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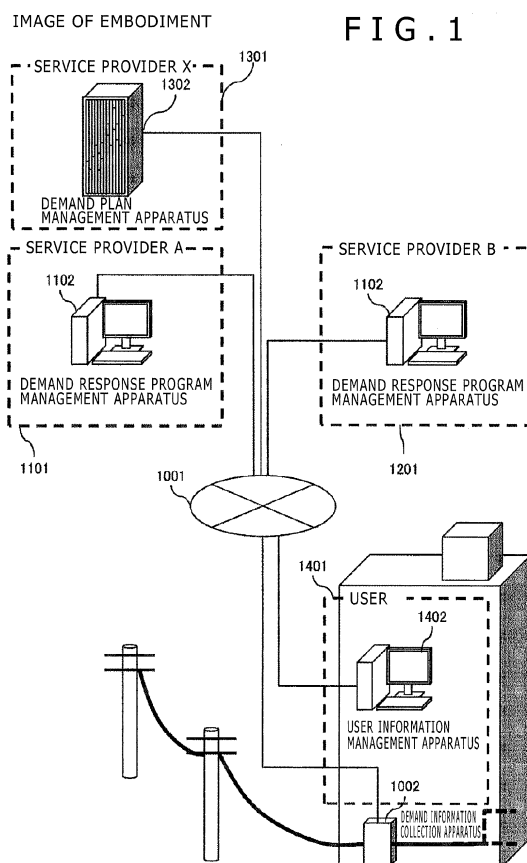
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(54) **Demand plan management system**

(57) To extract a demand response program that it is desirable for a user (1401) to register from demand response programs each of which has a different registration condition after considering implementability of energy suppression at the time of a user's demand response event. In order to realize the problem, a demand plan management system according to the present invention supports decision making to registration to the demand response program of the user (1401) by: estimating suppression energy at an arbitrary productivity and an amount of balance by participation in a demand response event using a user's past energy consumption history based on a different condition for each demand response program, generating a measure for realizing energy suppression from owned facility information of the user (1401), and additionally presenting it together with an action measure in contingency.



Description

Technical Field

[0001] The present invention relates to a technology of, when a user selects and registers one or more programs from among multiple demand response programs in order to participate in a demand response event, presenting a demand response program suitable as a registration target and information on a demand response measure in connection with it after evaluating a realization possibility to a demand response of the user.

Background

[0002] In demand and supply of energies, such as electric power, gas, water, and heat, it is required for a quantity demanded and a quantity supplied of energy to be in agreement. Therefore, when an energy demand increases, the quantity supplied is made to increase in connection with this. However, when it is predicted that the energy demand moves closer to a maximum supply capacity or exceeds the maximum supply capacity, implementation of demand response (hereinafter, the demand response event) of entrusting suppression of the energy demand or restricting energy usage to a user (generally also called a demand response) is carried out.

[0003] In order for the user to participate in the demand response event, in principle, the user needs to perform registration to the demand response program in advance. Generally, regarding the demand response program, one or more demand response programs are presented from one or more demand response program presenters. These demand response programs differ in the registration condition, respectively, and existence of these multiple demand response programs enable the users of a variety of energy demand modes to participate in the demand response event. The user participates in the demand response event by selecting and registering a program that conforms to its own energy demand mode from among the multiple demand response programs.

[0004] As a technology of selecting and registering a program that conforms to the user's demand mode from among multiple existing programs in this way, there is a method of Japanese Unexamined Patent Application Publication No. 2000-78747. In this publication, the method supports the user so that the user's own consumption condition may be satisfied and the user can perform an optimal selection with a cheap rate easily when the user selects a provider from among multiple electric power utilities freely and makes a contract.

Summary

[0005] In a scene of receiving a supply service of energy, a user adopts a measure of making cheapest an electricity rate that must be paid in order to secure required productivity, and this can be realized with a tech-

nology of the above-mentioned prior art literature 1. On the other hand, in a framework of the demand response, the user adopts a measure such that a bonus that is a consideration to suppressing consumption energy becomes a highest amount. However, since an increase of the bonus and a reduction of the productivity are in a strong correlation, it is desirable that the user maximizes the amount of bonus, without spoiling the user's own productivity excessively. Moreover, depending on a demand response program, a promised condition must be often applied at the time of registration to the program, and if an applied amount of energy suppression cannot be achieved by any chance, a penal regulation may be charged. Therefore, it is important to secure in advance that the amount of energy suppression that is assumed is realizable. However, in the framework of demand response, since a variety of demand response programs exist and each of the demand response programs differs in conditions, such as a bonus unit price, existence of penal regulations, a time zone of a demand response event, and a computation method of an amount of suppression energy, it is not easy to select a most suitable demand response program from among them. In addition, a judgment of the measure for realizing the amount of suppression energy that is assumed is not easy, either. Then, the object of the present invention is to, in a scene where the user selects one or more programs from among multiple existing demand response programs and registers them, make it possible to evaluate that the demand is an achievable condition and after that to extract and present a program most suitable to a desire of the user with a simple apparatus.

[0006] In order to achieve the above-mentioned object, in the present invention, registration to the demand response program by a user is supported in a scene where the user selects and registers a suitable program from among the multiple demand response programs by: estimating an amount of suppression energy of the user from the user's past demand history information based on a condition of each demand response program; further making a determination as to existence of both a demand response measure as a physical operation method of a load facility for satisfying an amount of estimation and a demand response measure as a contrived behavior that does not depend on a special function of an energy facility based on facility information that the user owns; in addition, improving certainty of energy suppression of the user by the demand response measure and by presenting an alternative means to the user; and after that, presenting the demand response program that can conform to desired conditions acquired from the user in advance. In this case, the desired conditions acquired from the user are a time zone in which participation in the demand response event is possible and a value obtained by quantifying an extent of energy that should be suppressed as compared with the demand at a normal period when the demand response event is not activated, and using these values is one mode of the present invention. Moreover,

the certainty of energy suppression means that multiple operation measures of a facility capable of realizing the amount of suppression energy that is targeted exist and the user accepts the measure. Others, i.e., a problem that the present application discloses and its solution means become clear by a column of the best mode for carrying out the invention and drawings.

[0007] According to the present invention, in a scene where the user selects one or more programs from among the existing multiple demand response programs and registers them, it becomes possible to evaluate that the demand is an achievable condition and after that to extract and present a program that is most suitable to the desire of the user.

Brief Description of the Drawings

[0008]

Fig. 1 is a diagram showing a scene in which a demand plan management system is applied.

Fig. 2 is a block diagram showing an entire configuration of the demand plan management system.

Fig. 3 is one example of an overall processing flow of the demand plan management system.

Fig. 4 is one example of a processing flow of a registration candidate program extraction part.

Fig. 5 is one example of an acquisition method of a user's desired preconditions when the demand plan management system is applied.

Fig. 6 is one example of a demand response program information table that a demand response program information storage means holds.

Fig. 7 is one example of a registration candidate program list that the registration candidate program extraction part outputs.

Fig. 8 is one example of a processing flow of a suppression electric power estimation part.

Fig. 9 is one example of a consumption electric power distribution in the processing of the suppression electric power estimation part.

Fig. 10 is one example of the consumption electric power distribution in the processing of the suppression electric power estimation part.

Fig. 11 is one example of a processing flow of a demand response measure generation part.

Fig. 12 is one example of a facility information table that a facility information storage means holds.

Fig. 13 is one example of facility information that the facility information storage means holds.

Fig. 14 is one example of the facility information table that the facility information storage means holds.

Fig. 15 is one example of an incident information table that an incident information storage means holds.

Fig. 16 is one example of information that a registration program selection indication part outputs.

Fig. 17 is one example of the information that the

registration program selection indication part outputs.

Detailed Description

[0009] Hereinafter, embodiments of the present invention will be described taking electric power as energy for example, with reference to drawings.

<Configuration example of embodiment>

[0010] Fig. 1 shows an embodiment (a demand plan management system) of the present invention. The demand plan management system has a demand plan management apparatus 1302, a demand response program management apparatus 1102, a user information management apparatus 1402, a demand information collection apparatus 1002, and a network 1001 that connects these apparatuses.

[0011] A service provider A 1101 and a service provider B 1201 own and manage the demand response program management apparatus 1102 for managing a demand response program. In order to select a suitable program from among the demand response programs that the service provider A 1101 and the service provider B 1201 make public, a user 1401 entrusts a processing to select the demand response program to the demand plan management apparatus 1302 that a service provider X 1301 owns and manages through the user information management apparatus 1402. Based on the registration condition of each program acquired from the demand response program management apparatus 1102 through the network 1001 and the information of the user 1401, such as demand history information, facility information, and the building information, that were acquired from the user information management apparatus 1402 through a network 1011, the user information management apparatus 1402 synthetically evaluates productivity, the amount of bonus, and executability, and subsequently presents a suitable demand response program to the user information management apparatus 1402. Here, the demand history information is time series data of the consumption electric power measured with arbitrary time intervals in the demand information collection apparatus 1002. Here, the demand information collection apparatus 1002 refers to an apparatus for measuring the amount of energy used (electric power, gas, water, heat quantity, etc.), such as a so-called smart meter. Moreover, a word "program" used in this embodiment is used as a term indicating a classification (a menu) of the demand response. That is, it is not a term that indicates a computer program.

[0012] Fig. 2 shows details of each apparatus. The demand plan management apparatus 1302 is an apparatus that evaluates the productivity, the amount of bonus, and effectiveness of the user, and extracts and presents the demand response program suitable for the user 1401 based on registration conditions of multiple demand re-

sponse programs and information of a demand history, a load facility, a building, etc. of the user. The demand response program management apparatus 1102 is an apparatus for managing the demand response program that holds the registration conditions, such as, a unit price of bonus of the demand response program, an activation time zone of a demand response event, a computation method of reference electric power, an amount of minimum suppression electric power required when being registered, existence of penal regulations and their system, and a facility condition that is required to hold information of the registration conditions when being in participation. The user information management apparatus 1402 is an apparatus for managing: the demand history information such that the user's consumption electric power is recorded in time series; the facility information of load facilities of an air conditioner, illumination, etc. that the user 1401 owns, of supply facilities of a storage battery, a power generator, etc. and of a facility for controlling these facilities, and the like; and the building information of a layout plan of rooms and a physical arrangement of facilities, an electric power system, a control system, etc. The demand information collection apparatus 1002 is an apparatus that generates and transmits the demand information by measuring the consumption electric power of the user 1401 with arbitrary time intervals and adding date and time information to it.

[0013] Next, hardware and a functional configuration of each apparatus will be explained. The demand plan management apparatus 1302 is an apparatus whose main purpose is to extract a program suitable as the demand response program that the user 1401 registers from the registration condition of the demand response program, and the demand history information, the facility information, and the building information of the user, and present it with the measure information for satisfying the conditions when the user 1401 makes registration. Explaining it as an example with a minimum configuration, it is an information processing device, such as a personal computer, a server computer, and a hand-held computer, that is comprised of a CPU 2301, input devices 2302 of a key board, a mouse, etc., output devices 2303 of a display, a printer, etc., a communication device 2304 of a wireless LAN, a cable LAN, etc., and a storage apparatus 2305 of memory, a hard disk drive, etc.

[0014] The storage apparatus 2305 stores at least the following computer programs. (1) A registration candidate program extraction program 2306 (a registration candidate program extraction part) for acquiring a conforming demand response program from the demand response program management apparatus 1102 based on desired preconditions, such as a time zone in which participation in the demand response is possible, existence of penal regulations, or whether a supply facility of the storage battery, the power generator, etc. is used or not. (2) A suppression electric power estimation program 2307 (a suppression electric power estimation part) for estimating amounts of the maximum consumption elec-

tric power expected for each demand response program, of the reference electric power, and of the suppression electric power that is their difference using the demand history information acquired from the user management apparatus 1402 based on the calculation system of the reference electric power described in the demand response program that the registration candidate program extraction part 2306 acquired and a condition of the demand response event time zone. (3) A demand response balance computation program 2308 (a demand response balance computation part) that computes a received amount of bonus that is expected from bonus unit price information of each demand response program, additionally computes also an expenditure that may arise from participating in the demand response event, and computes an amount of difference thereof as a demand response balance. (4) A demand response measure generation program 2309 (a demand response measure generation part) for generating a measure of an electric power facility operation at the time of demand response event activation and a measure as a contrived action not depending on the electric power facility from the estimate value of the maximum consumption electric power outputted by a suppression electric power estimation part 2307 based on the facility information and the building information that were acquired from the user information management apparatus 1402. (5) An incident information storage means 2312 for storing a factor of bringing about a phenomenon in which the consumption electric power largely exceeds the estimate value thereof at the time of the demand response event activation and an incident management program 2310 (an incident management part) for generating an alternative measure at the time of becoming so. (6) A registration program selection indication program 2311 (a registration program selection indication part) for extracting and presenting a suitable demand response program that the user 1401 should register based on an amount of demand response balance for each program computed by the demand response balance computation part 2308.

[0015] The demand response program management apparatus 1102 is an apparatus whose main purpose is to manage information of the demand response program, and is the same information processing device as the demand plan management apparatus in hardware.

[0016] A storage apparatus 2105 that the demand response program management apparatus has includes a demand response program information storage means 2106 for recording the registration conditions to the program, such as a unit price of bonus, the activation time zone of the demand response event, a computation method of the reference electric power, the amount of the minimum suppression electric power required when registering, existence of penal regulations and its system, and conditions of a facility that needs to be owned when participating for each demand response program, and a computer program 2107 (a demand response program management part) for managing the demand response

program for performing registration, search, update, and deletion on the storage means 2106.

[0017] The user information management apparatus 1402 is an apparatus whose main purpose is to present information of the user, such as the demand history information, the facility information, and the building information of the user, and is the same information processing device as the demand plan management apparatus in hardware.

[0018] A storage apparatus 2405 that the user information management apparatus has stores at least three databases and three computer programs. First, the storage apparatus 2405 has the followings as the databases: (1) a facility information storage means 2406 for holding the facility information, such as load facilities of air conditioners, illumination, etc., supply facilities of the storage battery, the power generator, etc., and control facilities for controlling these loads facilities and supply facilities; (2) a building information storage means 2408 for holding information related to a configuration of the whole building, such as a floor plan of rooms that the user manages, a physical arrangement of facilities in a room, electric power systems and control systems of the facilities, and further materials and a location of the building; and (3) a demand history information storage means 2410 for holding a value of the user's consumption electric power as time series data.

[0019] Next, as computer programs, (1) a facility information management program 2407 (a facility information management part) that performs registration, search, update, and deletion on the storage means 2406, (2) a building information management program 2409 (a building information management part) that performs registration, search, update, and deletion on the storage means 2408, and (3) a demand history management program 2411 (a demand history management part) that performs registration, search, update, and deletion on the storage means 2406 are provided.

[0020] The demand information collection apparatus 1002 is an apparatus whose main purpose is to measure the consumption electric power of the user and transmit demand information, and has a consumption electric power measurement part 2005 for measuring the consumption electric power of the user 1401 with arbitrary time intervals and a demand information transmission part 2006 for transmitting consumption electric power information measured by the measurement part 2005 with time and date added thereon to the user information management apparatus 1402. Although in this embodiment, an example where the user itself manages the user information management apparatus 1402 is shown, a service provider X 1301, a service provider A 1101, or a service provider B 1201 may perform operation management, or an electric power utility may perform the operation management, for example. Next, a general outline of a processing for acquiring the effect by the present invention will be explained using Fig. 3.

[0021] First, at step S301, based on information of the

desired preconditions to participation in the demand response event acquired from the user, for example, a time zone in which participation in an event is possible, existence of penal regulations, or whether the supply facilities of the storage battery, the power generator, etc. are used, a conforming demand response program is acquired from the demand response program information storage means 2106. The registration candidate program extraction part 2306 performs this processing. The demand response program information storage means 2106 that is a target of an acquisition processing at this time does not need to be limited to what a certain specific service provider manages. Next, at step S302, when the registration candidate program extraction part 2306 acquires the multiple demand response programs, one of them is selected, by using the demand history information of the user 1401 that is acquired from the demand history information storage means 2410 in parallel based on a computation method of the event activation time zone and the reference electric power of the selected demand response program, an estimate value of the maximum consumption electric power, an estimate value of the reference electric power, and an estimate value of the suppression electric power computed as their difference during activation of the demand response event are computed. The demand history information is, for example, information obtained by measuring the demand electric power represented with a unit of kW every 30 minutes with time and data information added and recorded thereon. The suppression electric power estimation part 2307 performs this processing.

[0022] After that, at step S303, the amount of bonus according to a bonus unit price of the demand response program is computed based on the estimate value of the suppression electric power computed at S302, further, expenditures that arise from participating in the demand response event, for example, an expenditure of a fuel charge for operating the power generator, are also computed, and a difference of the amount of bonus and an amount of expenditures is computed as the demand response balance. The demand response balance computation part 2308 performs this processing. Moreover, at step S304, based on the facility information of the user 1401 acquired from the facility information storage means 2406, operation measure information of a facility in which the estimate value of the peak consumption electric power computed at the S302 is set as a constraint upper limit, for example, a temperature setting range of an air conditioner, the number of air conditioners that can be activated, etc. and measure information regarding a behavior of the user, for example, specification of air conditioning outdoor unit on which chilled water is splashed and specification of windows kept open, etc. are generated. The demand response measure generation part 2309 performs this processing.

[0023] Incidentally, although it is considered in this embodiment that step S303 and step S304 have no dependency in a processing order and are put into a parallel

processing, they may be processed one by one sequentially.

[0024] The processings of the above-mentioned steps S302, S303, and S304 are performed repeatedly by the number of registration candidate programs extracted at step S301. After that, at step S305, phenomenon information that can hinder realization of electric power suppression that is a target and measure information for its countermeasure are generated. For example, to phenomenon information that it becomes extremely seriously intense hot in the demand response event activation day, measure information, including halting some businesses, making a day no-business day temporarily, etc. is generated as a measure for its countermeasure. The incident management part 2310 performs this processing.

[0025] Finally, at step S306, based on the amount of demand response balance computed at step S303, the demand response program suitable for the user 1401 is extracted, and is presented to the user 1401. Moreover, information of the amount of demand response balance computed at step S303, demand response measure information generated at step S304, and alternative measure information generated at step S305 are presented simultaneously with it. The above is an explanation of an outline of the whole processing of the present invention. As a utilization mode of the present invention, it completes by the user's decision making after information presentation to the user at step S306. For example, if the user made a decision that the user wished to alter a desired condition and perform the selection again, steps S301 to S306 will be repeatedly performed upon an input of desired condition information from the user after the alteration.

[0026] Below, details of a processing in each of processing parts that process step S301 to S306 will be explained.

[0027] Details of the processing of the registration candidate program extraction part 2306 will be explained using Fig. 4, Fig. 5, Fig. 6, and Fig. 7.

[0028] As explained in the processing of step S301, the registration candidate program extraction part 2306 is a processing part whose main purpose is to extract the demand response program of the registration candidate based on the desired preconditions acquired from the user.

[0029] First, at step S401, all the demand response programs that coincide with the conditions are acquired from the demand response program management apparatus 1102 by using the user's desired preconditions as keys. For example, when the user transmits the precondition information to the demand plan management apparatus 1302, an input transmission form as shown in Fig. 5 may be used. In an example of Fig. 5, as the user's desired conditions, a time zone in which participation in the demand response event possible is "13:00 to 16:00" (5001), penal regulation clause is "none" (5003), and a usable supply facility at the time of the demand response

event is "none" (5004). By the user pressing a "search" button (5005), a processing of step S401 is started. The demand response program information that becomes a search target is held in the demand response program information storage means 2106 as table data, for example, as shown in Fig. 6. Here, if based on the time zone (5001) in which participation is possible, the existence (5003) of the penal regulation clause, and the usable supply facility (5004), a line 6003, a line 6004, a line 6005, and a line 6007 will be acquired as the demand response program that coincides with the desire of the user 1401. Next, at step 402, a demand response program list of registration candidates also including a combination of demand response programs that can be registered simultaneously is created. For example, the demand response program of a program name "P03" of the line 6003 and the demand response program of the program name "P07" of the line 6007 have no possibility of event overlapping because the event time zones at a time of the activation of the demand response event are "13:00 to 14:00 (a start time to an end time)" and "14:00 to 15:00," respectively. Therefore, the demand response programs of the program names "P03" and "P07" are one of combinations of demand response programs that can be registered simultaneously. Similarly, it is also possible for the demand response program of the program name "P05" and the demand response program of the program name "P07" of the line 6005 to be simultaneously registered." Finally, combinations of six patterns of the demand response programs shown in Fig. 7 are extracted as registration candidate programs, which are stored in the memory as a registration candidate program list at step S403, and a processing in the registration candidate program extraction part is ended.

<One example of suppression electric power estimation processing>

[0030] Details of a processing of the suppression electric power estimation part 2307 will be explained using Fig. 8, Fig. 9, and Fig. 10.

[0031] Fig. 8 shows a processing flow. First, at step S801, one pair of combination whose processing in this processing part has not been done is extracted from the registration candidate program list stored in the memory at step S403. For example, the demand response program of the program name "P03" shown in a line 7001 is extracted from the registration candidate program list shown in Fig. 7. Next, at step S802, the calculation method of the reference electric power of the extracted demand response program is extracted. For example, from the line 6003 of Fig. 6, the computation method of the reference electric power of the demand response program "P03" is one that finds the maximum consumption electric power in a month. Subsequently, at step S803, a distribution of the reference electric power fbase is computed from the demand history stored in a demand history storage means 2401 based on the extracted calculation

method of the reference electric power. Next, at step S804, a demand response event period of the demand response program extracted at step S801 is extracted. For example, a start time and an end time of the demand response program "P03" are "13:00" and "14:00," respectively, from the line 6003 of Fig. 6. Therefore, "13:00 to 16:00" is extracted as the demand response event period. Subsequently, at step S805, all the demand history information corresponding to the demand response event period extracted at step S804 are acquired from a demand history information storage means 2410, and a consumption electric power distribution f_{normal} at a normal period during the demand response event period is computed based on the acquired information.

[0032] On the other hand, at step S806, all the demand history information of holidays are extracted from the demand history information storage means 2410 and a consumption electric power distribution f_{proMin} is computed. Moreover, at step S807, from all the demand history information stored in the demand history information storage means 2410, the demand histories in top 1% in descending order of numerical value are extracted and a consumption electric power distribution f_{proMax} is computed. Since S802, S804, S806, and S807 do not have a dependency at the time of processing start, it does not matter if a parallel processing is performed. Next, at step S810, parameters for computing the consumption electric power distribution at an arbitrary value of the productivity are estimated, considering the consumption electric power distribution f_{proMin} generated at S806 as a distribution when the productivity is zero, the consumption electric power distribution f_{proMax} generated at S807 as a distribution when the productivity is unity, and the consumption electric power distribution f_{normal} generated at S80 as a distribution when the productivity is 0.5. One example of this processing will be explained using Fig. 9. One examples of the consumption electric power distribution f_{proMax} computed at step S807, the consumption electric power distribution f_{normal} computed at step S805, and the consumption electric power distribution f_{proMin} computed at step S806 are shown in 9001, 9002, and 9003 in Fig. 9, respectively, with the consumption electric power on a transverse axis and the probability on a vertical axis. For example, 9001 shows results that at step S807, an average value and a standard deviation are computed to be 251 kW and 10.3, respectively, and the consumption electric power distribution f_{proMax} is computed in a normal distribution based on the average value and the standard deviation with the consumption electric power (kW) on a transverse axis. Similarly, at step S805 and step S806, it is computed that the average values are 186 kW and 23.3 kW, and the standard deviations are 34.6 and 0.588, respectively. An average value of 251 kW computed at step S807, an average value of 186 kW computed at step S805, and an average value of 23.3 kW computed at step S806 when the productivity is assumed to be unity, when the productivity is assumed to be 0.5, and when the productivity is assumed to be

zero, respectively, are plotted in a diagram with the productivity on a transverse axis and the average value on a vertical axis are shown in 9004. Fitting these three points with a binomial expression, a curve is calculated as " $y = -0.00194x^2 + 4.2171x + 23.269$ (Formula 1)" denoting the productivity as x and an average value of the consumption electric power as y .

[0033] Similarly, regarding the standard deviation, 9005 shows points plotted in a diagram with the productivity on a transverse axis and the standard deviation on a vertical deviation, and fitting these three points with a binomial expression, a curve is calculated as " $y = -0.00116x^2 + 1.2618x + 0.5883$ (Formula 2)" denoting the productivity as x and the standard deviation as y . The above is one example of the processing at step S810, in which parameters of the consumption electric power distribution at an arbitrary productivity are estimated from the consumption electric power distribution f_{proMax} , the consumption electric power distribution f_{normal} , and the consumption electric power distribution f_{proMin} that are computed at steps S807, S805, and S806, respectively. Next, at step S811, a presumed distribution of consumption electric power f_{cons} at a desired productivity of the user 1401 is computed from information on productivity at the time of demand response event that has been acquired in advance from the user as the desired precondition. For example, as shown in 5002 of Fig. 5, the user desires "slight suppression" as the productivity at the time of demand event activation. This is equivalent to a productivity of 30% when the productivity at the normal period is assumed to be 50% as shown also in 5002. Therefore, assuming the productivity x as 0.3 from the formula (Formula 1) of the average value of the consumption electric power to the productivity computed at step S810, 132 kW is computed as the average value of the consumption electric power. Similarly, a standard deviation of 28.0 is computed from a formula of standard deviation (Formula 2) to the productivity. Fig. 10 shows a result of the presumed distribution of the consumption electric power at a productivity of 30 % that is a desire of the user as a normal distribution based on the above-mentioned average value and standard deviation computed with the consumption electric power on a transverse axis and the probability on a vertical axis. Next, at step S813, a presumed distribution f_{reduct} of the suppression electric power is computed from the reference electric power distribution f_{base} computed at step S803 and the consumption electric power distribution f_{cons} computed at step S803. Specifically, for example, each probability of each of n reference electric powers of 0 (kW) to n (kW) is computed based on the reference electric power distribution f_{base} computed at step S803, and n -dimension discrete vector $b = [b(n), \dots, b(0)]$ is generated as an arrangement. Next, each probability of each of k consumption electric powers of 0 (kW) to k (kW) based on the consumption electric power distribution f_{cons} computed at step S811, and k -dimension discrete vector $p = [p(k), \dots, p(0)]^T$ is generated as an arrangement. Then, an inner product p

● b of the vector p and the vector b is calculated to compute a $k \times n$ matrix. This matrix is the suppression electric power distribution frequency. For example, a value of an element in the first column of the first row of this matrix means a probability that the suppression electric power that is a difference becomes $n-k$ (kW) in which the reference electric power becomes n (kW) and the consumption electric power becomes k (kW). Finally, at step S815, the expected value and standard deviation of the suppression electric power are computed from the computed suppression electric power distribution frequency. By the above processing, the suppression electric power in each demand response program at a productivity that the user desires is estimated.

[0034] Although in this embodiment, a normal distribution was used as the consumption electric power distribution, for example, another distribution that conforms to a data tendency of the demand information, such as a log normal distribution, may be used. Moreover, although also regarding the calculation method of the parameters of the distribution, the average value and the standard deviation were used by a simple computational operation based on the demand history in this embodiment, a statistical method, such as maximum likelihood estimation, may be used. Next, details of a processing of the demand response balance computation part 2308 will be explained. First, a receivable amount of bonus to participation in the demand response event is computed. For example, it may be all right that expected value information of the suppression electric power that was computed at step S815 and was recorded in the memory at step S816 is called and a value obtained by multiplying it by the bonus unit price of the demand response program is computed as the receivable amount of bonus. Moreover, for example, it may be all right that the suppression electric power distribution frequency expressed as a $k \times n$ matrix that was computed at step S813 and was stored in the memory at step S814 is called, the bonus unit price of the demand response program is multiplied to the suppression electric power computed for each element of the suppression electric power distribution frequency, and after that an expected value of the amount of bonus and its standard deviation are computed.

[0035] Next, an expenditure that may occur in order to participate in the demand response event is computed. For example, when the user 1401 owns a private power generator and makes it the desired condition to use the private power generator, a fuel charge for making the private power generator operate during the demand response event period is computed as an expenditure. Moreover, when using the storage battery, an electric usage fee for inputting predetermined electric energy into the storage battery is computed. A difference between the computed receivable amount of bonus and the amount of expenditures that can occur is computed as the amount of demand response balance.

[0036] Moreover, when penal regulation clause exists in the conditions of the demand response program, a

penalty that can occur may be computed. For example, in the case where a content of the penal regulation clause is a content that a penalty of 300 yen is paid each time the suppression electric power for each shot measured by setting 30 minutes to one shot at the time of the demand response event lowers by 5 (kW) to the suppression electric power that was applied in advance at the time of registration to the demand response program, a penalty when the suppression electric power decreases by multiple of 5 (kW) may be computed on the basis of the expected value of the suppression electric power computed at step S815.

<One example of demand response measure>

[0037] Using Fig. 11 and Fig. 12, details of a processing of the demand response measure generation part 2309 will be explained.

[0038] Fig. 11 shows one example of a processing of generating an operable range of an electric power load facility that the user 1401 owns as one of the demand response measures. First, at step S1101, an expected value of the consumption electric power distribution f_{proMin} at a productivity of zero computed at step S809 and an expected value of the consumption electric power computed at S812 are acquired from respective pieces of the memory, and a difference thereof is computed as a consumable electric power. For example, since an expected value of the consumption electric power distribution at a productivity of zero is 23.3 (kW) from 9003 of Fig. 9 and an expected value of the consumption electric power at a productivity of 0.3 is 132 (kW) from Fig. 10, a consumable electric power at a productivity of 0.3 is computed as 99.8 (kW). Next, at step S1102, an operation range of the electric power load facility that defines an electric power computed at step S1101 as a constraint condition is generated based on electric power load facility information of the user 1401 held in a facility storage means 2406. For example, Fig. 12 shows one example of the electric power load facility information of the user 1401 held in the facility storage means 2406. From Fig. 12, the user 1401 owns total 16 facilities of facility ID's "A001" to "A016" as air conditioning facilities, and a sum total of their consumption electric powers is 160 (kW). Moreover, as lighting facilities, it owns a total of 400 facilities of facility ID "L001" to "L400," and a sum total of their consumption electric powers is 40 (kW). When the consumable electric power of 99.8 (kW) computed at step S1101 as a specific example is considered as the constraint condition, facility operation range information, for example, that "the operable facilities are total nine air conditioning facilities and total 98 lighting facilities" is generated as the operation range of the electric power load facility of the user 1401. Moreover, as another measure, facility operation range information that "operable electric power load facilities are total five air conditioning facilities and total 400 lighting facilities" may be generated. Moreover, regarding facility operable range informa-

tion, all the operation ranges may be calculated and generated, or the processing may be ended at a stage where the number of generations reaches the number of cases decided in advance. Moreover, when the desired precondition about the operation range of a facility has been acquired in advance from the user, the condition may be added as a constraint condition. For example, when a desired precondition that "operable air conditioning facilities is six or more" has been acquired from the user in advance, taking the consumable electric power of 99.8 (kW) as an example, regarding the generated facility operable range information, information that "the operable electric power load facilities are total six air conditioning facilities and total 398 lighting facilities, and inoperable electric power load facilities are total 10 air conditioning facilities and total 100 lighting facilities" may be generated and information that "the operable electric power load facilities are total seven air conditioning facilities and total 298 lighting facilities, and the inoperable electric power load facilities are total nine air conditioning facilities and total 200 lighting facilities" may be generated. Moreover, the facility operable range information may be generated based on the priority of electric power supply set up in advance for each facility. For example, values of 1 to 5 are recorded in a column of the "priority" of an electric power load facility table shown in Fig. 12 in ascending order of the priority of the electric power supply. In this example, since the priority of the air conditioning facility of a facility ID "A004" shown in a line 1403 is "5," it is incorporated first as one of the operable power load facilities. Taking the consumable electric power of 99.8 (kW) as an example, incorporation of the facility ID "A004" as an operable electric power load facility makes a residual consumable electric power become 89.8 (kW). Subsequently, since a facility of a high priority next to this is the air conditioning facility of a facility ID "A003", the facility is incorporated as one of the operable electric power load facilities and the residual consumable electric power becomes 79.8 (kW). After this, similarly, the facility operation range information is generated by repeating the operation until an operable facility ceases from existence to the consumable electric power. Moreover, it may be all right that more concrete information on the user's behavior is generated as the demand response measure information and information on the building that the user 1401 owns is used as the facility information for generating the behavior information. As information about the building, one example is shown in Fig. 13 and Fig. 14. 1301 of Fig. 13 shows a floor plan of one floor in the building of the user 1401, for example, the user 1401 has attached names, such as a conference room A, a conference room B, and an office, to respective locations of the floor. On the other hand, 1302 of Fig. 13 shows one example for managing each location of the floor by a location ID, and Fig. 14 shows one example of managing this information as table information. For example, a location called the conference room A is represented by total nine pieces of ID information of six pieces of ID

information, location ID's "P101," "P102," "P103," "P201," "P202," and "P203," plus "P301," "P302," and "P303" from 1401, 1402, 1403, 1404, 1405, and 1406 of Fig. 14. However, for simplification of expression of the figure, representations of "P301," "P302," and "P303" are omitted in Fig. 14. Here, for example, suppose that it became clear for a lighting facility of a facility ID "L001" shown in 1204 of Fig. 12 to be unable to operate as a result of a processing of generating the facility operable range information. Since the facility ID "L001" is installed in the conference room A that has a location ID "P101" from 1401 of the location information table of Fig. 14, information that "a lighting facility "L001" installed in the location "P101" of the conference room A is cut off" is generated as the demand response measure information.

[0039] The above is one example of a concrete processing in the demand response measure generation part 2309. The demand response measure information generated finally by the generation part only needs to be an expression that people can understand easily, and therefore character information, image information, speech information, etc. will do.

<One example of incident and action means>

[0040] A concrete example of a processing in the incident management part 2310 will be explained using Fig. 15. Fig. 15 shows one example of information currently held in an incident information storage means 2312, and 1501 among them shows one example of incident information that is factor information that can hinder realization of the amount of suppression electric power estimated in the suppression electric power estimation part 2307.

[0041] For example, a line 1504 records the followings as one piece of the incident information: as one of direct factors that may hinder realization of the amount of suppression electric power, there is a factor that the reference electric power calculated in a day when the demand response event actually activates become less than the reference electric power estimated in the suppression electric power estimation part 2307; and furthermore, as one of indirect factors of the direct factor, there is a factor that the maximum value in a month of the event activation month by the computation method of the reference electric power becomes less than an estimate value estimated by the suppression electric power estimation part 2307. On the other hand, 1502 of Fig. 15 shows one example of action measure information to a sudden phenomenon that is other than targets of the generated information in the demand response measure generation part 2309. For example, on the line 1505, as one of the countermeasures to a certain event, an action measure that before a time when the demand response event is activated, a room temperature inside a room is kept in a state lower than at the normal period using the air conditioning facility is recorded. The incident information of

1501 and the action measure information of 1502 are associated with each other by a countermeasure ID, for example, a countermeasure to a phenomenon ID "I01" of the line 1504 described above is related to a countermeasure of a countermeasure ID "CP04." Moreover, the incident information has a dependency according to the user's category of business, a building scale, etc., and this is shown in a user classification incident information table shown in 1503 of Fig. 15 as one example. For example, a line 1506 means that there are phenomenon ID's "I01" and "I02" as incidents that may occur to the user of a different classification of office work as a classification. Using user classification information acquired from the demand in advance as a key, a phenomenon ID of an incident that may occur to the user 1401 is extracted from information of 1503. Based on the phenomenon ID, the incident information is extracted from 1501, and the action measure information is further extracted from 1502. The user classification information may be simultaneously acquired when acquiring the user's desired preconditions, or may be acquired in advance in paper.

[0042] Moreover, in the combination of two or more registration candidate programs, although there is a case where the action measure to the incident of one registration candidate program may bring about an incident of the other program, at this time, the incident and action measure to the program in which a penal regulation code is provided are presented preferentially. In the case where none of the programs has the penal regulation code, the incident and action measure to a program whose amount of balance is larger are presented preferentially. For example, although in the demand response program list of Fig. 6, "P08" of 6003 and the "P03" of 6008 overlap each other in a start time and in an end time, there is no overlap in a computation range of the suppression electric power because of a computation method of the suppression electric power; therefore, the two programs become registration candidate programs that can be registered simultaneously. Here, for example, when the phenomenon ID "I01" described in 1501 of Fig. 15 is extracted as an incident of "P03," the countermeasure ID "CP04" is extracted as its countermeasure, and this will make the suppression electric power of the program "P08" decrease as a result. In this case, since in final balances of the both programs, the "P03" is calculated to be larger, the above-described incident corresponding to the "P03" and its countermeasure are presented preferentially, and then the incident corresponding to the "P08" and its countermeasure are presented.

<One example of information presented to user>

[0043] One example of information generated in a registration program selection indication part 2311 will be explained using Fig. 16 and Fig. 17.

[0044] First, Fig. 16 shows one example of a screen at the time of being presented to the user, and 1601 in

Fig. 16 shows combinations of the registration candidate programs in descending order of the positive amount of balance based on the amount of demand response balance computed for each combination of the registration candidate programs in the demand response balance computation part 2308. For example, 1602 shows that as a result of a processing of the demand response balance computation part 2308, the demand response program that makes the amount of balance of the demand response highest is "P04," and its amount of balance is 81,000 yen. Moreover, it also shows that as a condition for receiving the amount of balance, the consumption electric power needs to be adjusted so that the consumption electric power at the time of the demand response event may become 132 (kW) and the reference electric power may become 186 (kW). A next combination of the registration candidate programs in descending order of the positive amount of balance is a combination of the demand response programs of "P05" and "P07" shown in 1603, and similarly with what was mentioned above, the screen shows the amount of balance, the consumption electric power that needs to be adjusted for it, and the reference electric power.

[0045] Next, Fig. 17 shows one example of information presented to the user as details of each demand response program. In this example, 1701 shows a computation basis of the amount of demand response balance computed in the demand response balance computation part 2308, 1702 shows a computation basis of the suppression electric power computed in the suppression electric power estimation part 2307, 1711 shows the demand response measure information generated in the demand response measure generation part, and 1712 shows incident action measure information extracted in the incident management part 2310. Moreover, 1704 shows an index value of the productivity among the desired preconditions that were acquired in advance from the user shown in 5002 of Fig. 5, and 1703 shows a meaning of the index value shown in 1704. For example, in this embodiment, the user desires the productivity at the time of the demand response event to be "slight suppression (30%)" from 5002 of Fig. 5, and this shows an index value, as shown by 1703, when a productivity of a non-business day is assumed to be 0%, a productivity in a day when the consumption electric power is especially large is assumed to be 100%, and a productivity at the normal period in the demand response event time zone that is a condition of the demand response program is assumed is 50%. Moreover, 1710 shows a computation basis of the suppression electric power as an image diagram, 1705 shows an estimate value of the reference electric power computed in the suppression electric power estimation part 2307, 1706 shows an estimate value of the consumption electric power computed similarly in the suppression electric power estimation part 2307, and 1707 shows an estimate value of the suppression electric power computed in the suppression electric power estimation part 2307 as their difference, respectively. More-

over, 1708 shows the expected value of the consumption electric power distribution at the normal period fnormal computed in the suppression electric power estimation part 2307, and 1709 shows a standard deviation of the fnormal. Detailed information of the demand response program that takes Fig. 17 explained in the above as an example is generated for every combination of the registration candidate programs. Moreover, 1604 of Fig. 16 shows the demand response program that it is desirable for the user 1401 to register and that does not however apply to the user's desired preconditions acquired in advance. For example, in 1604, a demand response program of "P02" is presented as the demand response program that it is desirable for the user 1401 to register. From 6001 of Fig. 6, since in a program of "P0," the penal regulation clause "exists," in a processing in the registration candidate program extraction part 2306, it is not recorded on the registration candidate program list. However, since there is a private power generator among owned facilities of the user 1401 from a line 1205 of Fig. 12 and a participation condition of "P02" designates "owning of private power generator" from 6001 of Fig. 6, it may be presented as the demand response program that it is desirable for the user 1401 to register.

[0046] The above processing enables the user to grasp the demand response program that the user itself should register and to judge whether the demand response behavior is achievable from information of the demand response program that should be registered, shown in Fig. 16 as one example, computation reason information of the suppression electric power, shown in Fig. 17 as one example, and information of a measure in order to achieve the suppression electric power and of a measure when contingency occurs, and therefore it becomes possible to make a decision as to whether registration to the demand response program is to be performed. As described above, the embodiment of the present invention was explained concretely, but the present invention is not limited to this and can be variously modified within a range that does not deviate from its gist. For example, although in the above-mentioned embodiment, the user's desired preconditions were acquired at the time of an operation start of the present invention, a case where there are no desired conditions may be all right. In that case, all the demand response programs become registration candidate programs, and subsequent processings are performed. Moreover, although in the above-mentioned embodiment, as an acquisition method of the desired preconditions, it was assumed that it was done through a network, the present invention is not limited to this; for example, acquisition through paper may be all right. Moreover, regarding its acquisition term, information more detailed than the information of this embodiment may be acquired. Moreover, although in the above-mentioned embodiment, in order to acquire the demand response program, it was assumed that the demand plan management apparatus acquired it each time from the demand response program management apparatus, it

causes no trouble that the demand plan management apparatus has acquired it in advance, and in that case, a timing of acquisition can be asynchronous. Moreover, although in the above-mentioned embodiment, when generating the operation range of the facility, the number of operable sets is computed based on specification information of the rated consumption electric power, a concept of the facility operation range is not limited to this. For example, a range of preset temperature of an air conditioner may be generated based on a heat load simulation, and the number of necessary lighting facilities in operation and an illuminance adjustment value of the lighting facility may be generated based on an illuminance simulation. Moreover, information in time series may be generated, for example, an alteration timing of the preset temperature of the air conditioner etc. may be generated. Moreover, although in the above-mentioned embodiment, when generating the demand response measure information, it was assumed that the operation range of the electric power facility that the user managed was generated, the present invention is not limited to this, for example, operation ranges of multiple buildings that the user manages and operation ranges of multiple users that the user manages may be objects to be generated. Moreover, although in the above-mentioned embodiment, it was assumed that the incident information was being held in advance as fixed information, the present invention is not limited to this, for example, the incident information acquired from other users by a questionnaire etc. and its countermeasure information may be kept accumulated. Moreover, although in the above-mentioned embodiment, regarding information to be presented to the user in 1712 of Fig. 17, the example in which all the countermeasures acquired from 1501 and 1502 of Fig. 15 based on a user classification of the user 1401 were presented was shown, it is not necessarily needed to present all the countermeasures. For example, if it is understood that a future atmospheric temperature variation has a downward trend from a weather forecast, a possibility of occurrence of the incident of the phenomenon ID "I02" of 1501 of Fig. 15 is also low, and therefore countermeasures of the countermeasure ID's "CP01" and "CP02" do not need to be presented to the user. Moreover, in the above-mentioned embodiment, when presenting the user the demand response program that should be registered, only a largeness/smallness of the amount of balance at the time of participating in the demand response event was considered as a condition. However, the present invention is not limited to this, for example, it does not matter that the demand response programs are in descending order of the number of the generated demand response measures. Moreover, the demand response program that should be registered may be presented after considering a balance so that registration may not lean to a specific demand response program by referring to a registration situation to the demand response program of another user. Moreover, in an actual operation, a single provider may operate and

manage the demand plan management apparatus and the demand response program management apparatus. For example, such an operation as follows is also acceptable: an electric power utility or a third party public institution operates and manages these apparatuses, a third party service provider performs generation of the demand response program, and the service provider entrusts registration of the provider's own demand response program to a provider that operates and manages the demand response program management apparatus. Moreover, although in the above-mentioned embodiment, the explanation was given taking electric power as energy for example, the present invention is not limited to this and may be also applied to measurable energies, such as gas, water, and heat.

[0047] According to this embodiment, by extracting and presenting the demand response program that it is desirable for the user to register after evaluating realistic electric power suppression of the user at the time of the demand response event, it is made possible to support decision making of the user with a simple apparatus. For example, as one example thereof, the decision making for the registration to the demand response program of the user can be supported by estimating the suppression electric power at an arbitrary productivity and the amount of balance brought about by participation in the demand response event using the user's past electric power consumption history based on a condition different in each demand response program, and presenting an action measure in contingency from the user-owned facility information in addition to a measure of realizing the suppression electric power.

Claims

1. A demand plan management system that comprises a demand plan management apparatus (1302), a demand response program management apparatus (1102), a user information management apparatus (1402), and a demand information collection apparatus (1002), and extracts a specific demand response program from a plurality of demand response programs and presents it to a user (1401), wherein the demand response program management apparatus (1102) comprises a demand response program information storage part for holding specification information and registration condition information of the demand response program for each demand response program that is required to be registered in order for the user (1401) to participate in a demand response event, wherein the user information management apparatus (1402) comprises a facility information storage part for holding specification information of an energy facility and a housing facility of the user (1401), wherein the demand information collection apparatus (1002) comprises a storage part for holding con-

sumption energy of the user (1401) measured with arbitrary time intervals as time series data, and wherein the demand plan management apparatus (1302) comprises a demand response program information management processing part that estimates a realizable amount of suppression energy as the user (1401), from information of the demand response program information storage part, of the demand history storage part, and of the facility information storage part, and generates demand response measure information that the user (1401) performs in order to realize the amount of suppression energy, and a transmission part for transmitting the generated demand response measure information to the user (1401).

2. The demand plan management system according to claim 1, wherein the demand plan management apparatus (1302) includes:

a storage part for recording a phenomenon that can occur at the time of the demand response event and hinders achievement of a demand response, its factor, and its action measure information; and

a processing part for estimating the hindrance phenomenon that can occur to the user (1401) and its factor based on incident information and generating its action measure.

3. The demand plan management system according to claim 1 or claim 2, wherein the demand plan management apparatus (1302) comprises a processing part for, when registration to two or more demand response programs is assumed, and further when it is judged that a countermeasure generated to an incident belonging to one demand response program among them causes an incident belonging to the other demand response program to occur, generating and presenting preferentially an incident to the demand response program having a higher priority and its countermeasure based on a criterion set up in advance.
4. The demand plan management system according to any one of claim 1 to claim 3, wherein the demand plan management apparatus (1302) comprises a processing part that refers to the demand response program information storage part, refers to a demand history storage part based on a computation method of reference energy that acts as a reference at the time of suppression energy computation defined for each demand response program, and estimates the reference energy for each demand response program.
5. The demand plan management system according to

any one of claim 1 to claim 4,
 wherein the demand plan management apparatus
 (1302) comprises a processing part that refers to a
 demand response program information storage
 means, extracts the demand response program that
 coincides with a desired precondition to the user's
 participation in the demand response event, and
 generates a combination of demand response pro-
 grams that can be registered simultaneously from
 the extracted demand response program.

6. The demand plan management system according to
 any one of claim 1 to claim 5,
 wherein the demand plan management apparatus
 (1302) comprises a processing part that refers to a
 demand information storage means based on esti-
 mated consumption energy, and generates an op-
 erable range of a facility and its operation schedule.
7. The demand plan management system according to
 any one of claim 1 to claim 6,
 wherein the demand plan management apparatus
 (1302) comprises a processing part for computing
 an amount of bonus that arises from participating in
 the demand response event from estimated sup-
 pression energy, an amount of expenditures that can
 arise from participating in the demand event, and an
 amount of balance that is a difference thereof.
8. The demand plan management system according to
 claim 1,
 wherein the demand plan management apparatus
 (1302) comprises a processing part that refers to an
 incident information storage means, specifies a phe-
 nomenon hindering a demand response that may
 occur to the user (1401) based on a user classifica-
 tion of the user (1401), and extracts its action meas-
 ure information.
9. A demand plan management method of extracting
 a specific demand response program from a plurality
 of demand response programs and presenting it to
 a user (1401), comprising:
 - estimating a realizable amount of suppression
 energy as the user (1401) from facility informa-
 tion that holds specification information of an en-
 ergy facility and a housing facility of the user
 (1401), consumption energy information of the
 user (1401) measured with arbitrary time inter-
 vals, and specification information and registra-
 tion condition information of the demand re-
 sponse program;
 - generating demand response measure informa-
 tion that the user (1401) performs in order to
 realize the amount of suppression energy, and
 transmitting the generated demand response
 measure information to the user (1401).

IMAGE OF EMBODIMENT

FIG. 1

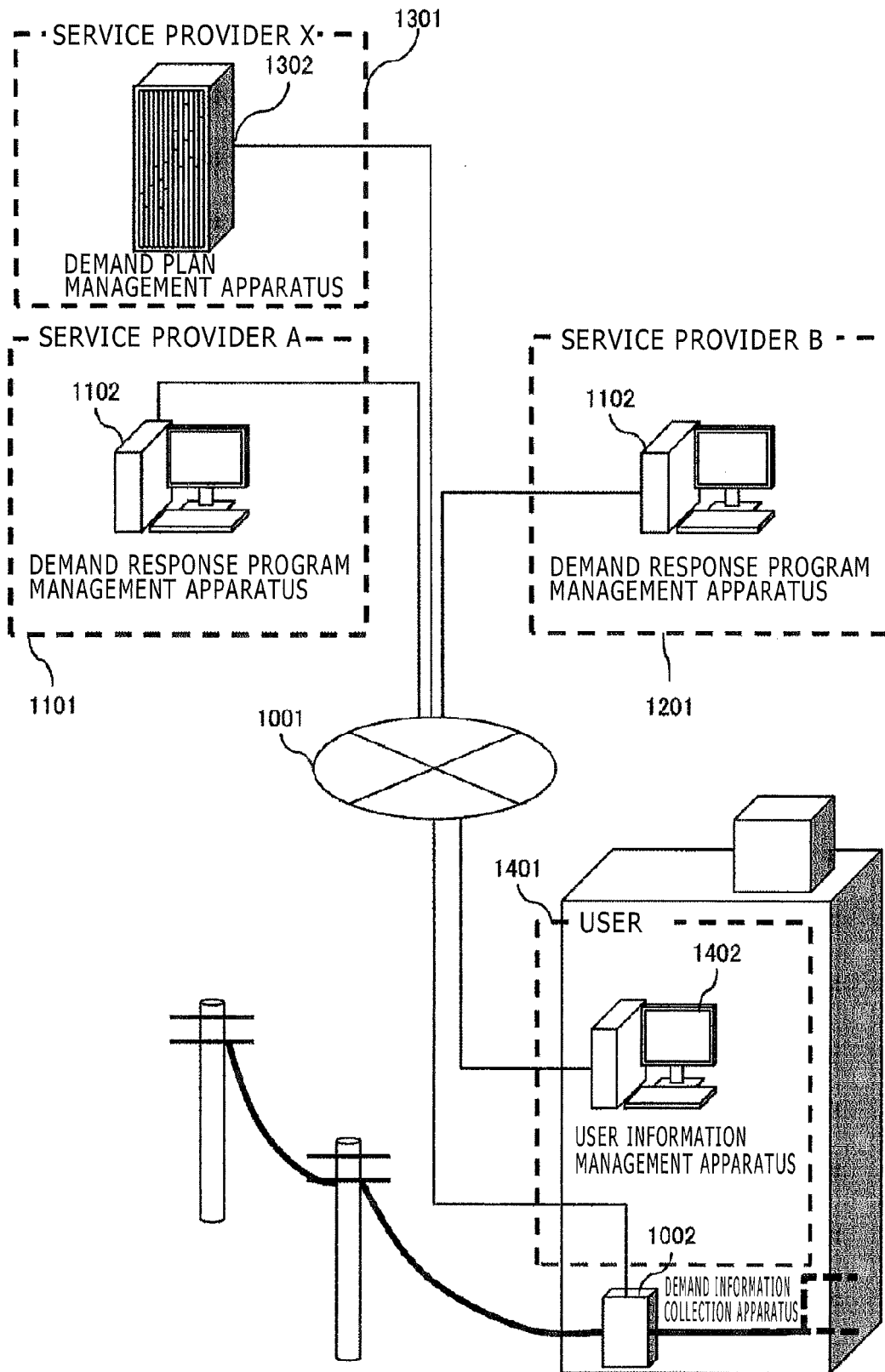


FIG. 2

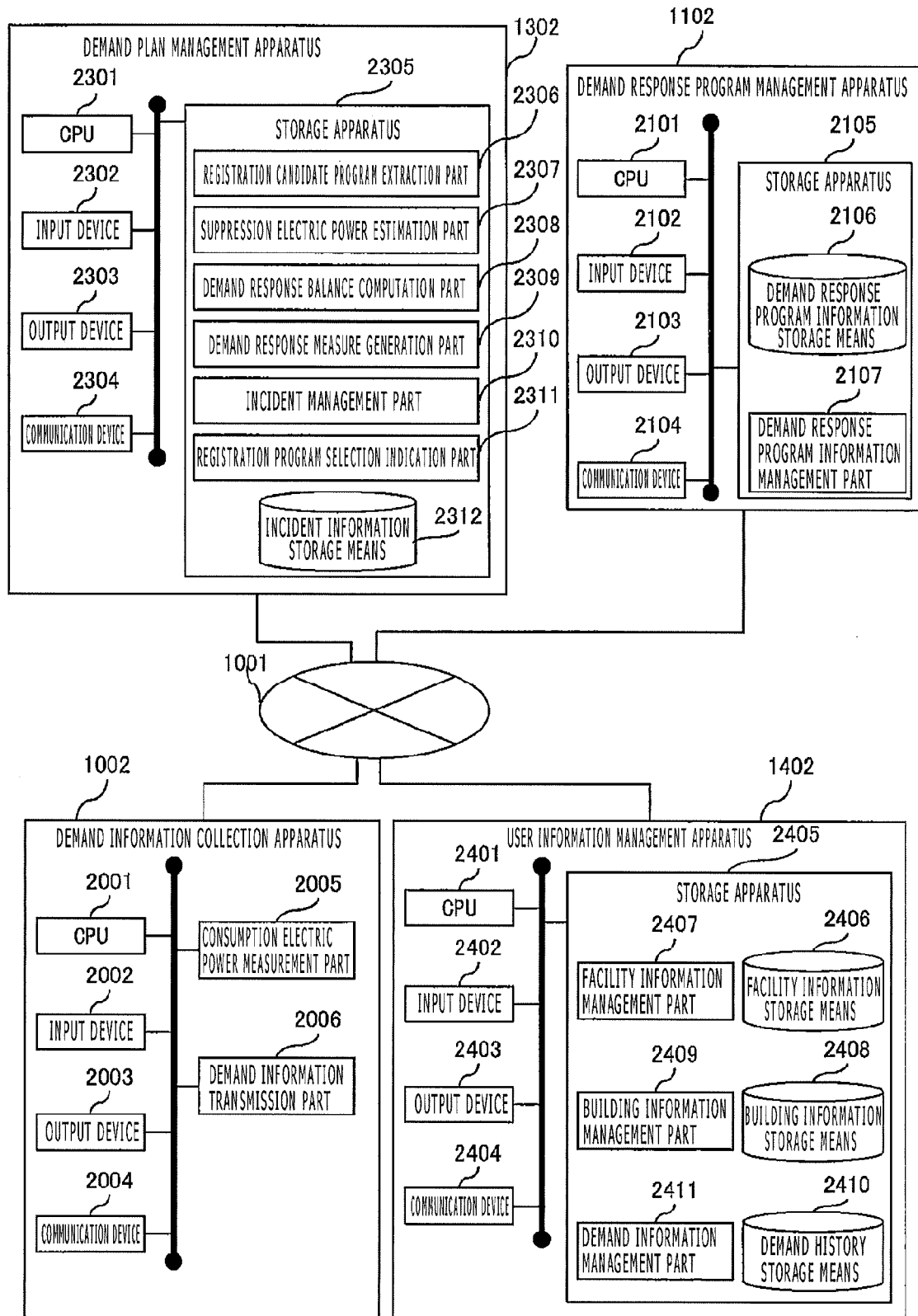


FIG. 3

OVERALL PROCESSING FLOW

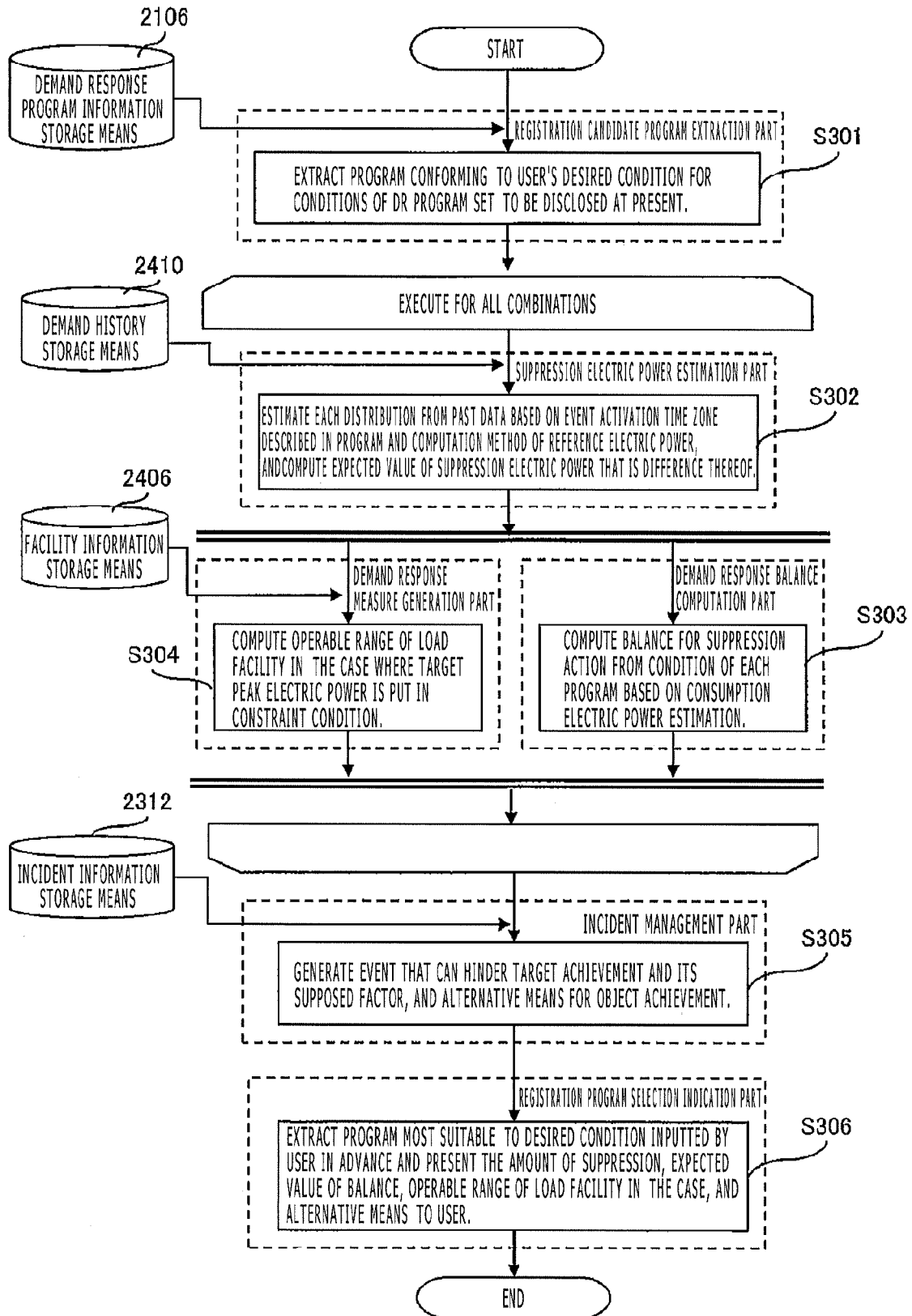


FIG. 4

REGISTRATION CANDIDATE PROGRAM EXTRACTION PROCESSING FLOW

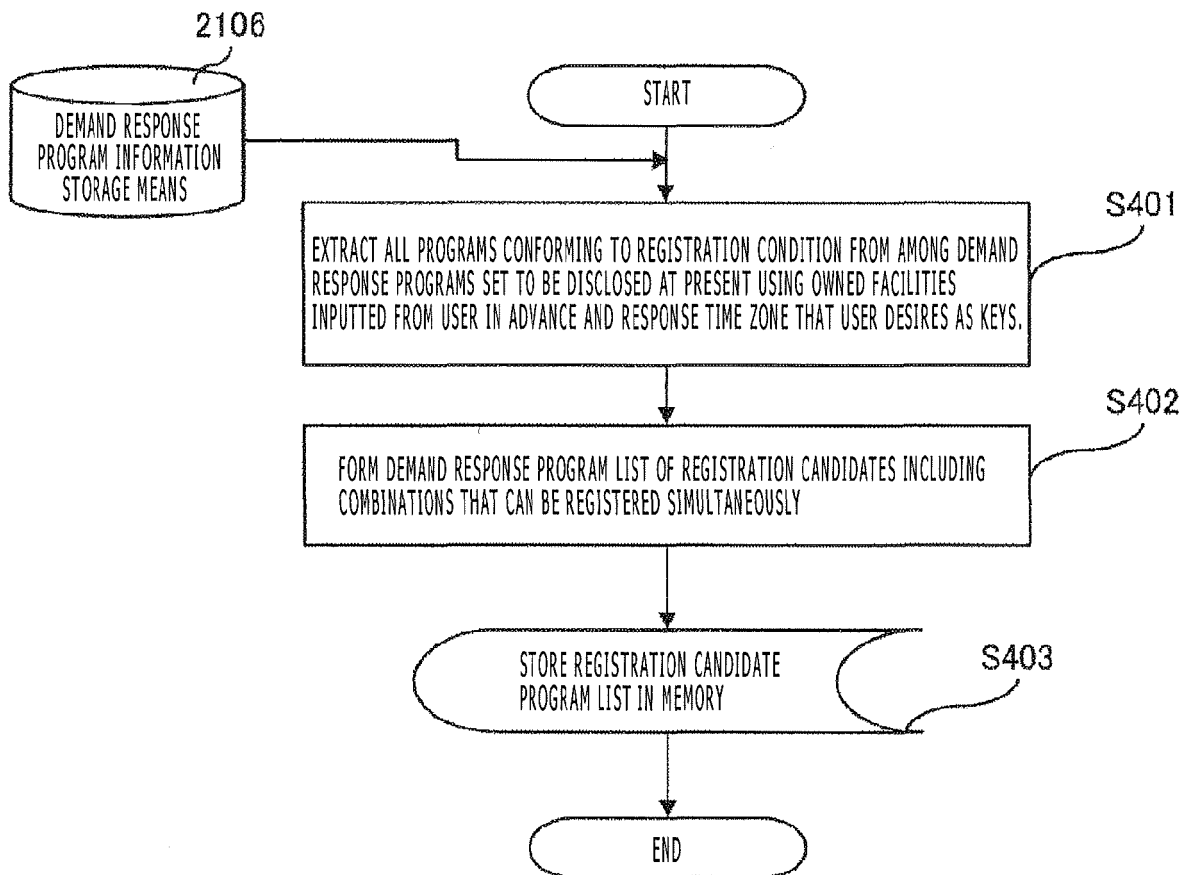


FIG. 5

DESIRED CONDITION

TIME ZONE IN WHICH EVENT PARTICIPATION IS POSSIBLE

PRODUCTIVITY AT EVENT ACTIVATION

EXISTENCE OF PENAL REGULATION

USABLE SUPPLY FACILITY

5001

5002

13:00 ~ 16:00

☐ AS USUAL (50%) ☒ SLIGHT SUPPRESSION (30%) ☐ MAXIMUM SUPPRESSION (0%)

☐ EXISTENCE ☒ NON-EXISTENCE ☐ EITHER WILL DO

5003

FACILITY NAME	RATED OUTPUT	SUPPLIABLE TIME

5004

ADD ONE LINE

5005

SEARCH

FIG. 6

DEMAND RESPONSE PROGRAM LIST

	PROGRAM NAME	START TIME	END TIME	BONUS UNIT PRICE	REFERENCE ELECTRIC POWER COMPUTATION METHOD	SUPPRESSION ELECTRIC POWER COMPUTATION METHOD	PARTICIPATION CONDITIONS	PENAL REGULATIONS
6001	P01	13:00	16:00	2,000 YEN /kW·hr	MAXIMUM VALUE IN EVENT ACTIVATION MONTH	REFERENCE ELECTRIC POWER-MAXIMUM CONSUMPTION ELECTRIC POWER IN EVENT TIME ZONE	MINIMUM AMOUNT OF SUPPRESSION 10kW	EXISTENCE
6002	P02	11:00	17:00	3,000 YEN /kW·hr	AVERAGE OVER MOST RESENT FIVE BUSINESS DAYS OF EVENT ACTIVATION DAY	REFERENCE ELECTRIC POWER-MAXIMUM CONSUMPTION ELECTRIC POWER IN EVENT TIME ZONE	PRIVATE POWER GENERATOR OWNED	EXISTENCE
6003	P03	13:00	14:00	300 YEN /kW·hr	MAXIMUM VALUE IN EVENT ACTIVATION MONTH	REFERENCE ELECTRIC POWER-MAXIMUM CONSUMPTION ELECTRIC POWER IN EVENT TIME ZONE	NON-EXISTENCE	NON-EXISTENCE
6004	P04	13:00	16:00	500 YEN /kW·hr	AVERAGE OVER MOST RESENT FIVE BUSINESS DAYS OF EVENT ACTIVATION DAY	REFERENCE ELECTRIC POWER-MAXIMUM CONSUMPTION ELECTRIC POWER IN EVENT TIME ZONE	NON-EXISTENCE	NON-EXISTENCE
6005	P05	13:00	14:00	700 YEN /kW·hr	AVERAGE OVER MOST RESENT FIVE BUSINESS DAYS OF EVENT ACTIVATION DAY	REFERENCE ELECTRIC POWER-MAXIMUM CONSUMPTION ELECTRIC POWER IN EVENT TIME ZONE	NON-EXISTENCE	NON-EXISTENCE
6006	P06	11:00	17:00	1,500 YEN /kW·hr	MAXIMUM VALUE IN EVENT ACTIVATION MONTH	REFERENCE ELECTRIC POWER-MAXIMUM CONSUMPTION ELECTRIC POWER IN EVENT TIME ZONE	NON-EXISTENCE	NON-EXISTENCE
6007	P07	14:00	15:00	300 YEN /kW·hr	AVERAGE OVER MOST RESENT THREE BUSINESS DAYS OF EVENT ACTIVATION DAY	REFERENCE ELECTRIC POWER-MAXIMUM CONSUMPTION ELECTRIC POWER IN EVENT TIME ZONE	NON-EXISTENCE	NON-EXISTENCE
6008	P08	7/1 00:00	9/30 00:00	200 YEN /kW-MONTH	MAXIMUM VALUE IN EVENT ACTIVATION MONTH	REFERENCE ELECTRIC POWER-MAXIMUM CONSUMPTION ELECTRIC POWER IN EVENT TIME ZONE	NON-EXISTENCE	NON-EXISTENCE

FIG. 7

7001	CANDIDATE ID	PROGRAM NAME 1	PROGRAM NAME 2	PROGRAM NAME 3
	1	P03	—	—
	2	P04	—	—
	3	P05	—	—
	4	P07	—	—
	5	P03	P07	—
	6	P05	P07	—

FIG. 8

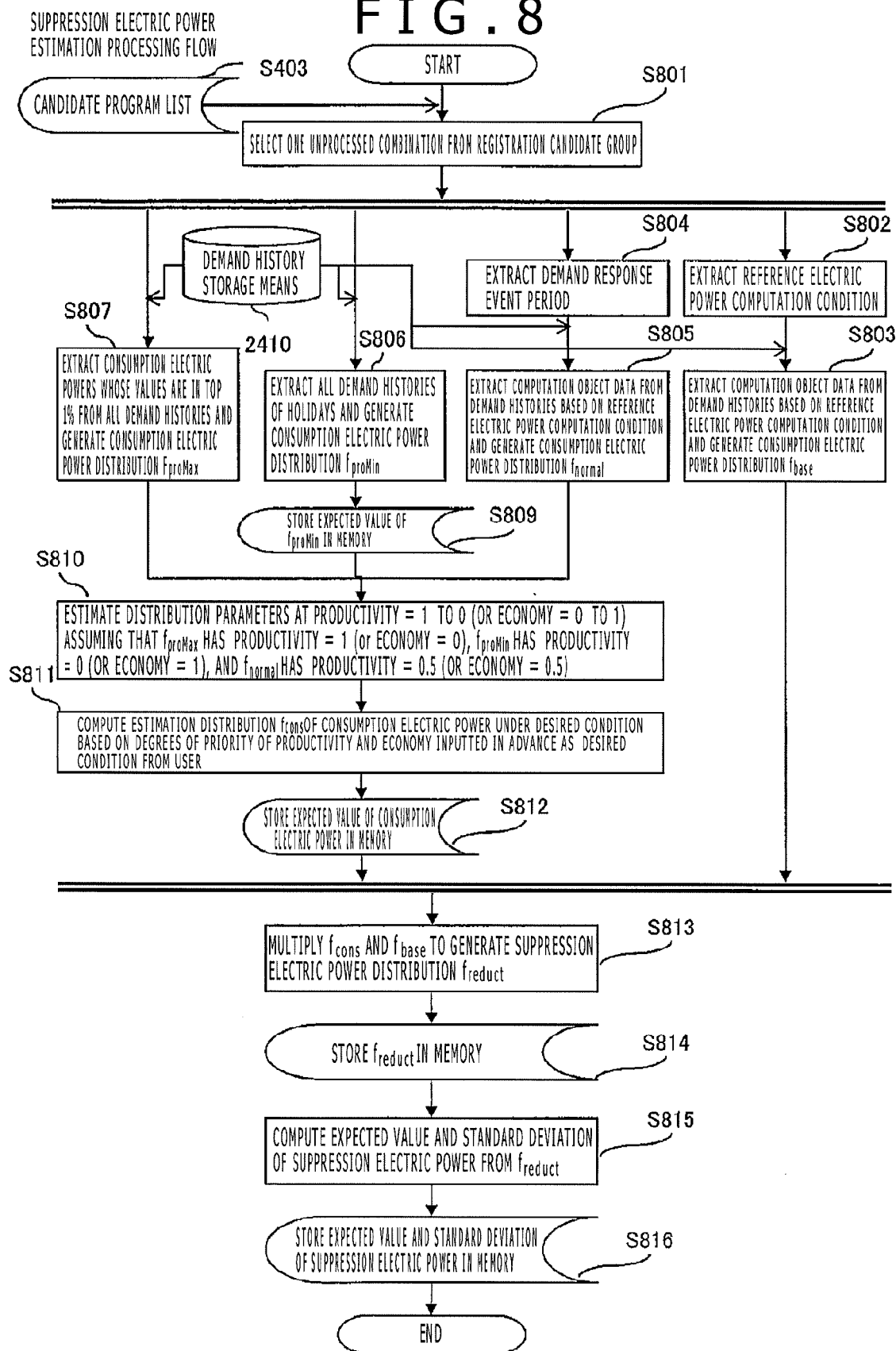


FIG. 9

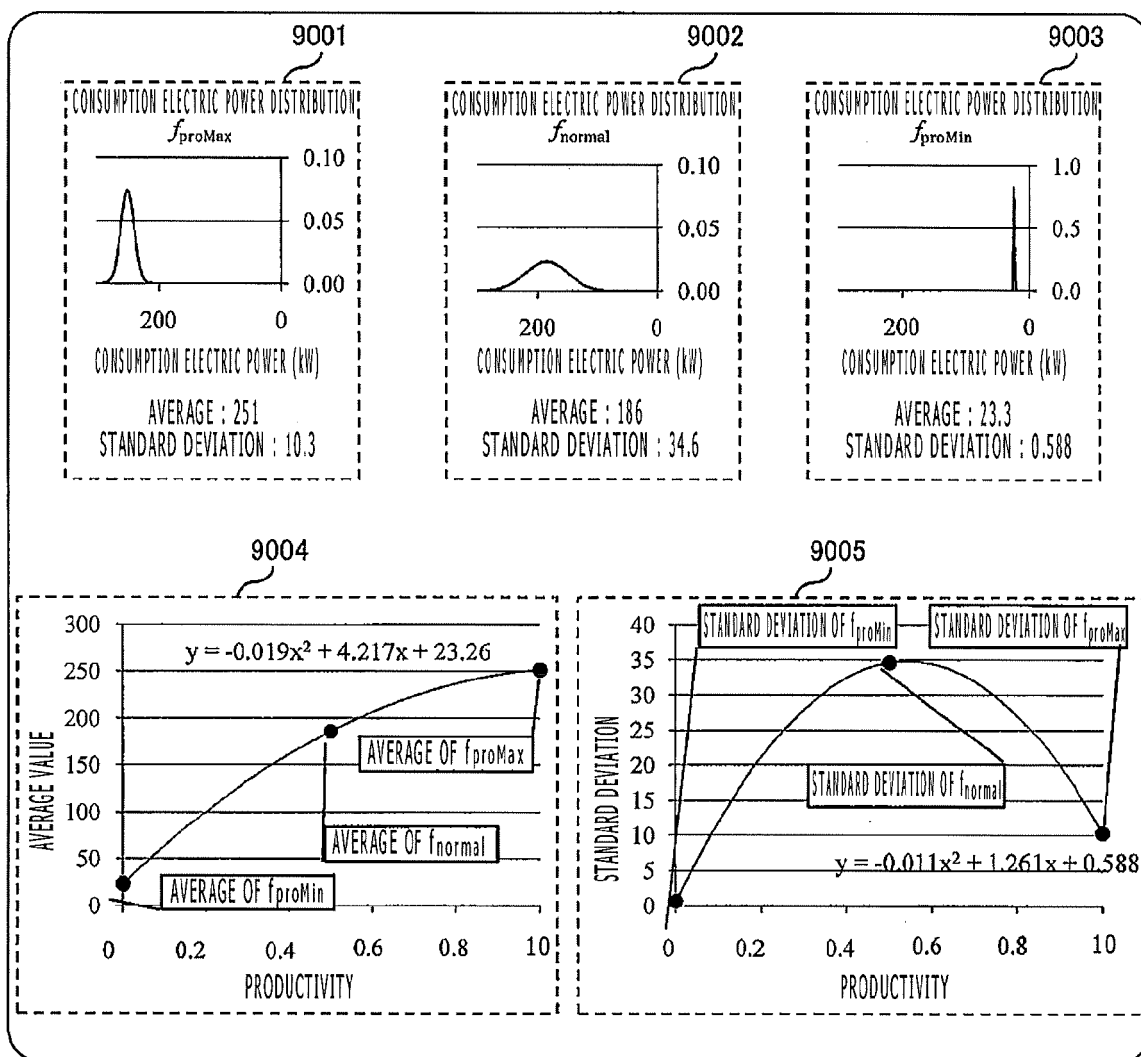


FIG. 10

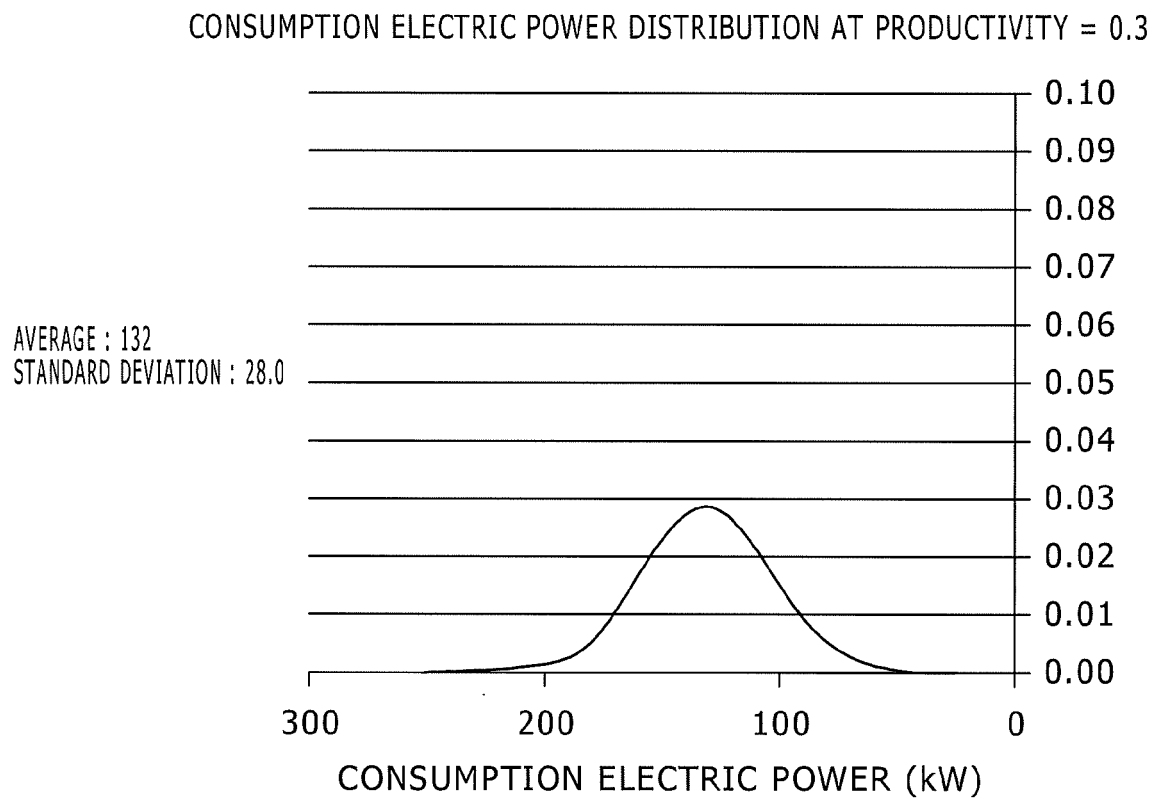


FIG. 11

【FACILITY OPERATION RANGE ESTIMATION FLOW】

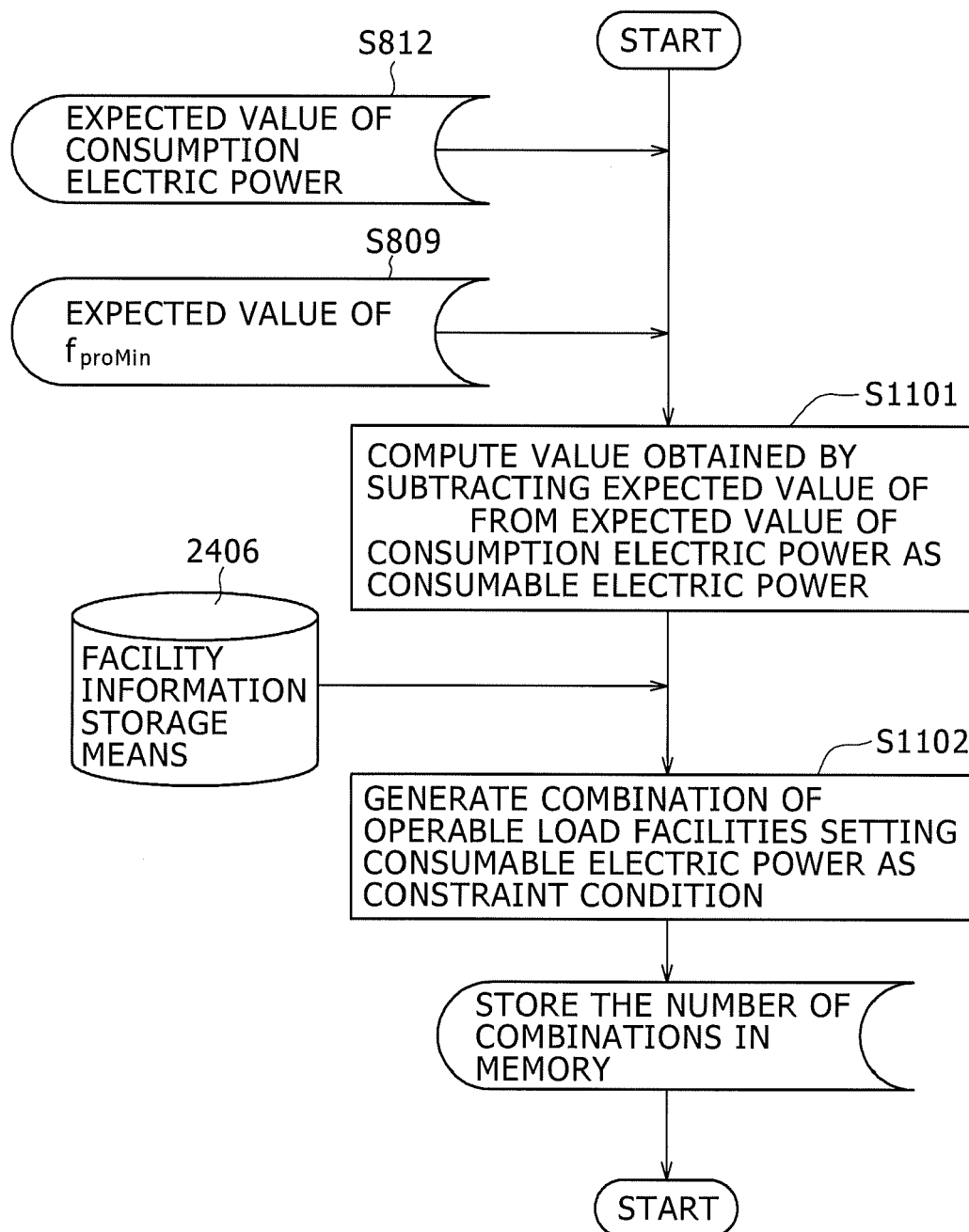


FIG. 12

ELECTRIC POWER FACILITY TABLE

	FACILITY ID	FACILITY NAME	RATED CONSUMPTION ELECTRIC POWER	RATED OUTPUT ELECTRIC POWER	CAPABILITY OF REMOTE CONTROL	PRIORITY
1201	A001	AIR CONDITIONING	10,000W	—	TRUE	3
1202	A002	AIR CONDITIONING	10,000W	—	TRUE	3
1203	A003	AIR CONDITIONING	10,000W	—	FALSE	4
	A004	AIR CONDITIONING	10,000W	—	FALSE	5
	A005	AIR CONDITIONING	10,000W	—	TRUE	3
	A006	AIR CONDITIONING	10,000W	—	TRUE	3

	A016	AIR CONDITIONING	10,000W	—	FALSE	3
1204	L001	ILLUMINATION	100W	—	TRUE	1
	L002	ILLUMINATION	100W	—	TRUE	1
	L003	ILLUMINATION	100W	—	TRUE	1

	L400	ILLUMINATION	100W	—	TRUE	3
1205	G01	POWER GENERATOR	—	100kW	TRUE	—
	B01	STORAGE BATTERY	—	10kVA	TRUE	—

FIG. 13

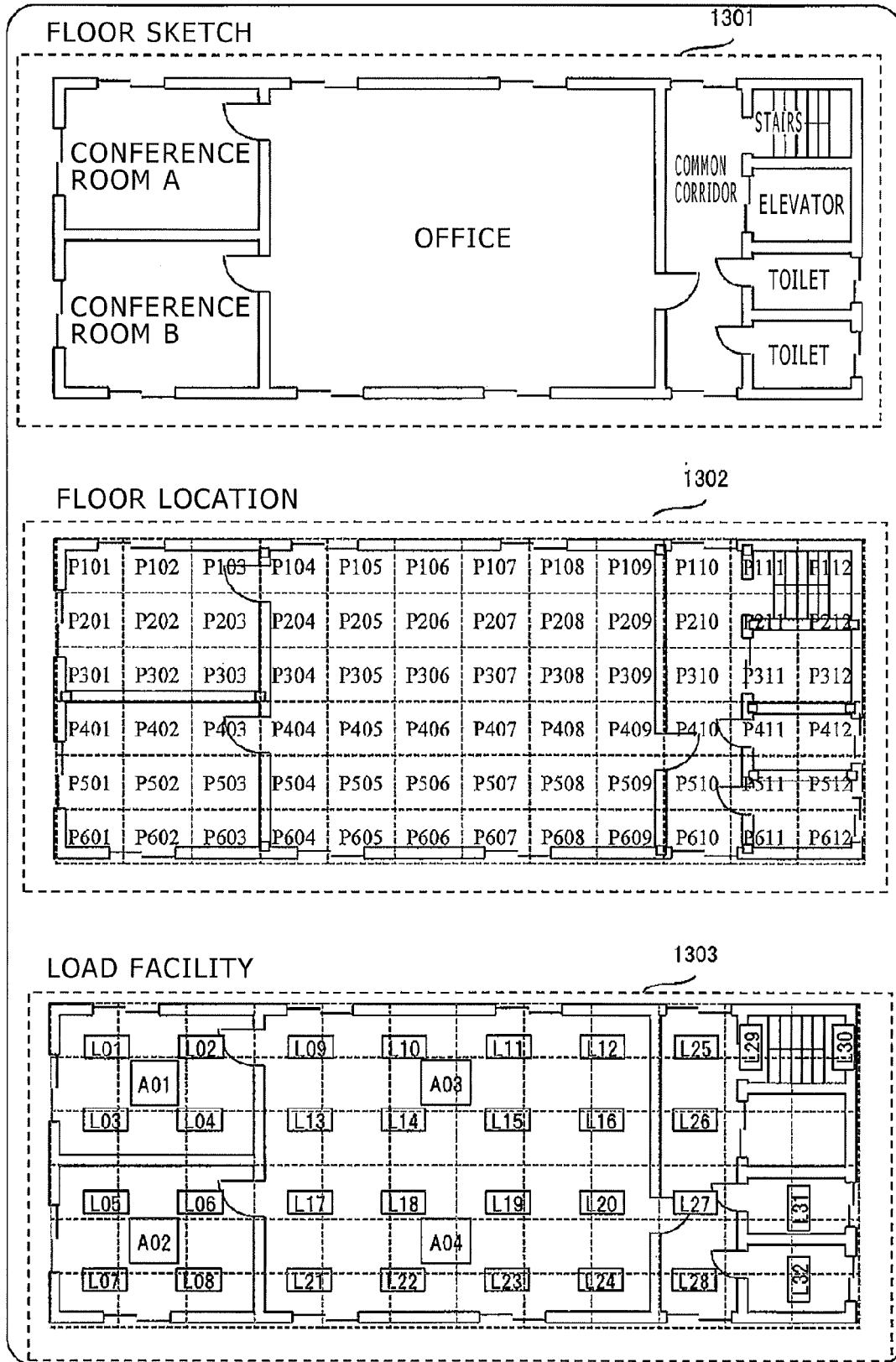


FIG. 14

LOCATION INFORMATION TABLE

	LOCATION ID	NAME	INSTALLED FACILITY
1401	P101	CONFERENCE ROOM A	L001
1402	P102	CONFERENCE ROOM A	—
1403	P103	CONFERENCE ROOM A	L002
	P104	OFFICE	L009
	P105	OFFICE	—
	P106	OFFICE	L010
	P107	OFFICE	L011
	P108	OFFICE	—
	P109	OFFICE	L012
	P110	COMMON CORRIDOR	L025
	P111	STAIRS	L029
	P112	STAIRS	L030
1404	P201	CONFERENCE ROOM A	—
1405	P202	CONFERENCE ROOM A	A001
1406	P203	CONFERENCE ROOM A	—
	P204	OFFICE	—

	P606	OFFICE	L022
	P607	OFFICE	L023
	P608	OFFICE	—
	P609	OFFICE	L024
	P610	COMMON CORRIDOR	L028
	P611	TOILET	—
	P612	TOILET	L032

FIG. 15

INCIDENT INFORMATION TABLE

1501

1504

PHENOMENON ID	DIRECT FACTOR	INDIRECT FACTOR	COUNTERMEASURE ID
I01	REFERENCE ELECTRIC POWER IS LESS THAN ESTIMATED VALUE	MAXIMUM VALUE OF EVENT ACTIVATION MONTH IS LESS THAN ESTIMATED VALUE SET AS TARGET	CP04
I02	CONSUMPTION ELECTRIC POWER IS LARGER THAN TARGET VALUE	HIGH LOAD OF AIR CONDITIONING FACILITY BECAUSE OF INCREASING OF AIR TEMPERATURE	CP01,CP02
I03	CONSUMPTION ELECTRIC POWER IS LARGER THAN TARGET VALUE	UNEXPECTED OPERATION OF FACILITY BECAUSE OF HAVING VISITOR	CP03
I04	CONSUMPTION ELECTRIC POWER IS LARGER THAN TARGET VALUE	UNEXPECTED OPERATION OF FACILITY BECAUSE OF ALTERATION OF CONSTRUCTION PERIOD	CP02

COUNTERMEASURE INFORMATION TABLE

1502

1505

COUNTERMEASURE ID	COUNTERMEASURE
CP01	PUT THE INSIDE OF ROOM IN SUPERCOOLED STATE BEFORE START TIME OF DEMAND RESPONSE EVENT
CP02	HALT TEMPORARILY BUSINESS ACTIVITY
CP03	CHANGE TIME OF VISITOR TO BEFORE/AFTER DEMAND RESPONSE EVENT TIME ZONE
CP04	CONSUME ELECTRIC POWER TO AMOUNT SET AS TARGET AS REFERENCE ELECTRIC POWER ONLY AT A SPECIFIC TIME AND DATE

USER CLASSIFICATION INCIDENT INFORMATION TABLE

1503

1506

USER CLASSIFICATION	PHENOMENON ID
SMALL-SCALE FACTORY	I01,I03
OFFICE BUSINESS	I01,I02
RETAIL BUSINESS	I01,I02

FIG.16

1601

SEARCH RESULT

	RECOMMENDED ORDER	PROGRAM NAME	ESTIMATED BALANCE	TARGET CONSUMPTION ELECTRIC POWER	REFERENCE ELECTRIC POWER	SUPPRESSION ELECTRIC POWER	
<input type="checkbox"/>	1	P04	¥81,000	132	186	54	DETAILS
<input type="checkbox"/>	2	P05	¥35,000	140	190	50	DETAILS
<input type="checkbox"/>		P07	¥14,100	138	185	47	DETAILS
<input type="checkbox"/>	3	P03	¥16,200	140	298	54	DETAILS
<input type="checkbox"/>		P07	¥14,100	138	185	47	DETAILS

PARTICIPATION
REGISTRATION

1604

RECOMMENDED PROGRAM

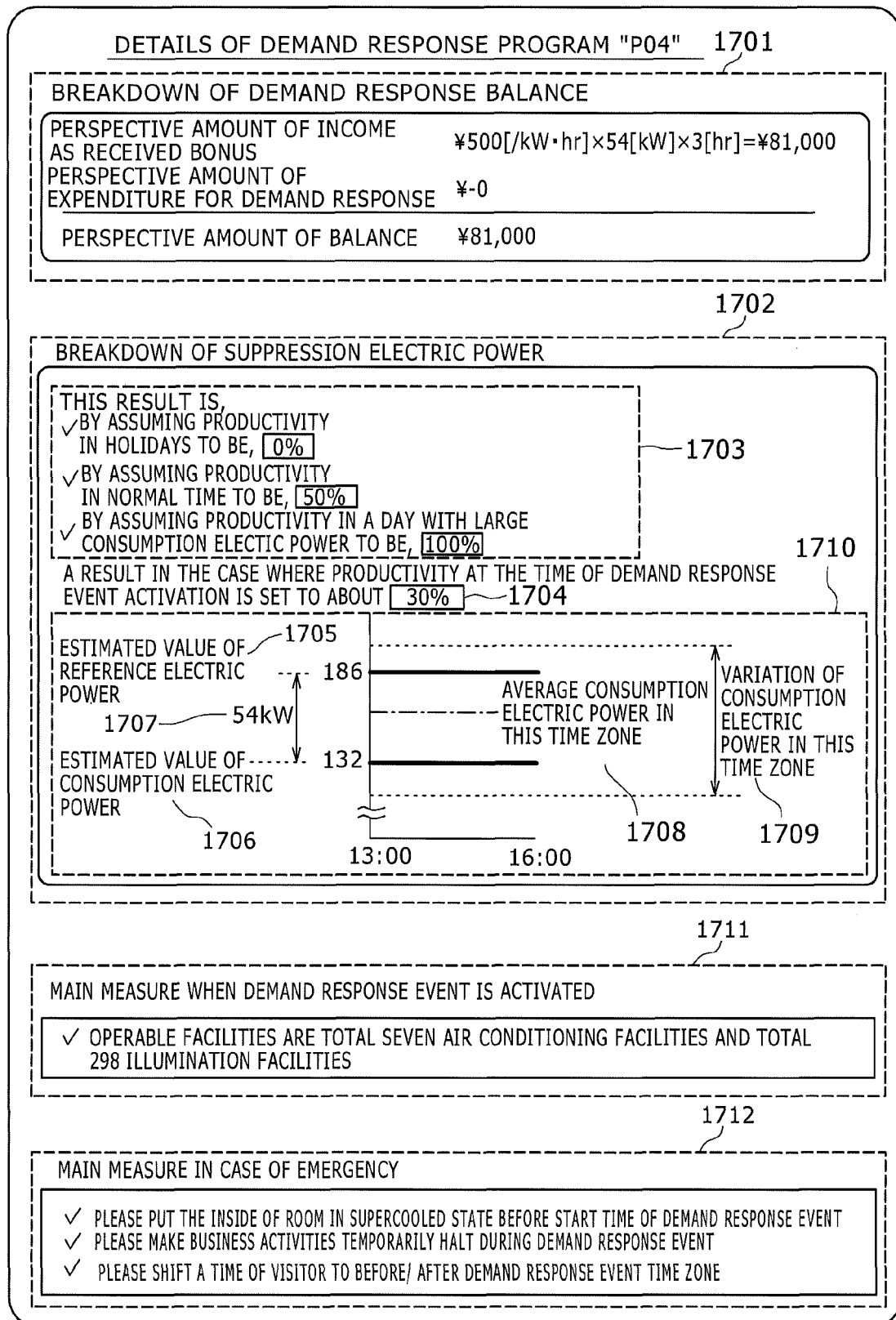
PROGRAM NAME	ESTIMATED BALANCE	TARGET CONSUMPTION ELECTRIC POWER	REFERENCE ELECTRIC POWER	SUPPRESSION ELECTRIC POWER	
p02	¥828,000	130	176	46	DETAILS

1605

1602

1603

FIG. 17





EUROPEAN SEARCH REPORT

Application Number
EP 13 19 1546

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 2 388 883 A1 (HITACHI LTD [JP]) 23 November 2011 (2011-11-23) * figures 1-8 * * paragraphs [0001], [0002] * * paragraphs [0011] - [0013] * * paragraphs [0016] - [0043] * * paragraphs [0051], [0054], [0056] * * paragraphs [0059] - [0116] * * paragraphs [0128] - [0130] * -----	1-9	INV. G06Q10/04 G06Q10/06
			TECHNICAL FIELDS SEARCHED (IPC)
			G06Q
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		7 March 2014	Meijs, Koen
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

1
EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 13 19 1546

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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07-03-2014

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EP 2388883	A1	23-11-2011	CN 102138266 A	27-07-2011
			EP 2388883 A1	23-11-2011
			JP 5255462 B2	07-08-2013
			JP 2010166636 A	29-07-2010
			US 2011282505 A1	17-11-2011
			WO 2010082536 A1	22-07-2010

REFERENCES CITED IN THE DESCRIPTION

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- JP 2000078747 A [0004]