provide an enhanced charging system capable of using the grid load data to create an improved transaction plan for charging a vehicle. A POSITA would have recognized Hafner as providing the framework for a versatile charging system that already included various attributes that can be accounted for in charging electrical vehicles, ready for improvement with DeVault's teachings about preferences surrounding grid load. Implementing these teachings would have enhanced Hafner's charging system, e.g., by allowing a user to set preferences within Hafner's system based on the power grid load and create a resulting transaction plan using Hafner's system that is "grid friendly."

94. Hafner already discloses using various preferences to create a transaction plan for charging a vehicle. EX1006, 9:4-36, 15:8-27. Hafner further provides an example where "preferences may indicate that charging when the price per kilowatt hour is less than thirteen cents is to be maximized and charging when prices are higher than thirteen cents per kilowatt hour is to be minimized or prohibited all together." *Id.*, 14:7-21. Hafner, however, does not explicitly consider using grid load as an attribute—but DeVault does. DeVault explains that its controller "can also anticipate when an electric utility is likely to be at peak load and modify charge parameters to avoid negatively affecting the grid." EX1008, 20:65-

21:20. A POSITA would have understood that a user of an electric vehicle would naturally find such a feature desirable in a charging system (e.g., to be "grid friendly" and lessen any negative environmental impact). Furthermore, a POSITA would have understood that in addition to the environmental benefits of charging in a "grid friendly" way (i.e., benefits an electric vehicle owner would be likely to appreciate), the cost of electricity would likely also be lower at these times, and a POSITA would have had another motivation in that implementing DeVault's teachings would lead to cost savings.

95. Moreover, in this combination, implementing DeVault's teachings regarding grid load would at most require minor modifications to Hafner's energy transaction planner software component. As mentioned, Hafner's system already receives information from a charging station about the price of electricity, e.g., Hafner's "[e]nergy data services 308 may include, without limitation, . . . charging station price information sources." EX1006, 8:64-9:3. And Hafner already notes that a preference may be "time," and that "[t]ime 512 preferences may specific, without limitation, time of day 530 for charging the vehicle, time of day to stop charging the vehicle," among other things. *Id.*, 18:17-42. Thus, using charging times that are based on DeVault's forecasted grid load would simply involve replacing the fixed time preferences of Hafner with the dynamic time preferences of DeVault. Based on this, a POSITA would have understood that Hafner could similarly receive

information about grid load, as the controller DeVault does. EX1008, 20:65-21:20, 7:58-8:9. Furthermore, in describing its energy transaction interrupt monitor 320, Hafner explains that this component "monitors data transmissions to detect interrupt conditions that may terminate the flow of electric power to or from a vehicle," and that such interrupts may "originate from the power grid, suppliers, and/or vehicles." EX1006, 9:19-36. In view of this, in the combined system, Hafner's energy transaction interrupt monitor would cease flow of electricity when the grid load exceeds a predetermined limit.

96. A POSITA would have had a reasonable expectation of success in combining Hafner with Lowenthal and DeVault because they all relate to charging electric vehicles, and both already consider receiving information from power-supplying sources about the electricity provided. EX1006, 8:64-9:3; EX1008, 20:65-21:20, 7:58-8:9. Accordingly, the combination would be to implement DeVault's additional teachings of grid load into Hafner's charging system, to provide an improved system that can create transaction plans in consideration of grid load. This would have required minimal modifications to Hafner's system (simply adding a user preference based on grid load) and the combination would have led to a predictable result (Hafner's existing system, but with the additional functionality to control charging based on a grid load).

C. Disclosures for Claim 15

97. In addition to the explanation provided in the Petition regarding how Hafner in view of Lowenthal, DeVault, and the knowledge of a POSITA renders obvious the elements of claim 15—which I have reviewed, had input into, and endorse—I provide the following explanations.

1. [15.2] wherein the dynamic attribute comprises at least one of: (i) a present electrical provider system load and (ii) an expected future electrical provider system load.

98. I have reviewed, had input into, and endorse the Petition's explanation of why the combination of Hafner, Lowenthal, DeVault, and the knowledge of a POSITA discloses, or renders this obvious, this claim limitation.

99. For example, DeVault discloses the *present electrical provider system load* this limitation because it discloses that its "server stores consumer profiles and utility company power grid load data." EX1007, Abstract. DeVault explains that its "vehicle controller 50 and the vehicle 10 can be 'grid friendly,' that is the vehicle 10 can intelligently choose to charge during times of lowest grid electric demand, off peak hours between 9:00 P.M. or 10:00 P.M. and 6:00 A.M., regardless of when vehicle 10 is plugged-in to the recharging station 102." EX1008, 20:65-21:20.

100. DeVault also discloses *an expected future electrical provider system load* because it discloses that "vehicle controller 50 can also anticipate when an

electric utility is likely to be at peak load and modify charge parameters to avoid negatively affecting the grid." *Id.*

101. A POSITA would have understood the benefit and desirability of including present or expected future electrical provider system load as part of Hafner's preferences, as it would have allowed for a user of the combined system to allow charging a vehicle only in "grid friendly" situations for the reasons I discussed above in ¶¶ 92-96.

X. AVAILABILITY FOR CROSS-EXAMINATION

102. In signing this declaration, I recognize that the declaration will be filed as evidence in a contested case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I also recognize that I may be subject to cross examination in the case and that cross examination will take place within the United States. If cross examination is required of me, I will appear for cross examination within the United States during the time allotted for cross examination.

XI. CONCLUSION

103. I hereby declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct, and that all statements made of my own knowledge are true and that all statements made on information and belief

are believed to be true. I understand that willful false statements are punishable by fine or imprisonment or both. *See* 18 U.S.C. § 1001.

Date: February 25, 2022

Respectfully submitted,

Scott Andrews