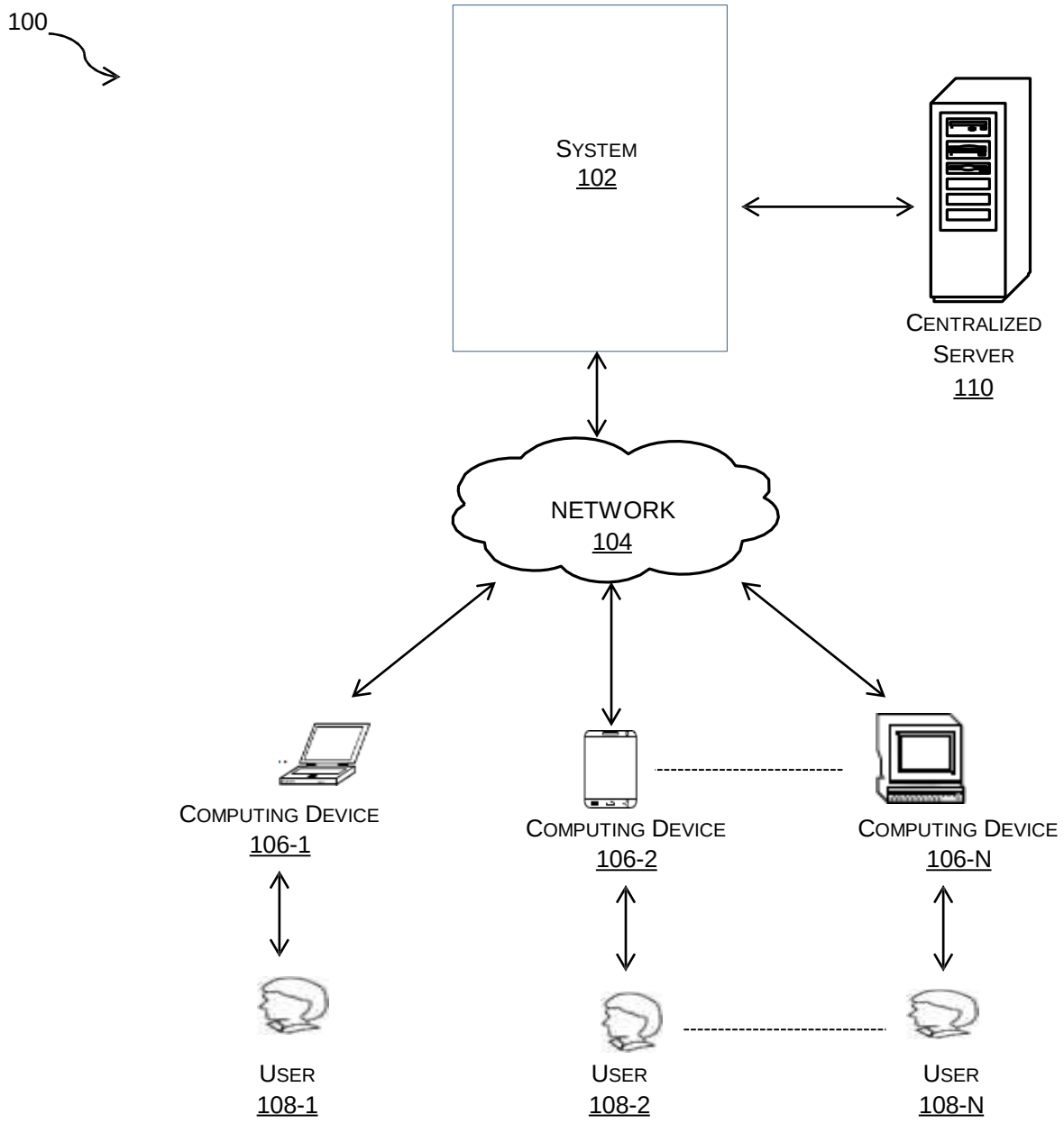


FIG. 1

Tarun Khurana
Regd. Patent Agent [IN/PA-1325]
Dated: 07th September, 2023

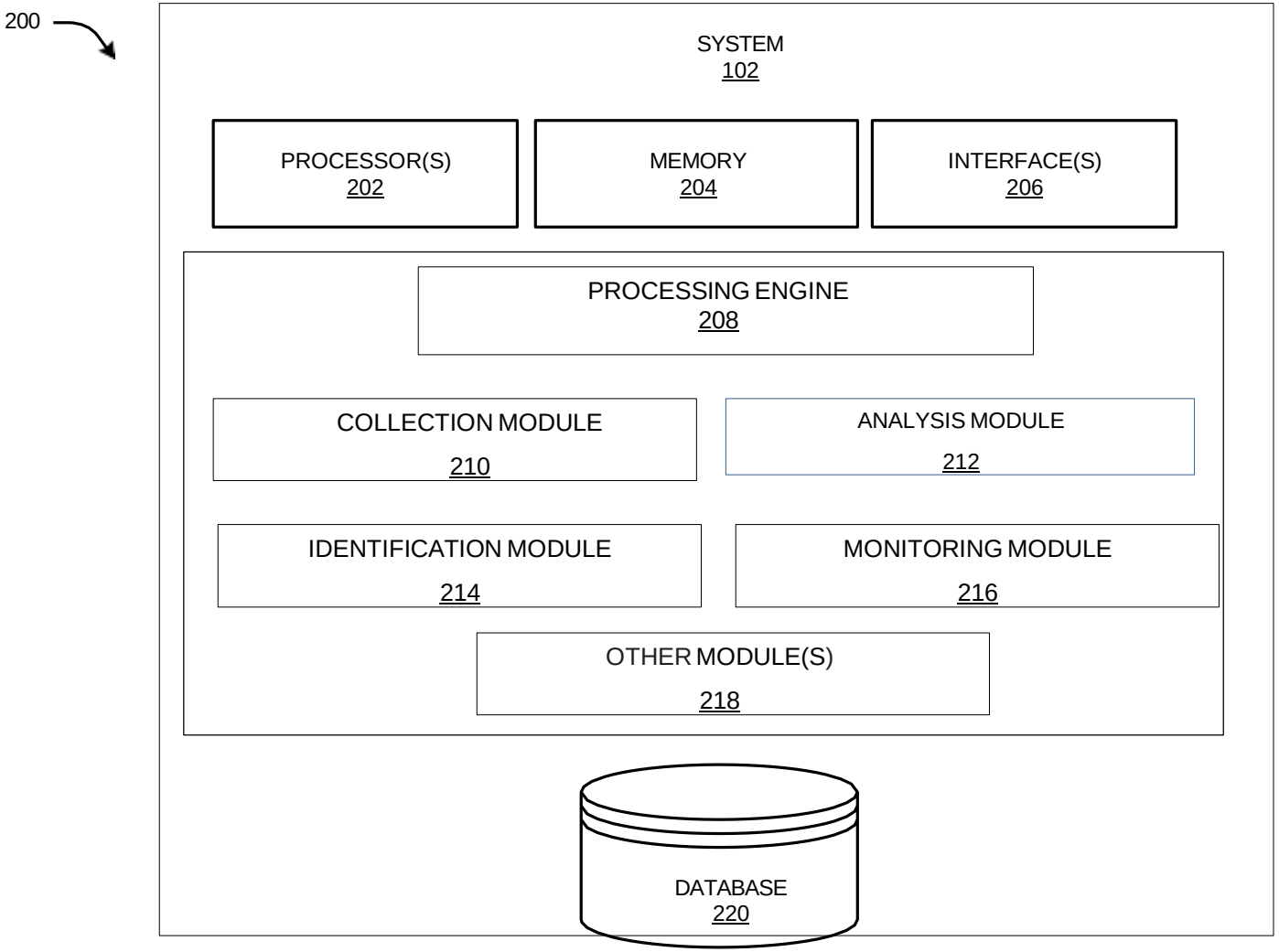


FIG. 2

Tarun Khurana
Regd. Patent Agent [IN/PA-1325]
Dated: 07th September, 2023

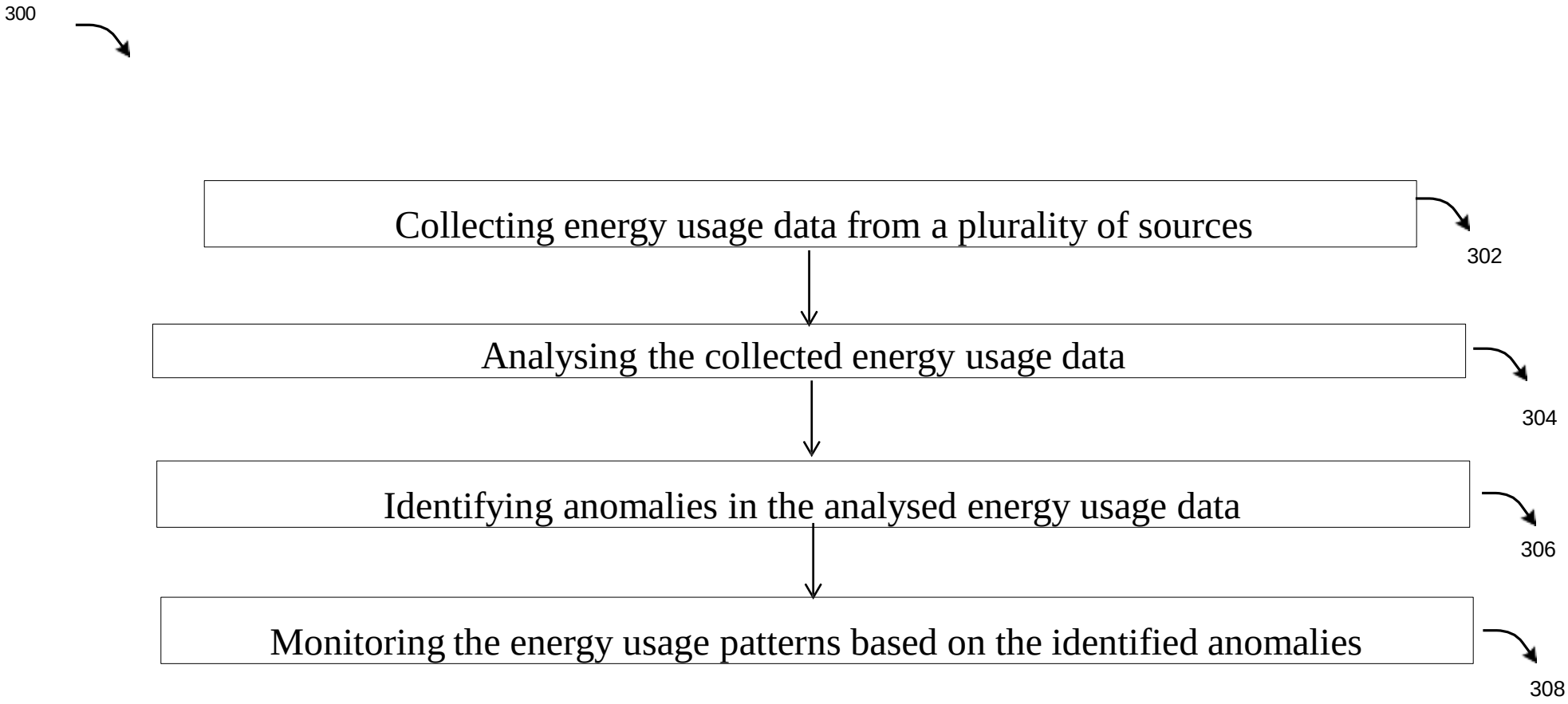


FIG. 3

Tarun Khurana
Regd. Patent Agent [IN/PA-1325]
Dated: 07th September, 2023

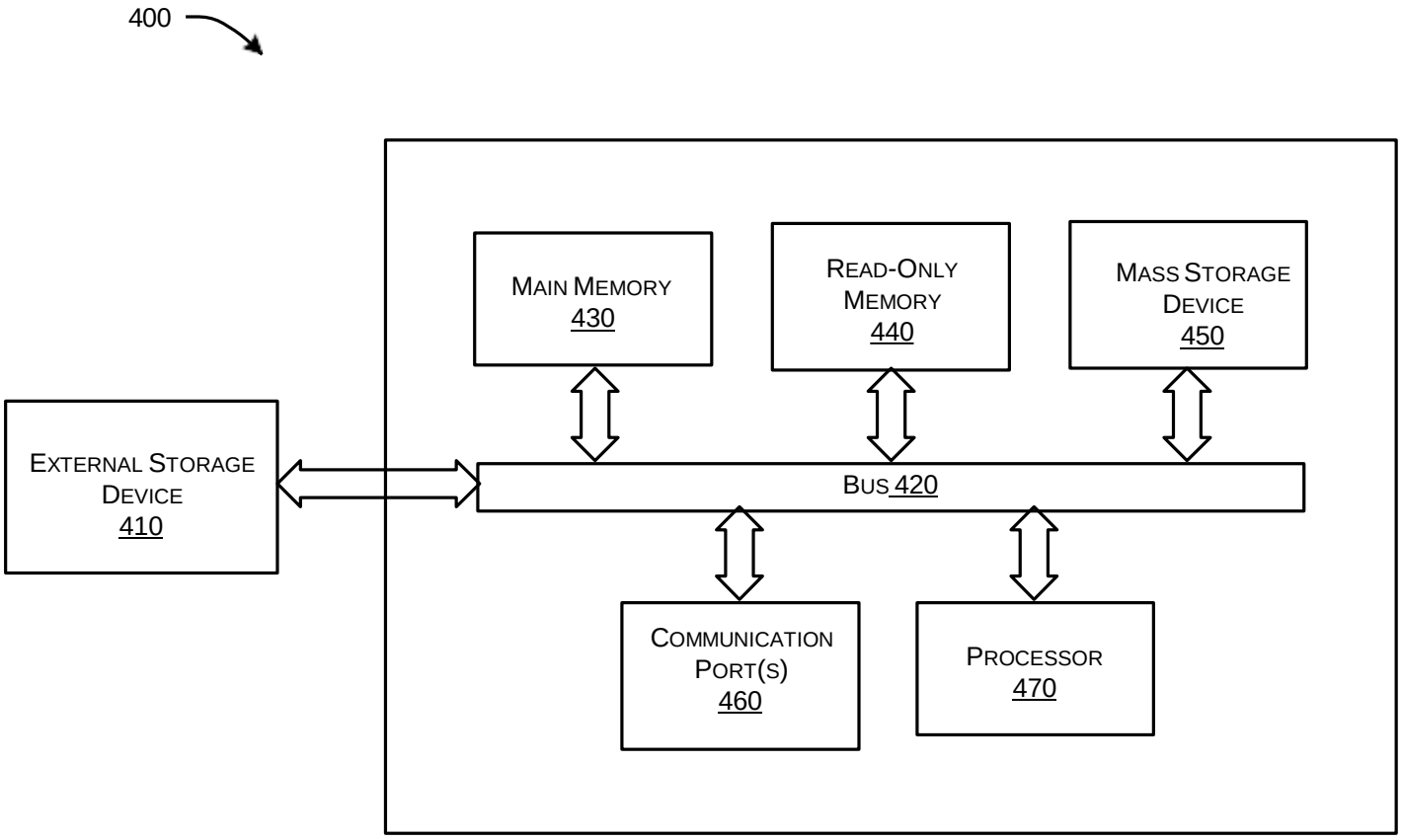


FIG. 4

Tarun Khurana
Regd. Patent Agent [IN/PA-1325]
Dated: 07th September, 2023

FORM 2

THE PATENTS ACT, 1970

(39 of 1970)

&

The Patent Rules, 2003

COMPLETE SPECIFICATION

(See sections 10 & rule 13)

1. TITLE OF THE INVENTION

A SYSTEM AND METHOD FOR MONITORING ENERGY USAGE PATTERNS IN REAL-TIME

2. APPLICANT (S)

NAME	NATIONALITY	ADDRESS
Chitkara University	IN	Chitkara University, Chandigarh-Patiala, National Highway, Village Jhansla, Rajpura, Punjab - 140401, India.
Bluest Mettle Solutions Private Limited	IN	ODC-4, Panchshil Tech Park, inside Courtyard by Marriott premises, Hinjewadi Phase - 1, Pune - 411057, Maharashtra, India.

3. PREAMBLE TO THE DESCRIPTION

COMPLETE SPECIFICATION

The following specification particularly describes the invention and the manner in which it is to be performed.

TECHNICAL FIELD

[0001] The present disclosure relates to the field of energy management and monitoring technologies. More particularly, the present disclosure relates to a system and method for monitoring energy usage patterns in real-time to analyse the performance, efficiency, and maintenance needs of various electrical energy systems.

BACKGROUND

[0002] Background description includes information that may be useful in understanding the present disclosure. It is not an admission that any of the information provided herein is prior art or relevant to the presently claimed disclosure, or that any publication specifically or implicitly referenced is prior art.

[0003] Energy systems play a crucial role in various industries and sectors, including manufacturing, infrastructure, and residential buildings. The efficient management of energy resources is essential for reducing costs, improving sustainability, and ensuring reliable operations. However, many energy systems suffer from inefficiencies, suboptimal performance, and unexpected failures, leading to increased energy consumption, higher operational costs, and environmental impact.

[0004] Traditionally, energy systems have been monitored through manual inspections or periodic meter readings, which are time-consuming, labour-intensive, and often provide limited information. Moreover, these approaches lack real-time data analysis capabilities, making it challenging to identify potential issues or optimize energy usage promptly.

[0005] With the advancements in data acquisition, communication, and analytical technologies, there is a growing need for innovative solutions that can monitor energy systems comprehensively and provide actionable insights in real-time. Such solutions can enable proactive maintenance, identify energy-saving opportunities, and optimize system performance.

[0006] Existing energy monitoring systems typically focus on specific aspects, such as electricity consumption or individual equipment monitoring.

These systems lack a holistic approach to energy system monitoring, which hampers the ability to identify interdependencies, detect inefficiencies across different subsystems, and provide comprehensive energy management solutions.

[0007] Therefore, there is a need for a sophisticated energy system monitoring solution that combines real-time data acquisition, advanced analytics, and user-friendly interfaces to provide a comprehensive view of energy systems. Such a solution should enable continuous monitoring, early fault detection, and optimization of energy usage to enhance efficiency, reduce downtime, and improve overall energy management.

[0008] There is, therefore, a need to overcome the above drawback, limitations, and shortcomings associated with the existing practices, and provide a system and method for monitoring energy usage patterns in real-time to analyse the performance, efficiency, and maintenance needs of various electrical energy systems.

OBJECTS OF THE PRESENT DISCLOSURE

[0009] Some of the objects of the present disclosure, which at least one embodiment herein satisfies are as listed herein below.

[0010] It is an object of the present disclosure to overcome the above drawback, limitations, and shortcomings associated with the existing systems monitoring energy usage patterns in real-time.

[0011] It is an object of the present disclosure to provide a system and method for monitoring energy usage patterns in real-time to analyse the performance, efficiency, and maintenance needs of various electrical energy systems.

[0012] It is an object of the present disclosure to provide a system and method for monitoring energy usage patterns in real-time to analyse the performance, efficiency, and maintenance needs of various electrical energy systems to identify inefficient practices or equipment that consume more energy than necessary.

[0013] It is an object of the present disclosure to provide a system and

method for monitoring energy usage patterns in real-time to analyse the performance, efficiency, and maintenance needs of various electrical energy systems to understand when and where energy is being used inefficiently, businesses and individuals can take steps to optimize energy consumption and reduce wastage.

[0014] It is an object of the present disclosure to provide a system and method for monitoring energy usage patterns in real-time to analyse the performance, efficiency, and maintenance needs of various electrical energy systems to budget effectively and make informed decisions about energy-related investments, such as upgrading to more energy-efficient appliances or systems.

[0015] It is an object of the present disclosure to provide a system and method for monitoring energy usage patterns in real-time to analyse the performance, efficiency, and maintenance needs of various electrical energy systems to help individuals and organizations reduce their carbon footprint by identifying opportunities to decrease energy consumption and transition to cleaner energy sources.

[0016] It is an object of the present disclosure to provide a system and method for monitoring energy usage patterns in real-time to analyse the performance, efficiency, and maintenance needs of various electrical energy systems to manage and balance the electrical grid more effectively.

[0017] It is an object of the present disclosure to provide a system and method for monitoring energy usage patterns in real-time to analyse the performance, efficiency, and maintenance needs of various electrical energy systems to distribute energy resources more efficiently and avoid overloading the grid during high-demand periods.

[0018] It is an object of the present disclosure to provide a system and method for monitoring energy usage patterns in real-time to analyse the performance, efficiency, and maintenance needs of various electrical energy systems to enable individuals, businesses, and policymakers to make informed decisions about energy-related investments, conservation strategies, and future planning.

[0019] It is an object of the present disclosure to provide a system and method for monitoring energy usage patterns in real-time to analyse the performance, efficiency, and maintenance needs of various electrical energy systems to help consumers and businesses align their energy consumption with periods of high renewable energy generation.

SUMMARY

[0020] The present disclosure relates to the field of energy management and monitoring technologies. More particularly, the present disclosure relates to a system and method for monitoring energy usage patterns in real-time to analyse the performance, efficiency, and maintenance needs of various electrical energy systems.

[0021] In an aspect, the present disclosure discloses a system for monitoring energy usage patterns in real-time to analyse the performance, efficiency, and maintenance needs of various electrical energy systems. The system comprises a processor coupled to a memory. The memory stores processor-executable instructions. The processor is configured to collect energy usage data from a plurality of sources. Further, the processor is configured to analyse the collected energy usage data. Next, the processor is configured to identify anomalies in the analysed energy usage data. In the end, the processor is configured to monitor the energy usage patterns based on the identified anomalies.

[0022] In an aspect, the present disclosure discloses a method for monitoring energy usage patterns in real-time to analyse the performance, efficiency, and maintenance needs of various electrical energy systems. The method begins with collecting, by a processor, energy usage data from a plurality of sources. Next, the method analyses, by the processor, the collected energy usage data. Thereafter, the method identifies, by the processor, anomalies in the analysed energy usage data. In the end, the method monitors, by the processor, the energy usage patterns based on the identified anomalies.

BRIEF DESCRIPTION OF DRAWINGS

[0023] The accompanying drawings are included to provide a further understanding of the present disclosure, and are incorporated in, and constitute a part of this specification. The drawings illustrate exemplary embodiments of the present disclosure, and together with the description, serve to explain the principles of the present disclosure.

[0024] In the figures, similar components, and/or features may have the same reference label. Further, various components of the same type may be distinguished by following the reference label with a second label that distinguishes among the similar components. If only the first reference label is used in the specification, the description is applicable to any one of the similar components having the same first reference label irrespective of the second reference label.

[0025] FIG. 1 illustrates an exemplary architecture diagram (100) of the proposed system for monitoring energy usage patterns in real-time to analyse the performance, efficiency, and maintenance needs of various electrical energy systems, in accordance with an embodiment of the present disclosure.

[0026] FIG. 2 illustrates a block diagram (200) of the proposed system for monitoring energy usage patterns in real-time to analyse the performance, efficiency, and maintenance needs of various electrical energy systems, in accordance with an embodiment of the present disclosure.

[0027] FIG. 3 illustrates an exemplary view of a flow diagram (300) of the proposed method for monitoring energy usage patterns in real-time to analyse the performance, efficiency, and maintenance needs of various electrical energy systems, in accordance with an embodiment of the present disclosure.

[0028] FIG. 4 illustrates an exemplary computer system (400) in which or with which embodiments of the present invention can be utilized in accordance with embodiments of the present disclosure.

DETAILED DESCRIPTION

[0029] The following is a detailed description of embodiments of the

disclosure depicted in the accompanying drawings. The embodiments are in such detail as to clearly communicate the disclosure. However, the amount of detail offered is not intended to limit the anticipated variations of embodiments. On the contrary, the intention is to cover all modifications, equivalents, and alternatives falling within the spirit, and scope of the present disclosure as defined by the appended claims.

[0030] In the following description, numerous specific details are set forth in order to provide a thorough understanding of embodiments of the present invention. It will be apparent to one skilled in the art that embodiments of the present invention may be practiced without some of these specific details.

[0031] Specific details are given in the following description to provide a thorough understanding of the embodiments. However, it will be understood by one of ordinary skill in the art that the embodiments may be practiced without these specific details. For example, circuits, systems, networks, processes, and other components may be shown as components in block diagram form in order not to obscure the embodiments in unnecessary detail. In other instances, well-known circuits, processes, algorithms, structures, and techniques may be shown without unnecessary detail to avoid obscuring the embodiments.

[0032] Also, it is noted that individual embodiments may be described as a process that is depicted as a flowchart, a flow diagram, a data flow diagram, a structure diagram, or a block diagram. Although a flowchart may describe the operations as a sequential process, many of the operations can be performed in parallel or concurrently. In addition, the order of the operations may be re-arranged. A process is terminated when its operations are completed but could have additional steps not included in a figure. A process may correspond to a method, a function, a procedure, a subroutine, a subprogram, etc. When a process corresponds to a function, its termination can correspond to a return of the function to the calling function or the main function.

[0033] The word “exemplary” and/or “demonstrative” is used herein to mean serving as an example, instance, or illustration. For the avoidance of doubt, the subject matter disclosed herein is not limited by such examples. In addition,

any aspect or design described herein as “exemplary” and/or “demonstrative” is not necessarily to be construed as preferred or advantageous over other aspects or designs, nor is it meant to preclude equivalent exemplary structures and techniques known to those of ordinary skill in the art. Furthermore, to the extent that the terms “includes,” “has,” “contains,” and other similar words are used in either the detailed description or the claims, such terms are intended to be inclusive in a manner similar to the term “comprising” as an open transition word without precluding any additional or other elements.

[0034] Reference throughout this specification to “one embodiment” or “an embodiment” or “an instance” or “one instance” means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment of the present disclosure. Thus, the appearances of the phrases “in one embodiment” or “in an embodiment” in various places throughout this specification are not necessarily all referring to the same embodiment. Furthermore, the particular features, structures, or characteristics may be combined in any suitable manner in one or more embodiments.

[0035] The terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the disclosure. As used herein, the singular forms “a”, “an”, and “the” are intended to include the plural forms as well, unless the context indicates otherwise. It will be further understood that the terms “comprises” and/or “comprising,” when used in this specification, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof. As used herein, the term “and/or” includes any and all combinations of one or more of the associated listed items.

[0036] The present disclosure relates to the field of energy management and monitoring technologies. More particularly, the present disclosure relates to a system and method for monitoring energy usage patterns in real-time to analyse the performance, efficiency, and maintenance needs of various electrical energy

systems.

[0037] The energy system monitoring solution described herein is designed to provide comprehensive monitoring, analysis, and optimization of energy systems. The invention incorporates a combination of hardware and software components to collect, process, and analyze data from various energy systems, enabling real-time monitoring and proactive maintenance. The core elements of the energy system monitoring solution include Data Acquisition Units (DAUs), a Central Monitoring System, a User Interface, and advanced Analytical Capabilities.

[0038] Data Acquisition Units (DAUs): Strategically placed within the energy systems, the DAUs are responsible for capturing real-time data from sensors, meters, and other measurement devices. These units are equipped with communication capabilities to transmit the acquired data to the Central Monitoring System. The DAUs are designed to be easily installed and integrated into existing energy systems, ensuring compatibility and seamless data acquisition.

[0039] Central Monitoring System: The Central Monitoring System serves as the nerve center of the energy system monitoring solution. It receives data transmitted by the DAUs and employs advanced algorithms and machine learning techniques to perform comprehensive analysis. The system processes the incoming data to generate valuable insights into energy consumption patterns, system performance metrics, and potential faults. The Central Monitoring System is designed to handle large volumes of data from multiple energy systems simultaneously, ensuring scalability and efficiency.

[0040] User Interface: The energy system monitoring solution features a user-friendly interface accessible via web-based platforms or dedicated software. The User Interface provides users with real-time and historical data visualization, enabling them to monitor energy system performance at a glance. Users can also set up customized dashboards, configure alerts and notifications, and access analytical reports. The intuitive User Interface empowers energy managers, facility operators, and maintenance personnel to make informed decisions

regarding energy usage, maintenance scheduling, and optimization strategies.

[0041] Analytical Capabilities: The energy system monitoring solution incorporates sophisticated algorithms and machine learning techniques to analyze the collected data and identify anomalies, inefficiencies, or potential malfunctions. The system can detect abnormal energy consumption patterns, identify underperforming components, and predict potential failures. By leveraging the analytical capabilities of the solution, users can proactively address issues, optimize energy usage, and improve the overall performance and efficiency of their energy systems.

[0042] Furthermore, the energy system monitoring solution can be customized and tailored to specific energy systems and industries. It supports the monitoring of various energy sources, including electrical grids, HVAC systems, renewable energy installations, and industrial processes. The solution can be seamlessly integrated into new or existing energy systems, ensuring compatibility and minimal disruption to operations.

[0043] In summary, the energy system monitoring solution described herein offers a comprehensive approach to energy system monitoring. It leverages advanced data acquisition, analysis, and visualization techniques to provide real-time insights into energy consumption, system performance, and potential faults. By enabling proactive maintenance, optimizing energy usage, and facilitating informed decision-making, the invention enhances energy efficiency, reduces downtime, and optimizes overall energy management for a wide range of industries and sectors.

[0044] The various embodiments throughout the disclosure will be explained in more detail with reference to FIGs. 1-4.

[0045] The present disclosure relates to the field of energy management and monitoring technologies. More particularly, the present disclosure relates to a system and method for monitoring energy usage patterns in real-time to analyse the performance, efficiency, and maintenance needs of various electrical energy systems.

[0046] Referring to FIG.1, a system 102 automatically detects presence of

the at least one user to access a computing device 102. The system 102 comprises a network 104, one or more computing devices (106-1, 106-2,…,106-N) (individually referred to as one or more computing devices 106), one or more users (108-1, 108-2,…,108-N) (individually referred to as one or more users 108), and a centralized server 110. The computing device 106 comprising a processor 202 and a memory 204. The memory 204 can comprise a set of instructions, which when executed, causes the processor 202 to monitor energy usage patterns in real-time to analyse the performance, efficiency, and maintenance needs of various electrical energy systems. The one or more user transactions are received via one or more computing devices 106.

[0047] In an exemplary embodiment, the network 102 may include, by way of example but not limitation, one or more of: a wireless network, a wired network, an internet, an intranet, a public network, a private network, a packet-switched network, a circuit-switched network, an ad hoc network, an infrastructure network, a Public-Switched Telephone Network (PSTN), a cable network, a cellular network, a satellite network, a fiber optic network, some combination thereof.

[0048] In another exemplary embodiment, the centralized server 110 may include or comprise, by way of example but not limitation, one or more of: a stand-alone server, a server blade, a server rack, a bank of servers, a server farm, hardware supporting a part of a cloud service or system, a home server, hardware running a virtualized server, one or more processors executing code to function as a server, one or more machines performing server-side functionality as described herein, at least a portion of any of the above, some combination thereof.

[0049] In an embodiment, the computing device 106 may include, but not limited to, mobile phone, smart phone, Virtual Reality (VR) devices, Augmented Reality (AR) devices, laptop, a general-purpose computer, desktop, personal digital assistant, tablet computer, mainframe computer, or any other computing device. It may be appreciated that the computing device 106 may not be restricted to the mentioned devices and various other devices may be used. A smart computing device may be one of the appropriate systems for storing data and

other private/sensitive information.

[0050] In an embodiment, the system 102 for monitoring energy usage patterns in real-time to analyse the performance, efficiency, and maintenance needs of various electrical energy systems comprises a processor 202 operatively coupled to a memory 204 that comprises a set of instructions, which upon being executed, causes the processor 202 to monitor energy usage patterns in real-time to analyse the performance, efficiency, and maintenance needs of various electrical energy systems.

[0051] FIG. 2 illustrates architecture of the proposed system for monitoring energy usage patterns in real-time to analyse the performance, efficiency, and maintenance needs of various electrical energy systems, in accordance with an embodiment of the present disclosure.

[0052] Referring to FIG. 2, an exemplary architecture of the proposed system 102 and method 300 is disclosed. The system 102 comprises one or more processor(s) 202. The one or more processor(s) 202 are implemented as one or more microprocessors, microcomputers, microcontrollers, digital signal processors, central processing units, logic circuitries, and/or any devices that manipulate data based on operational instructions. Among other capabilities, one or more processor(s) 202 are configured to fetch and execute computer-readable instructions stored in a memory 204 of the device. The memory 204 stores one or more computer-readable instructions or routines, which are fetched and executed to create or share the data units over a network service. Memory 204 comprises any non-transitory storage device comprising, for example, volatile memory such as RAM, or non-volatile memory such as EPROM, flash memory, and the like.

[0053] In an embodiment, the system 102 also comprises an interface(s) 206. The interface(s) 206 comprises a variety of interfaces, for example, interfaces for data input and output devices referred to as I/O devices, storage devices, and the like. The interface(s) 206 facilitates communication of the user device 102 with various devices or servers coupled to the user device. The interface(s) 206 also provides a communication pathway for one or more components of the user device 108. Examples of such components comprise, but are not limited to,

processing engine(s) and database. Interface 206 comprises a platform for communication with the devices/servers to read real-time data /write data in the system 102 and to communicate with the audio unit 106. Interfaces 206 comprise a Graphical interface that allows user to feed inputs, to type/write/ upload the data and certificates, and other software and hardware interfaces, for example, interfaces for peripheral device(s), such as a keyboard, a mouse, an external memory, and a printer.

[0054] In an embodiment, the processing engine(s) 208 are implemented as a combination of hardware and programming (for example, programmable instructions) to implement one or more functionalities of the processing engine(s) 208. In the examples described herein, such combinations of hardware and programming may be implemented in several different ways. For example, the programming for the processing engine(s) 208 are processor-executable instructions stored on a non-transitory machine-readable storage medium, and the hardware for the processing engine(s) comprises a processing resource (for example, one or more processors), to execute such instructions. In the present examples, the machine-readable storage medium stores instructions that, when executed by the processing resource, implement the processing engine(s). In such examples, the system 102 comprises the machine-readable storage medium storing the instructions and the processing resource to execute the instructions, or the machine-readable storage medium may be separate but accessible to the system 102 and the processing resource. In other examples, the processing engine(s) 208 is implemented by electronic circuitry. Database 220 comprises data that is either stored or generated as a result of functionalities implemented by any of the components of the processing engine(s) 208.

[0055] In an embodiment, the processing engine(s) 208 can include a collection module 210, an analysis module 212, an identification module 214, a monitoring module 216, and other module (s) 218 but not limited to the likes. The other unit(s) 218 implements functionalities that supplement applications or functions performed by the system 102 or the processing engine(s) 208. The data (or database 220) serves, amongst other things, as a repository for storing

data processed, received, and generated by one or more of the modules.

[0056] In an embodiment, the collection module 210 can be configured to collect energy usage data from a plurality of sources. The plurality of sources from which the energy usage data may be collected comprises sensors, electric meters, and electric measurement devices.

[0057] In an embodiment, the analysis module 212 can be configured to analyse the collected energy usage data. The collected data may be analysed by applying machine learning techniques. The collected data may be analysed by creating a machine learning model trained with historical data and real-time data of energy usage. Further, the collected data may be analysed to obtain information related to energy consumption patterns, device performance metrics, and potential faults in electrical networks.

[0058] In an embodiment, the identification module 214 can be configured to identify anomalies in the analysed energy usage data. The anomalies identified in the energy usage data may comprise abnormal energy consumption patterns, underperforming electrical devices, and potential electrical failures.

[0059] In an embodiment, the monitoring module 216 can be configured to monitor the energy usage patterns based on the identified anomalies. The energy usage patterns may be monitored to repair electrical faults, optimize energy usage of electrical devices, and improve a performance efficiency of electrical energy devices. The energy usage patterns may be monitored for electrical grids, HVAC systems, renewable energy installations, and industrial devices. The energy usage patterns may be transmitted to a user in real-time in an analytical report comprising graphs and charts.

[0060] FIG. 3 illustrates an exemplary view of a flow diagram (300) of the proposed method for monitoring energy usage patterns in real-time to analyse the performance, efficiency, and maintenance needs of various electrical energy systems, in accordance with an embodiment of the present disclosure.

[0061] In an embodiment, the proposed method 300 for method for monitoring energy usage patterns in real-time to analyse the performance, efficiency, and maintenance needs of various electrical energy systems is

disclosed. At step 302, collecting, by a processor 202, energy usage data from a plurality of sources. At step 304, analysing, by the processor 202, the collected energy usage data. At step 306, identifying, by the processor 202, anomalies in the analysed energy usage data. Finally, at step 308, monitoring, by the processor 202, the energy usage patterns based on the identified anomalies.

[0062] FIG.4 illustrates an exemplary computer system (400) in which or with which embodiments of the present invention can be utilized in accordance with embodiments of the present disclosure.

[0063] Referring to FIG. 4, computer system includes an external storage device 410, a bus 420, a main memory 430, a read only memory 440, a mass storage device 450, communication port 460, and a processor 470. A person skilled in the art will appreciate that computer system may include more than one processor and communication ports. Examples of processor 470 include, but are not limited to, an Intel® Itanium® or Itanium 2 processor(s), or AMD® Opteron® or Athlon MP® processor(s), Motorola® lines of processors, FortiSOC™ system on a chip processors or other future processors. Processor 470 may include various modules associated with embodiments of the present invention. Communication port 460 can be any of an RS-232 port for use with a modem based dialup connection, a 10/100 Ethernet port, a Gigabit or 10 Gigabit port using copper or fiber, a serial port, a parallel port, or other existing or future ports. Communication port 460 may be chosen depending on a network, such a Local Area Network (LAN), Wide Area Network (WAN), or any network to which computer system connects.

[0064] In an embodiment, the memory 430 can be Random Access Memory (RAM), or any other dynamic storage device commonly known in the art. Read only memory 440 can be any static storage device(s) e.g., but not limited to, a Programmable Read Only Memory (PROM) chips for storing static information e.g., start-up or BIOS instructions for processor 470. Mass storage 460 may be any current or future mass storage solution, which can be used to store information and/or instructions. Exemplary mass storage solutions include, but are not limited to, Parallel Advanced Technology Attachment (PATA) or Serial

Advanced Technology Attachment (SATA) hard disk drives or solid-state drives (internal or external, e.g., having Universal Serial Bus (USB) and/or Firewire interfaces), e.g. those available from Seagate (e.g., the Seagate Barracuda 7102 family) or Hitachi (e.g., the Hitachi Deskstar 7K1000), one or more optical discs, Redundant Array of Independent Disks (RAID) storage, e.g. an array of disks (e.g., SATA arrays), available from various vendors including Dot Hill Systems Corp., LaCie, Nexsan Technologies, Inc. and Enhance Technology, Inc.

[0065] In an embodiment, the bus 420 communicatively couples processor(s) 470 with the other memory, storage and communication blocks. Bus 420 can be, e.g. a Peripheral Component Interconnect (PCI) / PCI Extended (PCI-X) bus, Small Computer System Interface (SCSI), USB or the like, for connecting expansion cards, drives and other subsystems as well as other buses, such a front side bus (FSB), which connects processor 470 to software system.

[0066] In another embodiment, operator and administrative interfaces, e.g. a display, keyboard, and a cursor control device, may also be coupled to bus 420 to support direct operator interaction with computer system. Other operator and administrative interfaces can be provided through network connections connected through communication port 460. External storage device 410 can be any kind of external hard-drives, floppy drives, IOMEGA® Zip Drives, Compact Disc - Read Only Memory (CD-ROM), Compact Disc - Re-Writable (CD-RW), Digital Video Disk - Read Only Memory (DVD-ROM). Components described above are meant only to exemplify various possibilities. In no way should the aforementioned exemplary computer system limit the scope of the present disclosure.

[0067] If the specification states a component or feature “may”, “can”, “could”, or “might” be included or have a characteristic, that particular component or feature is not required to be included or have the characteristic.

[0068] As used in the description herein and throughout the claims that follow, the meaning of “a,” “an,” and “the” includes plural reference unless the context clearly dictates otherwise. Also, as used in the description herein, the meaning of “in” includes “in” and “on” unless the context clearly dictates otherwise.

[0069] It is to be appreciated by a person skilled in the art that while various embodiments of the present disclosure have been elaborated for the system and method for monitoring energy usage patterns in real-time to analyse the performance, efficiency, and maintenance needs of various electrical energy systems. However, the teachings of the present disclosure are also applicable for other types of applications as well, and all such embodiments are well within the scope of the present disclosure. However, the system and method for monitoring energy usage patterns in real-time to analyse the performance, efficiency, and maintenance needs of various electrical energy systems is also equally implementable in other industries as well, and all such embodiments are well within the scope of the present disclosure without any limitation.

[0070] Moreover, in interpreting the specification, all terms should be interpreted in the broadest possible manner consistent with the context. In particular, the terms “comprises” and “comprising” should be interpreted as referring to elements, components, or steps in a non-exclusive manner, indicating that the referenced elements, components, or steps may be present, or utilized, or combined with other elements, components, or steps that are not expressly referenced. Where the specification claims refer to at least one of something selected from the group consisting of A, B, C….and N, the text should be interpreted as requiring only one element from the group, not A plus N, or B plus N, etc.

[0071] While the foregoing describes various embodiments of the invention, other and further embodiments of the invention may be devised without departing from the basic scope thereof. The scope of the invention is determined by the claims that follow. The invention is not limited to the described embodiments, versions or examples, which are comprised to enable a person having ordinary skill in the art to make and use the invention when combined with information and knowledge available to the person having ordinary skill in the art.

ADVANTAGES OF THE INVENTION

[0072] The proposed invention overcomes the above drawback,

limitations, and shortcomings associated with the existing systems for monitoring energy usage patterns in real-time.

[0073] The present invention provides a system and method for monitoring energy usage patterns in real-time to analyse the performance, efficiency, and maintenance needs of various electrical energy systems.

[0074] The present invention provides a system and method for monitoring energy usage patterns in real-time to analyse the performance, efficiency, and maintenance needs of various electrical energy systems to identify inefficient practices or equipment that consume more energy than necessary.

[0075] The present invention provides a system and method for monitoring energy usage patterns in real-time to analyse the performance, efficiency, and maintenance needs of various electrical energy systems to understand when and where energy is being used inefficiently, businesses and individuals can take steps to optimize energy consumption and reduce wastage.

[0076] The present invention provides a system and method for monitoring energy usage patterns in real-time to analyse the performance, efficiency, and maintenance needs of various electrical energy systems to budget effectively and make informed decisions about energy-related investments, such as upgrading to more energy-efficient appliances or systems.

[0077] The present invention provides a system and method for monitoring energy usage patterns in real-time to analyse the performance, efficiency, and maintenance needs of various electrical energy systems to help individuals and organizations reduce their carbon footprint by identifying opportunities to decrease energy consumption and transition to cleaner energy sources.

[0078] The present invention provides a system and method for monitoring energy usage patterns in real-time to analyse the performance, efficiency, and maintenance needs of various electrical energy systems to manage and balance the electrical grid more effectively.

[0079] The present invention provides a system and method for monitoring energy usage patterns in real-time to analyse the performance,

efficiency, and maintenance needs of various electrical energy systems to distribute energy resources more efficiently and avoid overloading the grid during high-demand periods.

[0080] The present invention provides a system and method for monitoring energy usage patterns in real-time to analyse the performance, efficiency, and maintenance needs of various electrical energy systems to enable individuals, businesses, and policymakers to make informed decisions about energy-related investments, conservation strategies, and future planning.

[0081] The present invention provides a system and method for monitoring energy usage patterns in real-time to analyse the performance, efficiency, and maintenance needs of various electrical energy systems to help consumers and businesses align their energy consumption with periods of high renewable energy generation.

We Claim:

1. A system for monitoring energy usage patterns in real-time (102), the system (102) comprising:

   a processor (202); and

   a memory (204) coupled to the processor (202), wherein the memory (204) comprises processor-executable instructions, which on execution, causes the processor (202) to:

      collect energy usage data from a plurality of sources;

      analyse the collected energy usage data;

      identify anomalies in the analysed energy usage data; and

      monitor the energy usage patterns based on the identified anomalies.

2. The system (102) as claimed in claim 1, wherein the plurality of sources from which the energy usage data is collected comprises sensors, electric meters, and electric measurement devices.
3. The system (102) as claimed in claim 1, wherein the collected data is analysed by applying machine learning techniques.
4. The system (102) as claimed in claim 1, wherein the collected data is analysed by creating a machine learning model trained with historical data and real-time data of energy usage.
5. The system (102) as claimed in claim 1, wherein the collected data is analysed to obtain information related to energy consumption patterns, device performance metrics, and potential faults in electrical networks.
6. The system (102) as claimed in claim 1, wherein the anomalies identified in the energy usage data comprise abnormal energy consumption patterns, underperforming electrical devices, and potential electrical failures.
7. The system (102) as claimed in claim 1, wherein the energy usage patterns are monitored to repair electrical faults, optimize energy usage of electrical devices, and improve a performance efficiency of electrical energy devices.

8. The system (102) as claimed in claim 1, wherein the energy usage patterns are monitored for electrical grids, HVAC systems, renewable energy installations, and industrial devices.
9. The system (102) as claimed in claim 1, wherein the energy usage patterns are transmitted to a user in real-time in an analytical report comprising graphs and charts.
10. A method for monitoring energy usage patterns in real-time (300), the method (300) comprising:

collecting (302), by a processor (202), energy usage data from a plurality of sources;

analysing (304), by the processor (202), the collected energy usage data;

identifying (306), by the processor (202), anomalies in the analysed energy usage data; and

monitoring (308), by the processor (202), the energy usage patterns based on the identified anomalies.

For Chitkara University and
Bluest Mettle Solutions Private Limited



Tarun Khurana
Regd. Patent Agent [IN/PA-1325]
Dated: 07th September, 2023

ABSTRACT

A SYSTEM AND METHOD FOR MONITORING ENERGY USAGE PATTERNS IN REAL-TIME

Embodiments of the present disclosure relates to a system (100) and method (300) for monitoring energy usage patterns in real-time. In an aspect, the present disclosure discloses a system (102) for monitoring energy usage patterns in real-time to analyse the performance, efficiency, and maintenance needs of various electrical energy systems. The system (102) comprises a processor (202) coupled to a memory (204). The memory (204) stores processor-executable instructions. The processor (202) is configured to collect energy usage data from a plurality of sources. Further, the processor (202) is configured to analyse the collected energy usage data. Next, the processor (202) is configured to identify anomalies in the analysed energy usage data. In the end, the processor (202) is configured to monitor the energy usage patterns based on the identified anomalies.

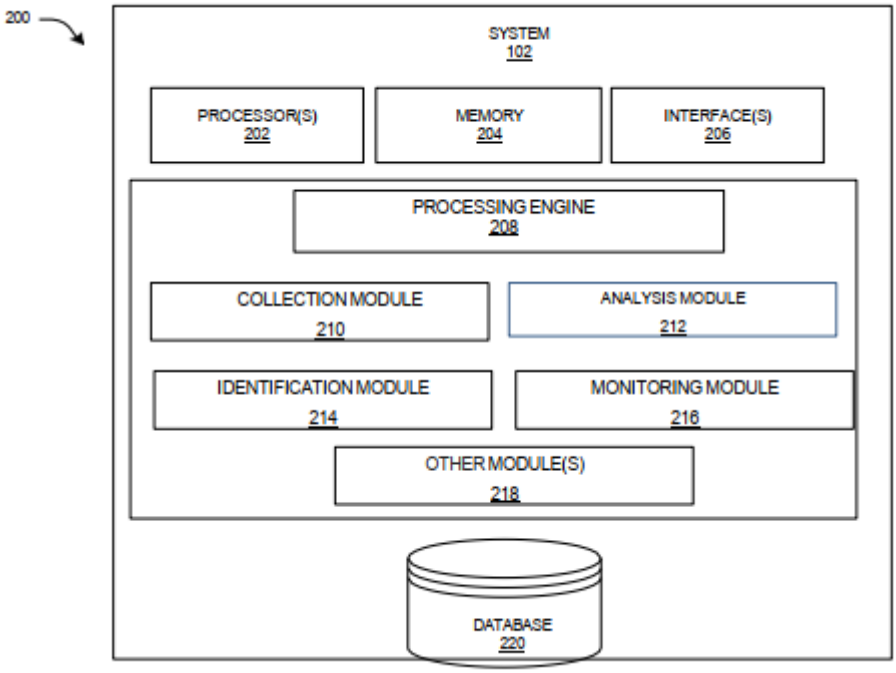


FIG. 2.

For Chitkara University and

Bluest Mettle Solutions Private Limited

Tarun Khurana

Regd. Patent Agent [IN/PA-1325]

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