***GENERIC SPECIFICATION FOR AI DRIVEN CLOUD-BASED ENERGY MANAGEMENT SYSTEM WITH MACHINE LEARNING, ENTERPRISE REPORTING, AND POWER QUALITY***

1. PRODUCT

2.1 AI Driven Energy Management and Power Quality System

1. The AI driven cloud-based system shall enable enterprise energy management and power quality analysis. The cloud-based system shall identify facilities and individual circuits most in need of power quality and energy efficiency improvements.
2. The cloud-based system shall encompass multiple components, including a meter management on-premises software application with databasing, meter configuration, and push to cloud.
3. The cloud-based system shall:
   * + 1. Be hosted on a multi-server cloud computing architecture.
       2. Make data available on a browser, a tablet, and a phone without use of any remote terminal services support.
4. The cloud-based system shall enable setup of multiple facilities containing multiple meters.
5. Trend data shall be available for all meters and facilities connected to the cloud system. Multiple dashboard and comparison graphs including AI driven future predictions shall be available for facility and meter level usage analysis.
   * + 1. The system shall provide meter and facility usage comparisons.
       2. The system shall provide degree days charts for energy usage analysis and resource planning.
       3. The system shall provide load disaggregation to break out load contributors.
       4. The system shall provide a heat map for usage analysis.
       5. The system shall provide top ten monthly usage and demand.
       6. The system shall provide daily, monthly, and yearly usage comparisons.
       7. The system shall provide monthly average power factor.
       8. The system shall provide PUE (power usage effectiveness) charts for data centers.
6. The cloud-based system shall provide enterprise-level summary reporting and facility comparison.
   * + 1. Enterprise summary shall show facilities graded for efficiency and power quality risk.
       2. Enterprise summary shall show year-to-date and predicted year end energy costs.
       3. Enterprise summary shall show worst facility risk factor and average enterprise risk.
       4. Enterprise summary shall show potential energy cost savings and potential percentage of risk reduction through improvements in facilities.
       5. Enterprise summary shall show total enterprise energy use, energy use per square foot, energy use per occupant, and CO2 footprint for the enterprise and for each facility.
       6. Enterprise summary shall show predicted totalized energy usage to end of month and end of year for the entire enterprise and for each facility.
       7. Enterprise summary shall show percentage change in energy usage prediction from the prior month and year, for the enterprise and for each facility.
       8. Enterprise comparison graphs shall show top ten facilities to the end of the month and for the past five years for total energy, energy per square foot, energy used per occupant, and CO2 footprint; and usage and predicted usage for the current and prior year for all facilities.
7. The cloud-based system shall predict energy usage and max demand for each metered circuit, using artificial intelligence and machine learning to show predicted energy usage for as far ahead as the end of the calendar year, with past usage and 30-day energy usage predictions for any metered circuit.
   * + 1. The user shall be able to compare predicted future usage at hourly, daily, weekly, and monthly bases between any meter and any facility within an enterprise.
       2. Graphs shall provide predicted usage in addition to current and past data.
       3. For data centers, graphs showing power usage effectiveness shall be available.
8. The cloud-based system shall provide a full complement of power quality viewing capability.
   * + 1. The system shall provide recorded waveforms, voltage surges and sags, and current fault signatures.
       2. The system shall automatically plot CBEMA and SEMI F-47 power quality graphs, THD, monthly power factor, and all meter-programmed alarm limits.
       3. The waveform fault analysis viewer shall allow for zoom and pan and selectable overlay.
       4. The waveform fault analysis shall provide location (direction) of the power quality event (upstream or downstream) and direction of the power harmonics.
       5. The waveform fault viewer shall enable single cycle waveform view with RMS data, harmonics, annotations, and ranges.
9. The cloud-based system shall support meter totalization for the purpose of creating aggregated meters representing a single load and for creating one main feeder meter for each facility. This feeder meter shall be used to provide enterprise comparison data. The meter totalization shall also be used to add or subtract a totalized meter for sub-metering purposes.
10. The cloud-based system shall support water, air, gas, electricity, and steam usage analysis.
11. Usage and cost comparisons and predicted usage and costs shall be available for all commodities.
12. A leak detecting feature shall be available to discover water and air pressure leaks.
13. Load disaggregation shall be available for commodity meters, to disaggregate total commodity costs.
14. The cloud-based system shall alarm via email on a new predicted peak demand at each metered circuit up to three days in advance, enabling proactive load management. Predicted demand must use artificial intelligence and machine learning and must predict a new peak demand at least 3 days in advance. The system shall also send alarm emails on power quality events, waveform capture, out of limit conditions, and commodity leak detection.
15. The cloud-based system shall have a reporting feature that lets the user set up and generate reports:
    * + 1. There shall be pre-designed report templates.
        2. The user shall be able to customize reports.
        3. The user shall be able to report on any meter data channels from any enterprise meter.
        4. The user shall be able to add multiple calculations to the report (aggregation, averaging, etc.).
16. The cloud-based system shall have C-Suite-level reports that analyze energy efficiency and power quality risk to identify worst buildings and circuits in the enterprise.
    * + 1. There shall be single page summary, facility benchmark, and single facility detailed reports.
        2. Single facility reports shall offer analysis of all facility circuits.
        3. Reports shall be of two types – cost management, designed to increase energy efficiency and risk mitigation, designed to increase power quality and safety of the power system.
        4. Reports shall grade enterprise facilities based on energy efficiency and power quality risk.
        5. Reports shall contain graphs and tables detailing the energy efficiency and power quality for the enterprise.
        6. Reports shall be viewable in the cloud-based application and be downloadable as a PDF file.
        7. User shall be able to schedule reports for automatic emailing to multiple email addresses.
17. The cloud-based system shall have a scheduler to facilitate emailing of reports and alarm emails. All alarm emails shall link back to the original event in the system via a hyperlink located within the email.
18. The cloud-based system shall provide advanced cyber security.
    * + 1. All web services shall be behind a web application firewall.
        2. There shall be no direct access to user databases.
        3. The system data shall be fully secured through an HTTPS secure socket layer.
        4. Encrypted and salted passwords and API keys shall be used when collecting data to the system.
        5. There shall be an Admin user who is able to set up and make changes to facilities, meters, and other user accounts.
        6. User access to facility data shall be configurable to limit access.
        7. Security audit logs shall be stored.
        8. There shall be dual factor authentication using a 128-bit encrypted key sent over email or text message to prevent fraudulent account access.
        9. Data shall be stored at the customer facility and in the cloud.
19. The cloud-based system shall have a meter management software with configuration and a data collection component.
    * + 1. The meter management component shall auto-discover and download all stored logs from networked meters. The software shall also group the meters to facilitate meter management.
        2. The meter management component shall upload meter data to the cloud automatically at programmable intervals.
        3. The meter management component shall periodically perform health check scans of network meters.
        4. The meter management component shall support automatic detection analytics of meter wiring and installation errors.
        5. The meter management component shall maintain error logs and status logs and provide diagnostic tools for forensic analysis of the complete energy system’s integrity.
        6. The configuration component shall enable local and remote meter configuration.
        7. The configuration component shall enable trending of data, including all measured parameters.
        8. The data collection component shall have memory for storing trending and power quality data.
        9. There shall be a log viewer to facilitate trending and power quality analysis.
        10. The cloud-based system shall support API for exporting the system’s data in a JSON format.
20. The system shall have a billing component. The billing component shall support:
    * + 1. Detailed rate structure configuration, including peak and off-peak periods for up to four seasons, weekend and holiday rates, fixed charges, coincident peak demand, and tiered rates.
        2. Usage totalization at a location.
        3. Measurement of energy usage and commodities such as steam, water, gas, etc.
        4. Automatic generation of custom designed monthly usage billing and/or invoicing.
    1. System shall be Electro Industries/GaugeTech model:  
       ENERGYPQA-1Y – Cloud-based energy management system.
       1. No substitutions allowed. Ordering chart is shown below.

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| --- | --- | --- | --- |
| **Software Module** | **Description** | **Model Number** | **Details** |
| EnergyPQA.com® System | Cloud-based energy management solution  (10 meter minimum) | EnergyPQA-1Y | Enterprise-wide cloud energy management (one year license) |

* + 1. For specification information, contact:

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