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(71) Applicant: **LOGICOR (R&D) LTD** [GB/GB]; Units 6 and 7, Thornes Office Park, Monckton Road, Wakefield Yorkshire WF2 7AN (GB).

(72) Inventor; and

(71) Applicant: **BOWEN, David** [GB/GB]; Units 6 and 7, Thornes Office Park, Monckton Road, Wakefield Yorkshire WF2 7AN (GB).

(74) Agent: **BAILEY WALSH & CO LLP**; 1 York Place, Leeds Yorkshire LS1 2DR (GB).

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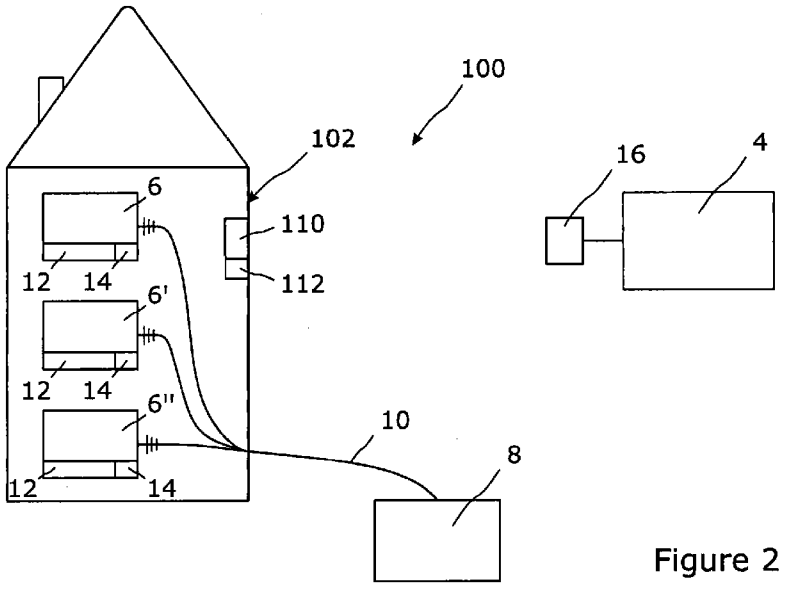


Figure 2

(57) Abstract: An energy management system is provided. The system includes at least one energy consuming device (6) which consumes energy in use and which is located at a first location. Energy supply control means (4) are provided and arranged to control the supply of energy to the at least one energy consuming device in use. The energy supply control means are located remotely from said first location. Energy supply means (8) are provided for supplying the energy from an energy source to the at least one energy consuming device in use. Control means (12) are provided on, with or associated with the at least one energy consuming device (6). The control means (12) are arranged to calculate the amount of energy said at least one energy consuming device is using, has used and/ or predicts it will require in the future in order to be operational for a pre-determined period of time, and submits data relating to said energy usage to said energy supply control means. The energy supply control means (4) is arranged to receive and process the data and obtain at least said predicted amount of energy required for supply by said energy supply means (8) and/ or generate an invoice to a user of the at least one energy consuming device based on the energy usage.

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ENERGY MANAGEMENT SYSTEM AND METHOD OF USE THEREOF

This invention relates to an energy management system and to a method of use thereof.

Conventionally, an energy supply company will purchase energy, such as electricity and gas, in a wholesale market and sell it on to customers. A large proportion of the energy is purchased weeks, months or even years in advance of when it is to be used so that the best price for the energy can be obtained on the wholesale market. In addition, it allows the energy company to guarantee the supply of energy to their customers. This type of purchasing is known as hedging and helps to even out the costs associated with energy purchase over time. However, a disadvantage of advance energy purchasing is that the energy supply company does not know what the actual customer energy requirements will be on any particular day in the future. As such, the energy supply company has to estimate how much energy is required. This estimate is difficult to undertake accurately so far in advance as the company may not have details relating to future weather conditions, what appliances a customer may be using in their home, whether any public or sporting events may be scheduled (it is often found that energy requirements increase when an important football match is being televised for example) and/or the like. On a particular day, any shortfall in energy previously purchased has to be topped up by purchasing energy on the day. Any excess energy purchased, is typically sold. However, it will be appreciated that energy purchased on the day is likely to be subject to higher prices than energy purchased months in advance. It is therefore an aim of energy supply companies to be able to more accurately predict the energy consumption of their customers.

In an attempt to address this problem, it is known to provide a smart meter in an energy consumer's home that records the consumption of electrical energy used within the home over a period of time. The smart meter allows two way communication of data between the energy consumer and the energy supply

company for the purposes of monitoring energy consumption and billing. However, this data typically relates to the property as a whole and it cannot distinguish between individual energy consuming devices within the home or property. In addition, the data generated by the smart meter only relates to energy that has been consumed. Although the data collected by the smart meter may be helpful to the energy supply company in being able to estimate how much energy a property or home may require on average in the future, it does not allow accurate monitoring of the energy supply requirements of the property or home on a real time basis or over a relatively short future time period, such as hours or days.

It is therefore an aim of the present invention to provide an energy management system that overcomes the abovementioned problems.

It is a further aim of the present invention to provide a method of using an energy management system that overcomes the abovementioned problems.

It is a yet further aim of the present invention to provide energy consuming apparatus that allows accurate energy requirements to be calculated and/or predicted.

It is a yet further aim of the present invention to provide a method of using energy consuming apparatus.

According to a first aspect of the present invention there is provided an energy management system, said system including at least one energy consuming device which consumes energy in use and which is located at a first location, energy supply control means arranged to control the supply of energy to the at least one energy consuming device in use, said energy supply control means located remotely from said first location, and energy supply means for supplying the energy from an energy source to the at least one energy consuming device, characterised in that control means are provided on, with, or associated with the at least one energy consuming device, said control means arranged to calculate the amount of energy said at least one energy consuming device is using, has used and/or predicts it will

require in the future in order to be operational for a pre-determined period of time, and submits data relating to said energy usage to said energy supply control means, said energy supply control means arranged to receive and process the data and obtain at least said predicted amount of energy for supply by said energy supply means and/or generate a payment request for a user of the at least one energy consuming device based on the energy usage.

Thus, the present invention provides an energy management system which allows the one or more energy consuming devices at a first location to request and/or pay for the amount of energy it needs in real time, or it predicts it will need, to operate for a pre-determined period of time from the energy supply control means, thereby allowing the energy supply control means to more accurately predict, purchase and/or obtain the required amount of energy at the first location.

Preferably the data communicated via and/or within the system includes one or more data items, packets and/or signals.

In one embodiment the first location can consist of or include one or more houses, apartments, buildings, premises, offices, retail outlets, rooms and/or the like.

In one embodiment the energy consuming device control means is, or is any device or unit that is, arranged to calculate the amount of energy said at least one energy consuming device is using and/or will need to use in real time.

In one embodiment the energy consuming device control means is, or is any device or unit that is, arranged to calculate the amount of energy said at least one energy consuming device predicts it will require for a pre-determined time period in the future.

Preferably the pre-determined time period is measured in seconds, minutes, hours, days, weeks, months, years and/or the like. In a preferred embodiment the pre-

determined time period is 24 hours or less, such as for example a four hour period, or an imminent time period.

In one embodiment the energy consuming device control means is, or is any device or unit that is, arranged to calculate the amount of energy said at least one energy consuming device requires in both real time and for a pre-determined time period in the future.

In one embodiment the energy consuming device control means is, or is any device or unit that is, arranged to measure and/or calculate the amount of energy said at least one energy consuming device has used within a pre-determined time period. Thus, in one example, the device control means can calculate historical energy usage and/or current energy usage.

Preferably the energy consuming device control means is, or is any device or unit that is, arranged to calculate the amount of energy said at least one energy consuming device requires in real time, immediately or in the future based on one or more parameters and/or control the energy consuming device based on one or more parameters.

The one or more parameters for calculating the amount of energy can be the same or different to the one or more parameters for controlling the energy consuming device.

Preferably said one or more parameters consist of or include any or any combination of one or more of the prevailing weather conditions; the future weather forecast; current energy usage of said at least one energy consuming device; historical and/or conditions of usage of said at least one energy consuming device; one or more scheduled and/or public events; the detection of one or more animals and/or humans in the vicinity or immediate vicinity of the at least one energy consuming device; movement detection, detection of room temperature or ambient temperature in the vicinity or immediate vicinity of the at least one energy consuming device; energy usage; electrical voltage used by the at least one energy

consuming device; electrical ampage used by the at least one energy consuming device; electrical wattage used by the at least one energy consuming device; time; target temperature; energy consuming device surface temperature and/or the like.

Preferably the one or more parameters relate to the first location and/or the at least one energy consuming devices.

In one embodiment the energy consuming device control means is arranged to be able to calculate a predicted amount of energy usage based on a 1°C change in environmental temperature, prevailing weather conditions, future weather conditions, room temperature at the first location and/or the like.

Preferably software, one or more mathematical formula, algorithms and/or the like are used by and/or provided in the energy consuming device control means to predict an amount of energy required by the device for a pre-determined time period.

Preferably the energy consuming device control means consists of or includes processing means, a processor, micro-processing means and/or a micro-processor.

In one example, the energy consuming device control means is in the form of a computer.

The energy consuming control means, processor, processing means, micro-processor, micro-processing means and/or the computer is preferably attached to integrally formed with the energy consuming device.

In one embodiment the at least one energy consuming device and/or energy consuming control means includes, is provided with or is associated with movement detection means or device to detect movement in the locality or vicinity of said at least one energy consuming device. This allows the device to determine whether a person and/or animal is present at the first location and hence determine whether the at least one energy consuming device needs to be

operational and/or whether it is likely to be moved into an operational condition from a non-operational time within a pre-determined period of time.

In one embodiment timing means or a timer is provided on or associated with the at least one energy consuming device, energy consuming device control means and/or movement detection means to allow the current time and/or the time of a detected event to be recorded and/or measured.

Preferably the at least one energy consuming device and/or energy consuming device control means includes communication means or a communication device for communicating data with the energy supply control means in use.

Preferably the communication means or communication device is arranged to allow one way communication from the at least one energy consuming device to the energy supply control means and/or two-way communication between the at least one energy consuming device and the energy supply control means.

In one embodiment the communication means or communication device include any or any combination wired means, through the mains electrical wiring or circuitry within the property or first location, wireless means, one or more transmitter means, transmitters, receiver means, receivers, transceiver means, transceivers and/or the like.

Preferably the wireless communication means includes any or any combination of one or more radio frequency signals, Bluetooth, WIFI, light and/or the like.

In one embodiment the energy management system includes two or more energy consuming devices located at the first location.

Preferably the two or more energy consuming devices are located separately and/or a spaced distance apart from each other.

Preferably the two or more energy consuming device are independent devices.

In one embodiment each energy consuming device and/or energy consuming device control means is arranged to communicate separately and/or independently with the energy supply control means.

In one embodiment a common control means or device is provided at or associated with the first location and said energy consuming devices communicate data with the common control means or device and/or with the energy supply control means.

Preferably the common control means or device is arranged to communicate data associated with the two or more energy consuming devices in the system with the energy supply control means.

In one embodiment one or more of the energy consuming devices in the system communicate data to the energy supply control means indirectly via the common control means or device.

In one embodiment the common control means or device includes processing means, a processor, a micro-processor and/or micro-processing means to allow processing of one or more data requests, data signals and/or the like from the one or more energy consuming devices and/or common control means.

In one embodiment the common control means is in the form of a computer, micro-processor, computer server and/or the like.

Preferably the common control means, the energy supply control means and/or the energy consuming device control means includes data storage means or device, memory means or device and/or the like for storing data relating to the one or more parameters and/or other data.

Preferably the common control means communicates with the one or more energy consuming device control means and/or the energy supply control means via wired or wireless means.

Preferably the common control means or device is separate to, independent of and/or remote from the energy consuming device control means at the first location.

In one embodiment the energy supply control means or device includes processing means, a processor, a micro-processor and/or micro-processing means to allow processing of one or more data requests, data signals and/or the like from the one or more energy consuming devices and/or common control means.

In one embodiment the energy supply control means or device includes a computer means, a computer server and/or the like.

In one embodiment the energy supply control means or device is located at an energy supply company, such as a gas and/or electricity service provider, and/or at a second or further location. The second or further location is remote from the first location.

Preferably the energy supply source is a power station, substation, wind generating power source, solar power generating source and/or the like.

Preferably the energy supply source is located at a third or yet further location.

Further preferably the third or yet further location is remote from at the first location and/or the second or further location.

In one embodiment the at least one energy consuming device includes one or more radiators, infra-red heaters, heaters, water heaters, electric water heaters, electrical heaters, illumination means, lights, lighting system and/or the like.

In one embodiment the energy supply means or mechanism includes a mains electrical supply, an electrical supply, mains gas supply, a gas supply, one or more electrical conduits and/or cables, one or more gas conduits and/or pipes, and/or the like.

In one embodiment the energy being consumed and/or supplied is electricity, gas, combustible fuel, and/or any combination of the same.

In one embodiment the at least one energy consuming device includes energy input means for inputting energy into said energy consuming device in use.

Preferably the at least one energy consuming device is movable between an operational condition, wherein it uses energy or a relatively high amount of energy, to a non-operational condition, wherein it does no use energy or uses a relatively low amount of energy.

Preferably the at least one energy consuming device is in the form of an infra-red heater, glass heater, ceramic heater, hot water heater and/or the like.

In one embodiment the at least one energy consuming device is a heating device as set out in EP3036588, the content of which is incorporated herein by reference, and/or a water heating device as set out in GB1704497.5, the content of which is incorporated herein by reference.

Preferably the energy supply control means or device obtains the energy it estimates or calculates it requires by purchasing the same from an energy supply marketplace, energy supply "stock exchange" and/or the like. This purchased energy is then made available to the energy consuming device(s) via the energy supply means.

Preferably the energy supply control means obtains energy at least equal to the predicted data energy request communicated from the at least one energy consuming device and/or common control means, thereby ensuring that the at least one energy consuming device has sufficient energy to allow it to operate in an operational condition for at least a pre-determined period of time.

Preferably each or the at least one energy consuming device has a unique identification means or code to allow the specific energy consuming device within the first location or a location to be identified by the common control means, by

one or more other energy consuming devices within the first location or a location and/or by the energy supply control means.

In one embodiment at least one energy consuming device is provided at two or more locations.

Preferably the two or more locations are in different buildings, premises and/or the like.

Preferably each energy consuming device at each location is able to communicate a calculated or predicted energy data request to said energy supply control means directly or indirectly in use.

Preferably each energy consuming device is able to calculate and communicate data relating to the predicted or requested energy and/or the actual recorded energy usage. Further preferably both these data items can be communicated simultaneously to the energy supply control means directly or indirectly.

Preferably the data items are used by the energy supply control means to calculate a bill for the owner of one or more energy consuming devices.

Preferably each energy consuming device is able to predict and/or calculate an estimated energy usage or requirement for a pre-determined period of time and submit this request to the common control means and/or the energy supply control means.

In one embodiment each energy consuming device and/or energy consuming device control means is arranged to communicate separately and/or independently with the wholesale energy market directly without the need to communicate via a retail energy company or energy supply control means.

Preferably the energy supply control means and/or the common control means have checking means or a checking mechanism for checking the energy request data submitted by one or more energy consuming devices and/or common control means. For example, this ensures the amount of energy being requested is a

realistic amount of energy usage for said location. One or more pre-determined thresholds may be provided or associated with this energy request data so that it prevents too much energy being requested and/or too little energy being requested, such as for example in case of miscalculation or unusual conditions at the location at which the energy consuming device is located.

Preferably the energy supply control means includes authorisation means or an authorisation mechanism is required which provides authorisation of the energy request from one or more energy consuming devices and/or common control means prior to purchasing or obtaining the requested energy. This helps to prevent too much or too little energy from being purchased in use.

Preferably the payment request or invoice generated by the system to a user of the at least one energy consuming device is based on energy already consumed by the at least one energy consuming device and/or predicted future energy usage by the at least one energy consuming device.

According to a second aspect of the present invention there is provided a method of using an energy management system, said system including at least one energy consuming device which consumes energy in use and which is located at a first location, energy supply control means arranged to control the supply of energy to the at least one energy consuming device in use, said energy supply control means located remotely from said first location, and energy supply means for supplying the energy from an energy source to the at least one energy consuming device, characterised in that control means are provided on, with or associated with the at least one energy consuming device, and wherein said method includes the steps of calculating the amount of energy said at least one energy consuming device is using, has used and/or predicts it will require in the future in order to be operational for a pre-determined period of time, submitting data relating to said energy usage from said at least one energy consuming device to said energy supply control means, said energy supply control means receiving and processing the data

and predicting an amount of energy required for supply by said energy supply means and/or generating a payment request for a user of the at least one energy consuming device based on the energy usage.

According to one aspect of the present invention there is provided an energy consuming device for use in the energy management system according to claim 1.

According to a third aspect of the present invention there is provided an energy consuming device which consumes energy when in an operational condition in use, said energy consuming device including energy input means for inputting energy into said energy consuming device in use, characterised in that control means are provided on, with, or associated with the at least one energy consuming device, said control means arranged to calculate the amount of energy said at least one energy consuming device requires or predicts it needs to be operational for a pre-determined period of time, said at least one energy consuming device including communication means for communicating said calculated energy data to a location remote from said at least one energy consuming device.

According to a fourth aspect of the present invention there is provided a method of using an energy consuming device.

Embodiments of the present invention will now be described with reference to the following figures, wherein:

Figure 1 is a simplified view of an energy management system according to one embodiment of the present invention;

Figure 2 is a simplified view of an energy management system according to a further embodiment of the present invention;

Figure 3 is an example of an energy consuming device in the form of an infra red heater according to an embodiment of the present invention;

Figure 4 is an example of an interface provided on an energy supply control server;

Figure 5 is further example of an interface provided on an energy supply control server showing an individual customer's electricity usage over a pre-determined time period;

Figure 6 is an example of an interface that could be provided on the common control unit shown in figure 2.

Referring firstly to figure 1, there is illustrated an energy management system 2 according to an embodiment of the present invention. The energy management system 2 comprises an energy consuming device 6 that consumes energy when in at least an operational condition. It is to be noted that the device 6 could also consume some energy when in a non-operational condition, albeit significantly less than when in an operational condition, such as for example, in a standby condition. Alternatively, the device 6 may consume no energy when in a non-operational condition. In one example the energy consuming device 6 is in the form of an electrical heater and is located at a first location.

The energy management system further comprises an energy supply source 8, such as for example an electricity sub-station, which takes electricity from a power station and transports it to device 6 at the first location along electricity cables 10 provided between the sub-station 8 and the device 6. The electricity source 8 is at a second location remote to the first location.

The energy management system also comprises energy supply control means in the form of a energy supply control server 4 located at an energy supply company at a third location. The first and second locations are typically remote from the third location. The energy supply control server 4 is arranged to purchase electricity from an electricity wholesale marketplace, such as for example, an electricity stock exchange and/or the like. This purchase is typically undertaken following a request for electricity submitted from the device 6.

The energy consuming device 6 has control means in the form of a control unit 12 provided on the same. Transceiver devices 14, 16 are associated with the control

unit 12 at the first location and the energy supply control server 4 located at the third location respectively. These transceiver devices 14,16 allow two way communication between the device 6 and the server 4 in use. In the illustration, communication between the transceiver devices 14, 16 is typically wireless, such as via WIFI, but it will be appreciated that other forms of wireless or wired technology could be used.

The control unit 12 contains a micro-processor and data storage to allow historical energy usage data to be stored and/or data relating to one or more parameters. The control unit includes one or more sensors for sensing some of the one or more parameters. The one or more parameters can include any or any combination of one or more of the prevailing weather conditions at the first location, the future weather forecast or conditions for the first location, current energy usage of device 6, historical usage of device 6, one or more scheduled events, such as football matches, popular events that may influence whether device 6 is operational and/or the like, the detection of one or more animals and/or humans in the vicinity of device 6, movement detection in the vicinity of device 6, room temperature or ambient temperature in the room or vicinity of device 6, voltage usage of device 6, amp usage of device 6, wattage usage of device 6, current time, target temperature for the room or vicinity in which device 6 is located and/or for device 6, device 6 surface temperature and/or the like.

The control unit 12 is able to calculate an amount of energy it is currently using in real time and also predicts the amount of energy it will need for an imminent time period in the future, such as for example the next 4 hours, based on the data collected and/or stored relating to the one or more parameters. The control unit 12 can perform this prediction based on mathematical formulae, algorithms, software and/or the like. The control unit 12 then communicates this predicted energy data request, typically together with data relating to the current/real time energy usage for device 6 to the energy supply control server 4.

The energy supply control server 4 is then able to use this transmitted energy data to purchase the predicted amount of energy at that point in time and also to bill the customer associated with device 6 for the amount of energy purchased. This method is a significantly more accurate method of purchasing energy, thereby preventing the problems of over-purchasing or under-purchasing of energy associated with the prior art. To prevent under purchasing the energy supply control server 4 can also instruct a device 6 to limit it's electrical usage to make sure that under purchasing is eliminated. In one embodiment device 6 can be an infrared heater and turning that off for short time periods will have little detriment to the temperature in a room in which the infrared heater is located but will reduce the amount of energy consumed by the device.

The energy management system 100 shown in figure 2 works in a similar manner to the energy management system 2 shown in figure 1, with the exception that a plurality of energy consuming devices 6, 6', 6" are provided in a house 102 at the first location. Each energy consuming device 6, 6', 6" has a control unit 12 and a transceiver 14. The electricity required to power devices 6, 6', 6" enters the house 102 via electricity cable 10 provided between the sub-station 8 and the house. Once the electricity reaches house 102, it then travels along electricity cables 104, 106, 108 to the respective devices 6, 6', 6". A common control unit 110 is provided in house 102 which also has a transceiver 112. The common control unit 110 can communicate directly and independently with each of devices 6, 6', 6" and also with energy supply control server 4. Thus, in this embodiment devices 6, 6', 6" do not generally communicate directly with energy supply control server 4 but communicate indirectly via common control unit 110. Communication between common control unit 100, energy supply control server 4 and control unit 12 is typically wirelessly as before, but could be wired communication and/or a combination of wired and wireless communication as required.

Figure 3 illustrates an example of an energy consuming device 6 in the form of an infra-red wall mounted heater.

Figure 4 illustrates an example of an interface 200 provided on a display screen associated with the energy supply control server 4. The interface 200 is arranged to display a number of data items, such as a customer identification number 202 to identify the customer's energy usage. Other data items displayed can include data relating to the actual recorded energy usage in kWh supplied by common control unit 110 provided in column 204 of table 206; data relating to the predicted energy usage in kWh supplied by common control unit 110 provided in column 208 of table 206; the cost of the energy purchased is provided in column 210 and time on an hour by hour basis within a 24 hour time period is shown in column 212. This data is represented graphically in graph 214 provided on interface 200.

Figure 5 illustrates a further example of data that can be displayed on interface 200. In this illustration, details relating to the customer are provided in table 216, such as for example their name, home address, contact details, notes on the customer and/or the like; details of a customer's actual usage per energy consuming device 6 within their home is provided in table 218, such as for example, identification of the device 6, the date and time on which the energy usage has been calculated for, which room in the house the device 6 is located, details relating to the device 6. It will be appreciated that this data provides a lot of information on a user that could be valuable to marketing companies to allow targeted marketing. For example, the data identifies when a user is at home, what appliances they use in their property and when and/or the like.

Figure 6 illustrates an example of an energy usage report 300 that the user could generate from the common control unit 110 and/or via a mobile device app associated with the energy management system. The report can show the customer name 302, the customer address 304, the telephone number 306, the identification code 308 of the common control unit 110, and the date and time 310 at which the report was generated on or for the time period of energy usage. Each energy consuming device 6 within the customer's home is given a unique identification number 312, its location within the home is identified 314, and the energy used by

the device 6 within the time period being measured 316 is provided. The total amount of energy used 318 is also provided. This data can be used by the customer to help manage their energy consumption and/or understand their energy bills.

Claims

1. An energy management system, said system including at least one energy consuming device which consumes energy in use and which is located at a first location, energy supply control means arranged to control the supply of energy to the at least one energy consuming device in use, said energy supply control means located remotely from said first location, and energy supply means for supplying the energy from an energy source to the at least one energy consuming device, characterised in that control means are provided on, with or associated with the at least one energy consuming device, said control means arranged to calculate the amount of energy said at least one energy consuming device is using, has used and/or predicts it will require in the future in order to be operational for a pre-determined period of time, and submits data relating to said energy usage to said energy supply control means, said energy supply control means arranged to receive and process the data and obtain at least said predicted amount of energy required for supply by said energy supply means and/or generate a payment request for a user of the at least one energy consuming device based on the energy usage.

2. An energy management system according to claim 1 wherein the energy consuming device control means is arranged to calculate the amount of energy said at least one energy consuming device is using and/or will need to use in real time.

3. An energy management system according to claim 1 wherein the energy consuming device control means is arranged to calculate the amount of energy said at least one energy consuming device requires in real time, immediately or in the future based on one or more parameters and/or

control the at least one energy consuming device based on one or more parameters.

4. An energy management system according to claim 3 wherein the one or more parameters consist or include any or any combination of one or more prevailing weather conditions; a future weather forecast; current energy usage of said at least one energy consuming device; historical and/or conditions of usage of said at least one energy consuming device; one or more scheduled and/or public events; the detection of one or more animals and/or humans in the vicinity or immediate vicinity of the at least one energy consuming device; movement detection, detection of room temperature and/or ambient temperature in the vicinity or immediate vicinity of the at least one energy consuming device; energy usage; electrical voltage, wattage and/or ampage used by the at least one energy consuming device; time; target temperature of the first location and/or at least one electrical consuming device; or at least one energy consuming device surface temperature.

5. An energy management system according to claim 1 is arranged to be able to calculate a predicted amount of energy usage based on a 1 degree change in environmental temperature, prevailing weather conditions and/or future weather conditions at the first location.

6. An energy management system according to claim 1 wherein the energy consuming control means consists of or includes a processor, processing means, a micro-processor, micro-processing means and/or a computer.

7. An energy management system according to claim 6 wherein the energy consuming control means, the process, processing means, micro-processor,

micro-processing means and/or computer is attached or is integrally formed with the at least one energy consuming devices.

8. An energy management system according to claim 1 wherein the at least one energy consuming device and/or energy consuming control means includes, is provided with or is associated with movement detection means or device to detect movement of the locality or immediate vicinity of said at least one energy consuming device.

9. An energy management system according to claim 1 wherein the at least one energy consuming device and/or the energy consuming device control means includes any or any combination of timing means or a timer or communication means or a communication device.

10. An energy management system according to claim 9 wherein the communication means or communication device are arranged to allow one way communication from the at least one energy consuming device to the energy supply control means and/or two way communication between the at least one energy consuming device and the energy supply control means.

11. An energy management system according to claims 9 or 10 wherein the communication means or communication device include any or any combination of wired means, mains electrical wiring or circuitry at the first location, wireless means, one or more transmitter means or transmitters, receiving means or receivers or transceiver means or transceivers.

12. An energy management system according to claim 11 wherein the wireless communication means includes any or any combination of one or more radio frequency signals, Bluetooth, WIFI or light.

13. An energy management system according to claim 1 wherein the system includes two or more energy consuming devices located at the first location.

14. An energy management system according to claim 13 wherein each energy consuming device is arranged to communicate separately and/or independently with the energy supply control means.

15. An energy management system according to claim 13 wherein each energy consuming device is arranged to communicate with a common control means, and said common control means communicates data with the energy supply control means.

16. An energy management system according to claim 15 wherein the common control means includes or is processing means, a processor, micro-processing means, a micro-processor, computer, computer server, data storage means and/or memory means.

17. An energy management system according to claim 1 wherein the energy supply control means is or includes a processor, processing means, micro-processing means, a micro-processor, computer and/or computer server.

18. An energy management system according to claim 1 wherein the energy supply control means is located at an energy supply company, a gas and/or electricity service provider, or at a second location remote to the first location.

19. An energy management system according to claim 1 wherein the energy supply source is a power station, sub-station, wind-generating power source, solar power generating source.

20. An energy management system according to claim 1 wherein the energy supply source is located at a third location which is remote from the first location and/or the second location.

21. An energy management system according to claim 1 wherein the at least one energy consuming device includes one or more radiators, infra-red heaters, glass heaters, ceramic heaters, heaters, water heaters, electrical water heaters, electrical heaters, illumination means, lights and/or lighting system.

22. An energy management system according to claim 1 wherein the energy supply means includes a mains electrical supply, an electrical supply, a mains gas supply, a gas supply, one or more electrical conduits and/or cables, and/or one or more gas conduits and/or pipes.

23. An energy management system according to claim 1 wherein the energy supply control means obtains the energy it requires or estimates it requires by purchasing the same from an energy supply marketplace or energy supply stock exchange.

24. An energy management system according to claim 1 wherein the energy supply control means obtains energy at least equal to the predicted data energy request communicated from the at least one energy consuming device and/or common control means.

25. An energy management system according to claim 1 wherein each, or the at least one, energy consuming device has a unique identification means or code to allow each energy consuming device to be identified by common control means, by one or more other energy consuming devices within the first location and/or by the energy supply control means.

26. An energy management system according to claims 1 or 15 wherein the energy supply control means and/or common control means having checking means and/or authorisation means for checking the energy request data submitted by one or more energy consuming devices and/or common control means.

27. A method of using an energy management system, said system including at least one energy consuming device which consumes energy in use and which is located at a first location, energy supply control means arranged to control the supply of energy to the at least one energy consuming device in use, said energy supply control means located remotely from said first location, and energy supply means for supplying the energy from an energy source to the at least one energy consuming device, characterised in that control means are provided on, with or associated with the at least one energy consuming device, and wherein said method includes the steps of calculating the amount of energy said at least one energy consuming device is using, has used and/or predicts it will require in the future in order to be operational for a pre-determined period of time, submitting data relating to said energy usage from said at least one energy consuming device to said energy supply control means, said energy supply control means receiving and processing the data and predicting an amount of energy required for supply by said energy supply means and/or generating a payment request for a user of the at least one energy consuming device based on the energy usage.

28. An energy consuming device for use in the energy management system according to claim 1.

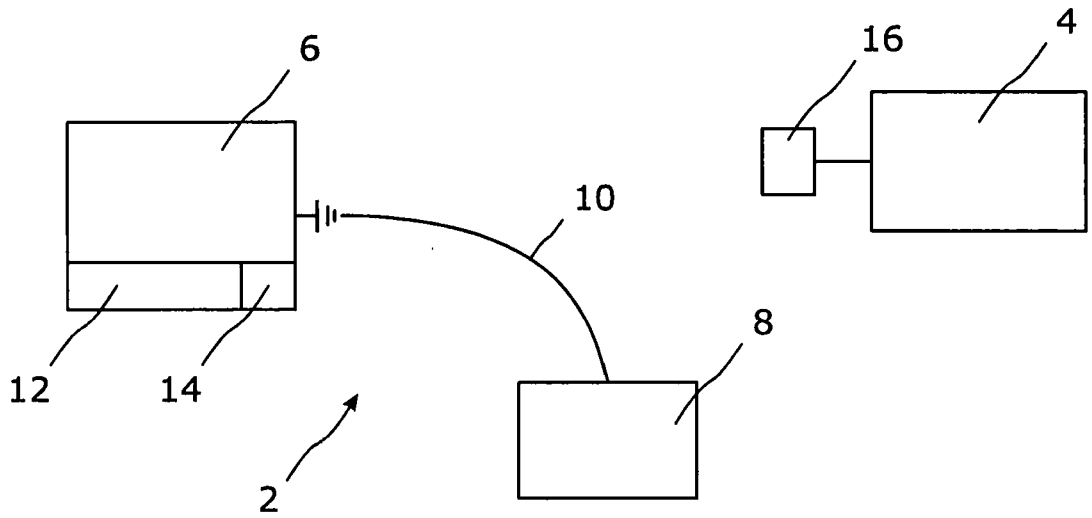


Figure 1

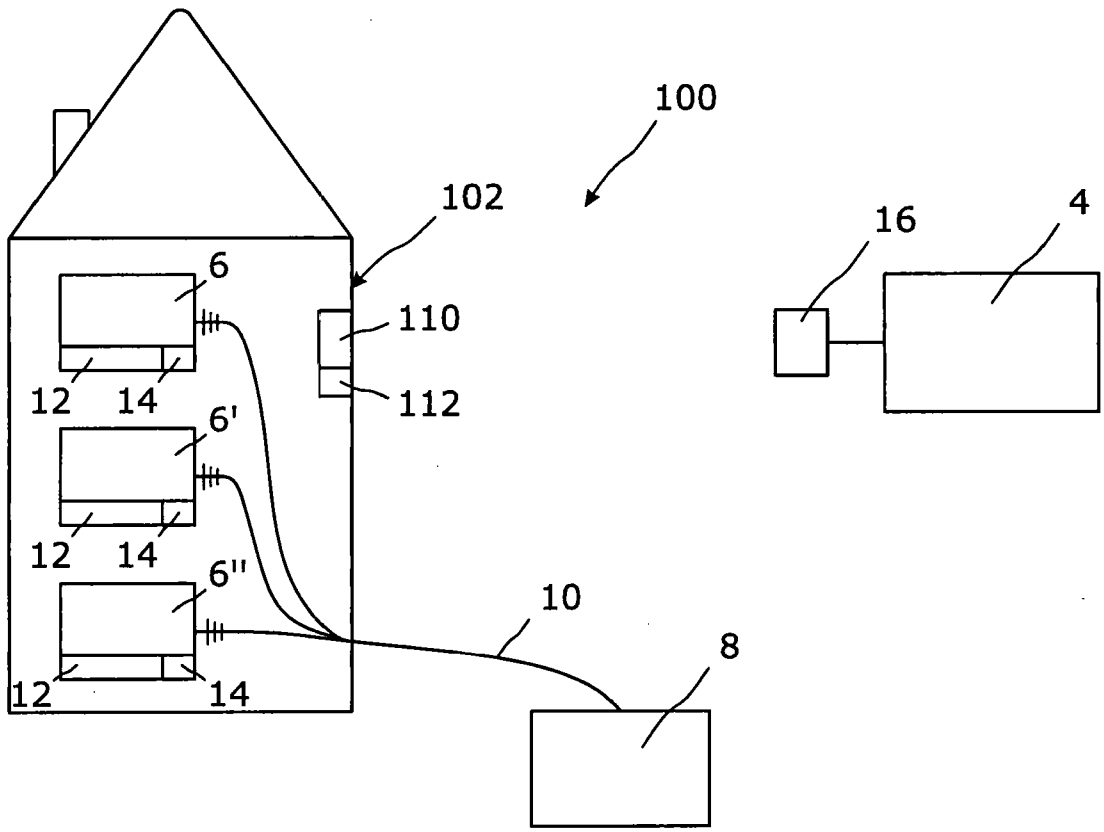


Figure 2

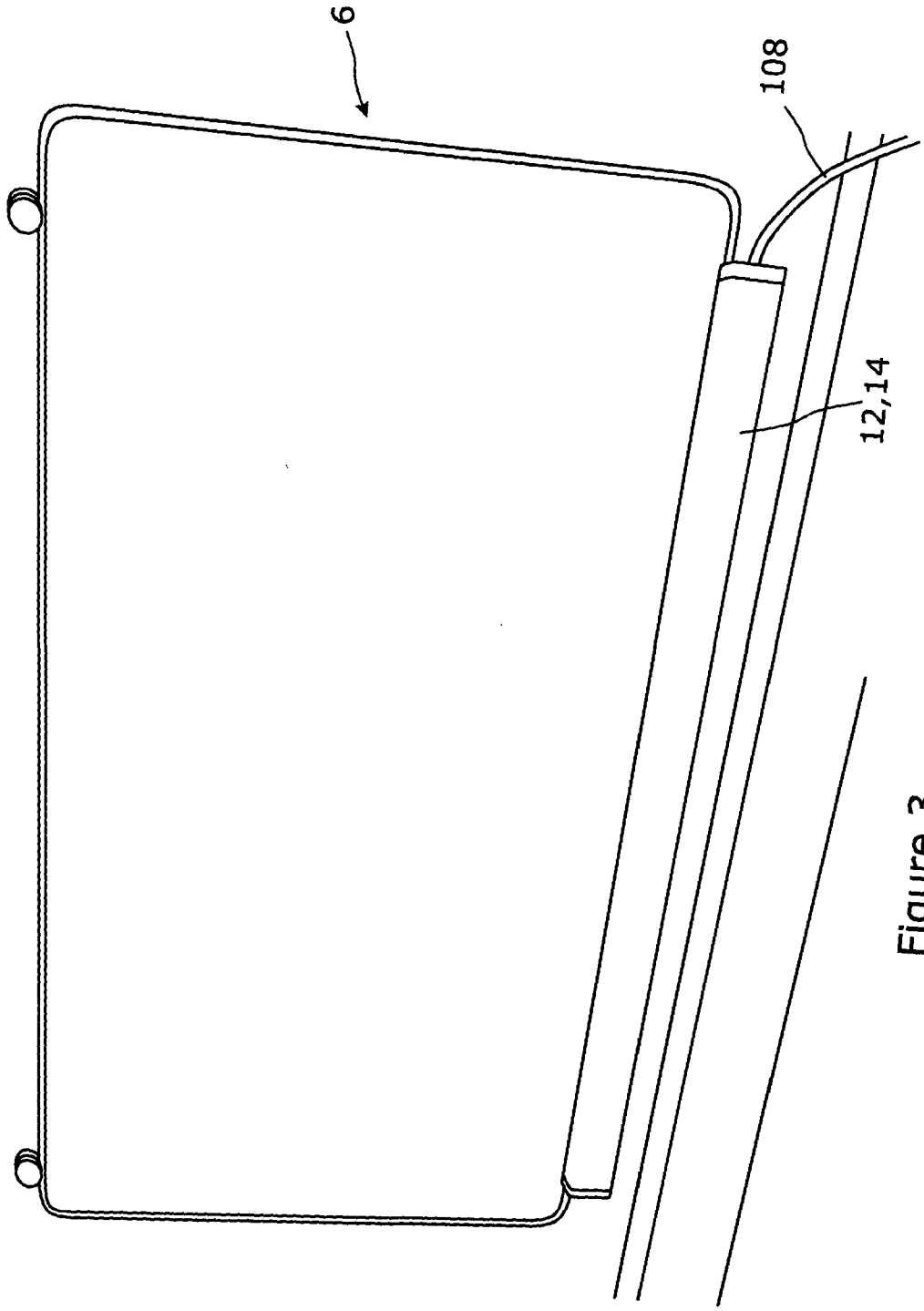


Figure 3

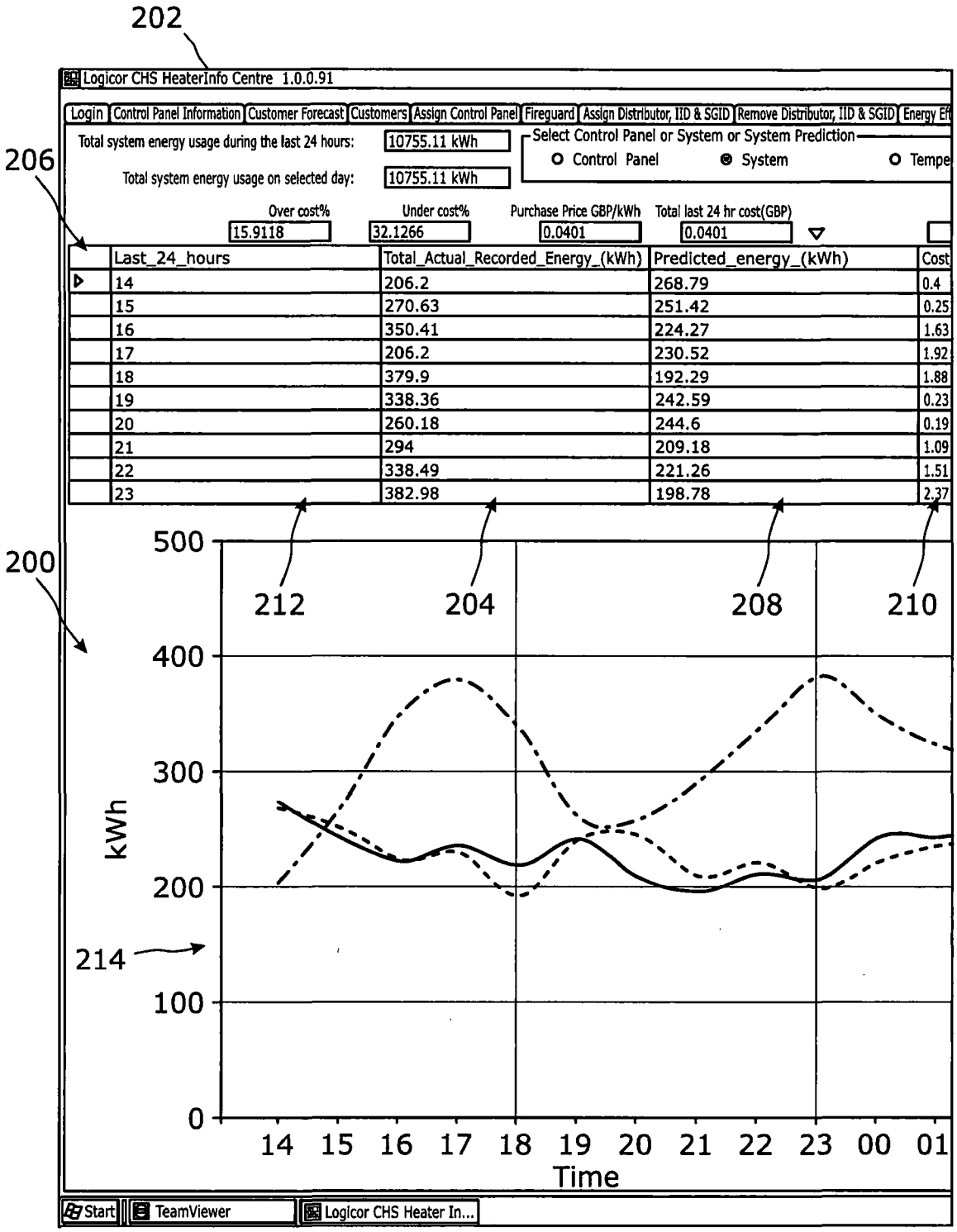

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Logicor CHS HeaterInfo Centre 1.0.0.91
Login
Control Panel Information
Customer Forecast
Customers
Assign Control Panel
Fireguard
Assign Distributor, IID & SGID
Remove Distributor, IID & SGID
Energy Ef
Total system energy usage during the last 24 hours: 10755.11 kWh
Total system energy usage on selected day: 10755.11 kWh
Select Control Panel or System or System Prediction
Control Panel
System
Tempe
206
Over cost% 15.9118
Under cost% 32.1266
Purchase Price GBP/kWh 0.0401
Total last 24 hr cost(GBP) 0.0401
Last_24_hours | Total_Actual_Recorded_Energy_(kWh) | Predicted_energy_(kWh) | Cost
14 | 206.2 | 268.79 | 0.4
15 | 270.63 | 251.42 | 0.25
16 | 350.41 | 224.27 | 1.63
17 | 206.2 | 230.52 | 1.92
18 | 379.9 | 192.29 | 1.88
19 | 338.36 | 242.59 | 0.23
20 | 260.18 | 244.6 | 0.19
21 | 294 | 209.18 | 1.09
22 | 338.49 | 221.26 | 1.51
23 | 382.98 | 198.78 | 2.37
200
212
204
208
210
500
400
300
200
100
0
kWh
214
14 15 16 17 18 19 20 21 22 23 00 01
Time
Start
TeamViewer
Logicor CHS Heater In...

Figure 4

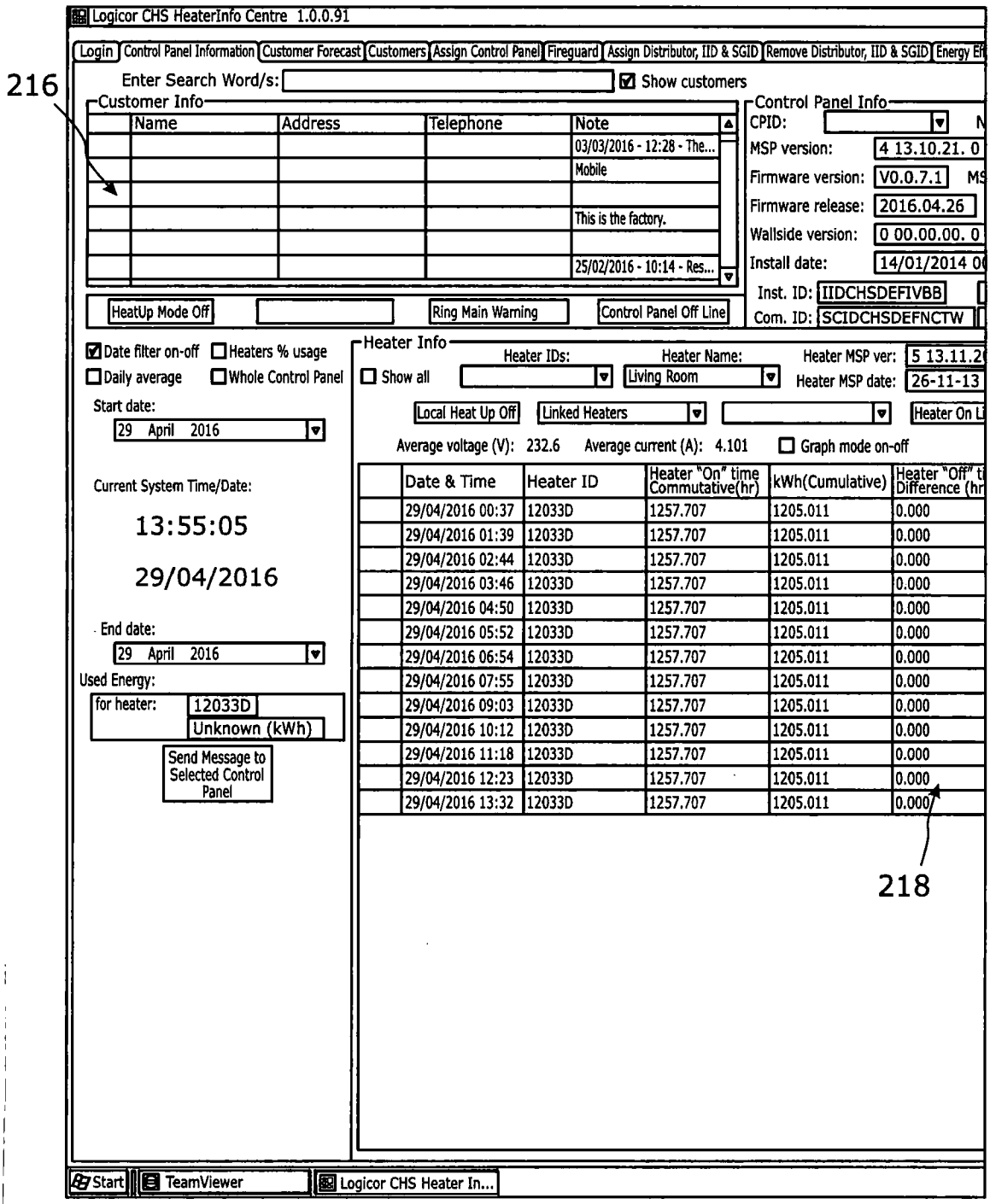
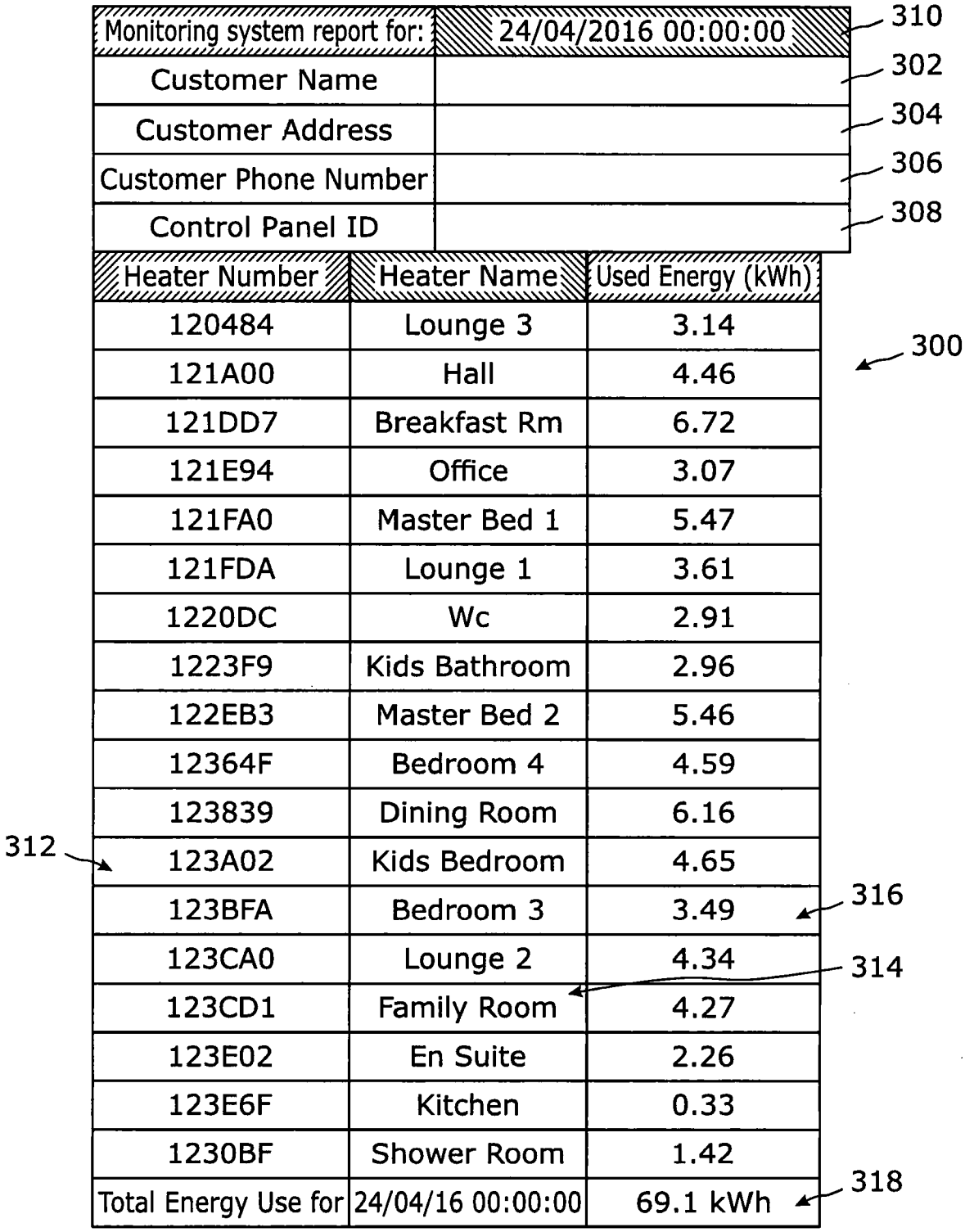

Logicor CHS HeaterInfo Centre 1.0.0.91
Login
Control Panel Information
Customer Forecast
Customers
Assign Control Panel
Fireguard
Assign Distributor, IID & SGID
Remove Distributor, IID & SGID
Energy Ef
216
Enter Search Word/s:
Show customers
Customer Info
Name
Address
Telephone
Note
03/03/2016 - 12:28 - The...
Mobile
This is the factory.
25/02/2016 - 10:14 - Res...
Control Panel Info
CPID:
MSP version:
4 13.10.21. 0
Firmware version:
V0.0.7.1
Firmware release:
2016.04.26
Wallside version:
0 00.00.00. 0
Install date:
14/01/2014 0
Inst. ID:
IIDCHSDEFIVBB
Com. ID:
SCIDCHSDEFNCTW
HeatUp Mode Off
Ring Main Warning
Control Panel Off Line
Date filter on-off
Heaters % usage
Daily average
Whole Control Panel
Start date:
29 April 2016
Current System Time/Date:
13:55:05
29/04/2016
End date:
29 April 2016
Used Energy:
for heater:
12033D
Unknown (kWh)
Send Message to Selected Control Panel
Heater Info
Heater IDs:
Heater Name:
Living Room
Heater MSP ver:
5 13.11.2
Show all
Heater MSP date:
26-11-13
Local Heat Up Off
Linked Heaters
Heater On Li
Average voltage (V): 232.6
Average current (A): 4.101
Graph mode on-off
Date & Time
Heater ID
Heater "On" time Commutative(hr)
kWh(Cumulative)
Heater "Off" ti Difference (hr
29/04/2016 00:37 12033D 1257.707 1205.011 0.000
29/04/2016 01:39 12033D 1257.707 1205.011 0.000
29/04/2016 02:44 12033D 1257.707 1205.011 0.000
29/04/2016 03:46 12033D 1257.707 1205.011 0.000
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29/04/2016 09:03 12033D 1257.707 1205.011 0.000
29/04/2016 10:12 12033D 1257.707 1205.011 0.000
29/04/2016 11:18 12033D 1257.707 1205.011 0.000
29/04/2016 12:23 12033D 1257.707 1205.011 0.000
29/04/2016 13:32 12033D 1257.707 1205.011 0.000
218
Start
TeamViewer
Logicor CHS Heater In...

Figure 5



Monitoring system report for:	24/04/2016 00:00:00	310
Customer Name		302
Customer Address		304
Customer Phone Number		306
Control Panel ID		308

Heater Number	Heater Name	Used Energy (kWh)
120484	Lounge 3	3.14
121A00	Hall	4.46
121DD7	Breakfast Rm	6.72
121E94	Office	3.07
121FA0	Master Bed 1	5.47
121FDA	Lounge 1	3.61
1220DC	Wc	2.91
1223F9	Kids Bathroom	2.96
122EB3	Master Bed 2	5.46
12364F	Bedroom 4	4.59
123839	Dining Room	6.16
123A02	Kids Bedroom	4.65
123BFA	Bedroom 3	3.49
123CA0	Lounge 2	4.34
123CD1	Family Room	4.27
123E02	En Suite	2.26
123E6F	Kitchen	0.33
1230BF	Shower Room	1.42
Total Energy Use for	24/04/16 00:00:00	69.1 kWh

Figure 6

INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2018/050571

A. CLASSIFICATION OF SUBJECT MATTER
INV. H02J13/00 H02J3/00 G06Q50/06 G01D4/00
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H02J G06Q G01D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2017/063084 A1 (HARPER KARL E [US] ET AL) 2 March 2017 (2017-03-02)	1-7,9, 11-13, 17-22, 24,27,28
Y	the whole document	8,10, 14-16, 23,25,26

X	US 2013/144769 A1 (SWAMINATHAN RADHAKRISHNAN [US] ET AL) 6 June 2013 (2013-06-06)	1-3,9, 11-13, 17-22, 27,28
	the whole document	

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
30 April 2018	14/05/2018

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Annibal, Stewart

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Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2018/050571

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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X A	US 2013/103378 A1 (TINNAKORNSRISUPHAP PEERAPOL [US] ET AL) 25 April 2013 (2013-04-25) paragraph [0043] -----	28 10, 14-16, 25,26
A	US 2010/025483 A1 (HOEYNCK MICHAEL [US] ET AL) 4 February 2010 (2010-02-04) abstract paragraph [0034] - paragraph [0036] -----	8

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/GB2018/050571

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		WO 2010014923 A1	04-02-2010