Digital Power and ISO 50001

Continuously improving energy performance with a systematic approach

Kevin Huang
PME Global Offer Marketing Owner

Life Is On Schneider Electric

It has been proven that energy performance can be improved!

3M – 5 US locations		HILTON WORLDWIDE – 5,100+ hotel globally		Google – Globally	
7.7%	Avg energy performance improvement over 2012 - 2015	18.6%	Avg energy performance improvement over 2008 - 2016	24%	Decrease in carbon intensity over 2013 - 2016
$2.4M	Total energy cost saving per year	$783M	Total energy cost saving	>$1B	Total energy cost saving to date
0.13 Year	Payback period on implementation	<1 Year	Payback period on implementation	<1 Year	Payback period on implementation
485K GJ	Total energy saving	5.8M GJ	Total energy saving	3.8M tCO2e	Total CO2 emission reduction
94.8K Metric Tons	Total CO2 emission reduction	770K Metric Tons	Total CO2 emission reduction		

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Note: these are not PME case studies but case studies on Better Buildings, see reference slide

It has been proven that energy performance can be improved!

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5 US locations	5,100+ hotel globally	Globally

A systematic approach to develop an efficiency policy, analyze energy use, measure results and review policy effectiveness to continue improve

ISO 50001 ENERGY MANAGEMENT

According to case studies on Better Buildings, see reference slide

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ISO 50001

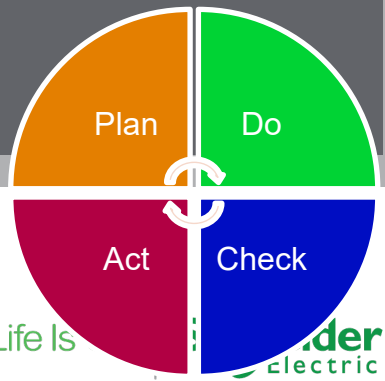
What is ISO 50001?

ISO 50001 is an International standard for Energy Management Systems. It specifies the requirements for establishing, implementing, maintaining and improving an energy management system.

How to improve energy performance with ISO 50001?

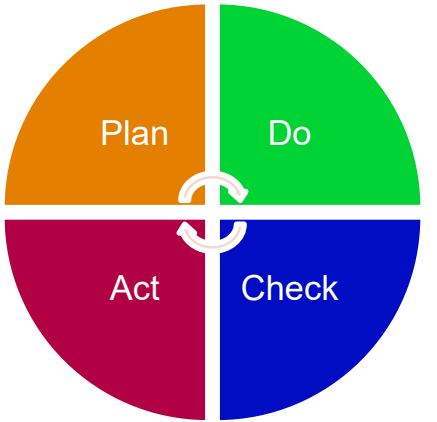
Based on the Plan-Do-Check-Act (PDCA), ISO 50001 provides a framework of requirements for organizations to

- Develop a policy for more efficient use of energy
- Fix targets and objectives to meet the policy
- Use data to better understand and make decisions about energy use
- Measure the results
- Review how well the policy works, and
- Continually improve energy management



ISO 50001, ISO 50002 and ISO 50006

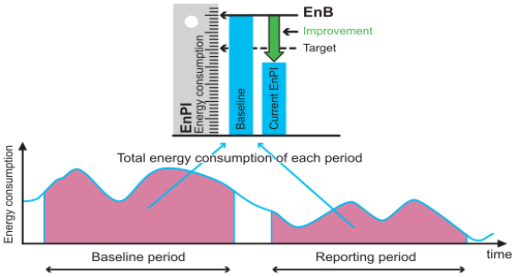
ISO 50001: Energy Management Systems



Complementary to ISO 50001

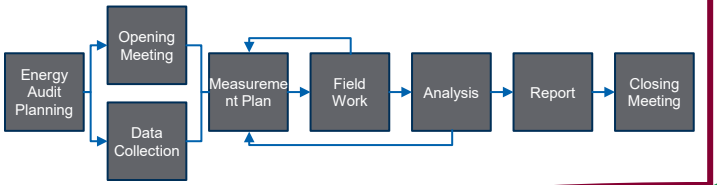
ISO 50006: Measuring Energy Performance

Measuring energy performance using energy baselines (EnB) and energy performance indicators (EnPI)



ISO 50002: Energy Audit

finding energy performance improvement opportunities



Certification to ISO 50001

Certification to ISO 50001 is possible but not obligatory.

An organization may decide to implement a system and process to improve energy performance according to the ISO 50001 standard for their own benefits

OR

An organization may decide to get ISO 50001 certification to prove to external parties they have implemented an energy management system complied with the requirements in ISO 50001 standards

Digital Power and ISO 50001

Digital Power and ISO 50001

Having Digital Power connected products and edge control software does not grant your facility the ISO 50001 certification. PME and DP connected products are certified data management system to help you continuously improve your facility's energy performance according to requirements in the ISO 50001 standard.

DP Certification to ISO 50001, ISO 50002 and ISO 50006

PME, Power Operation with Advanced Reports, Power Advisor along with Digital Power devices is Certified Energy Data Management System according to the ISO 50001, ISO 50002 and ISO 50006 International Standards to

- Collect and analyze energy performance data of a facility
- Provide appropriate data for energy audit
- Enable organization to implement action plans to improve energy performance based on review of energy audit

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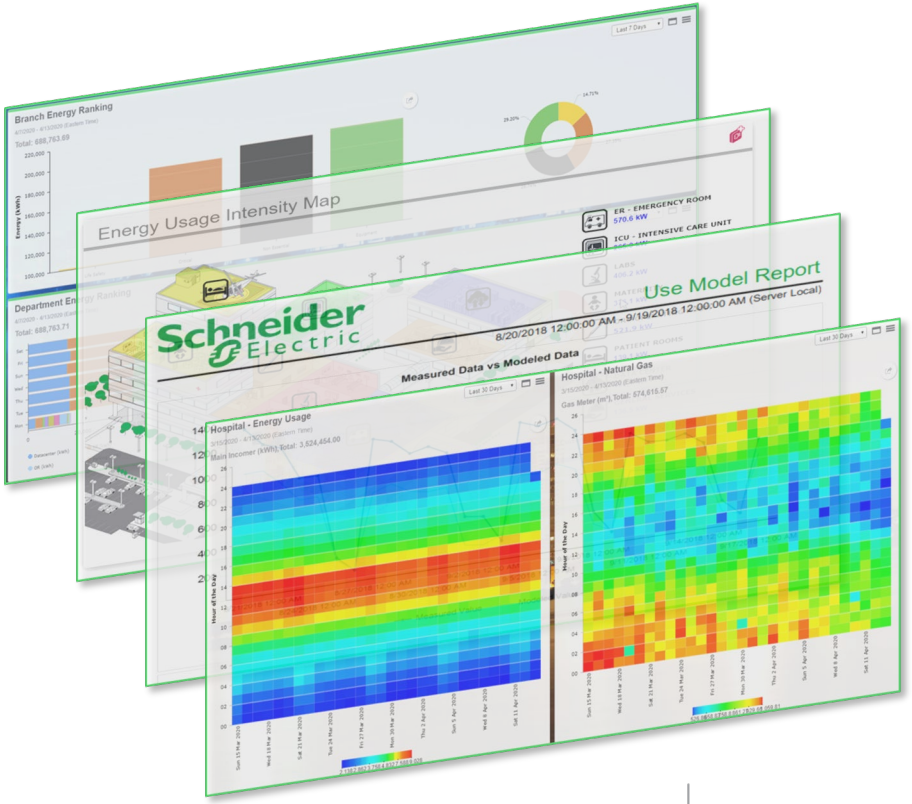
Energy Data Management System
Regular Surveillance
www.tuv.com
ID 0000043060



Link to Certificate

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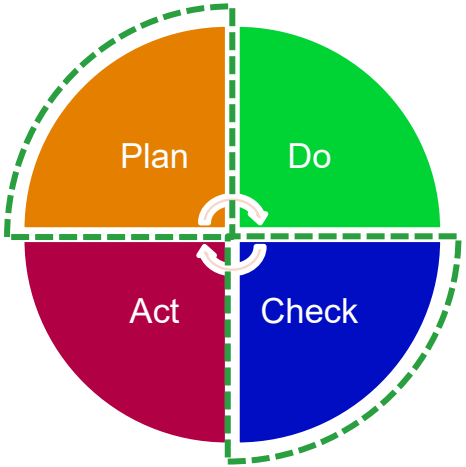
Energy Management is simple with Digital Power

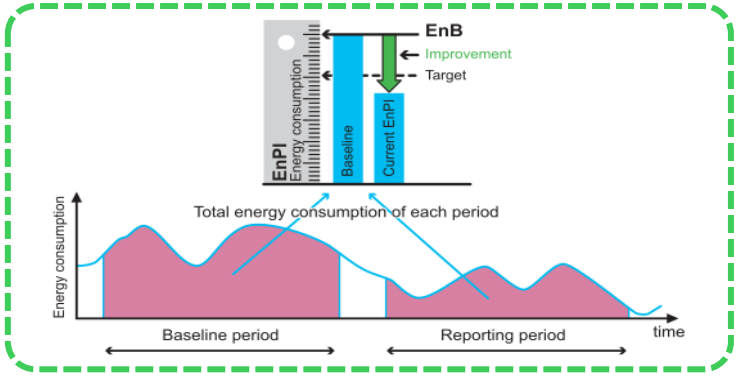
ISO 50001

Energy Management Systems



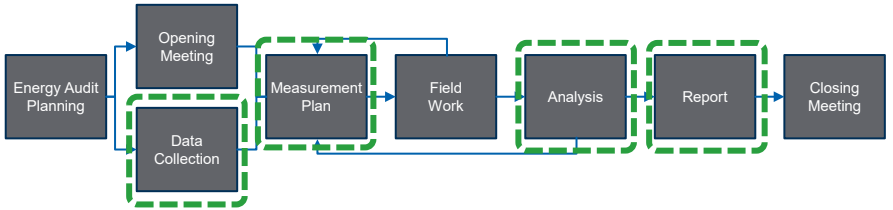
ISO 50006

Measuring Energy Performance



ISO 50002

Energy Audit



Connected Devices

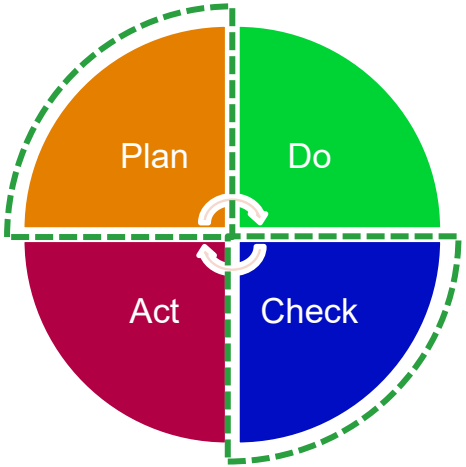
PME
PSO with Advanced Reports

Power Advisor

Energy Management Systems with Digital Power Devices

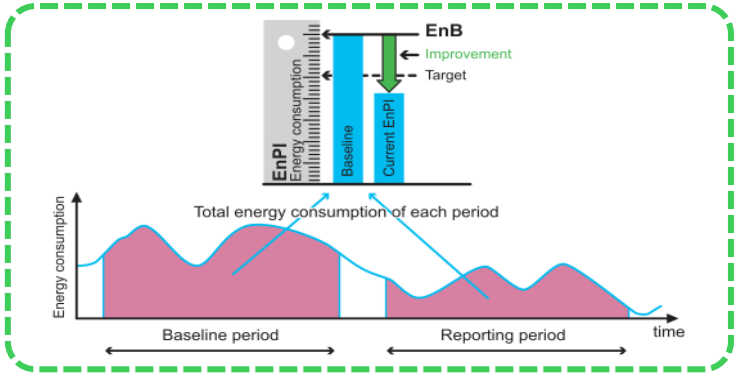
ISO 50001

Energy Management Systems



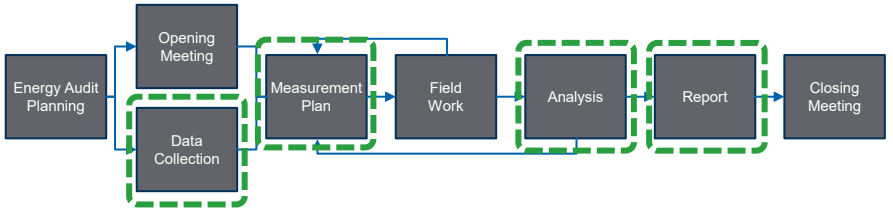
ISO 50006

Measuring Energy Performance



ISO 50002

Energy Audit



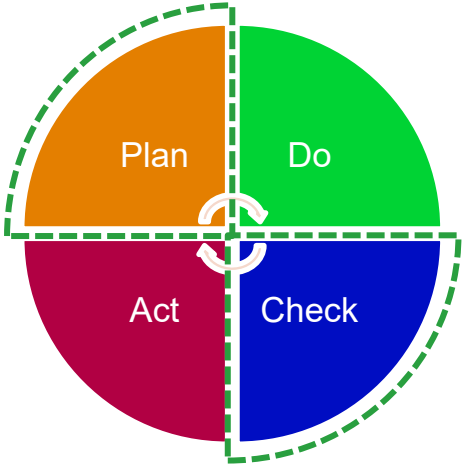
Consumption data from every level of your electrical distribution network

- EGX100/300 Com'X 210/510
- iEM2000 iEM3000 Series
- PM5000 Series
- PM8000 Series
- ION8600 Series
- ION9000 Series
- ION7x50 Series
- Compact NSX Series
- Masterpact NT/NW/MTZ Series

Energy Management Systems with Power Advisor

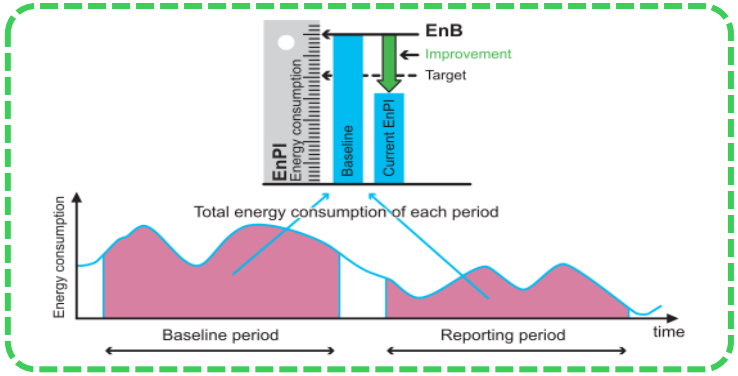
ISO 50001

Energy Management Systems



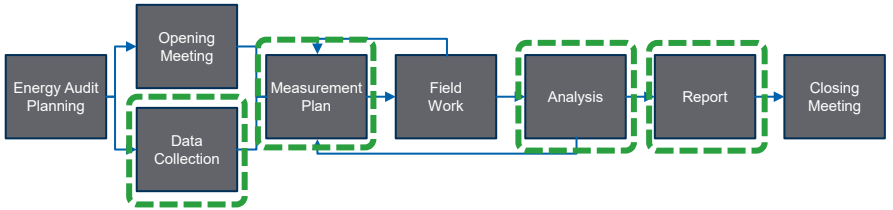
ISO 50006

Measuring Energy Performance



ISO 50002

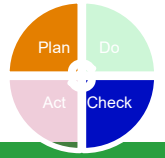
Energy Audit



Data Quality Analytics

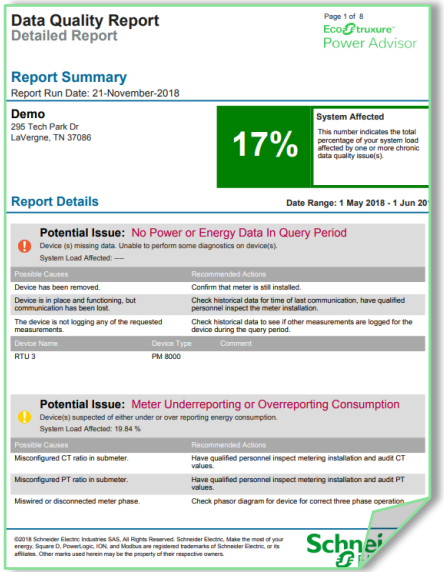
- Data Quality Detailed Report
- Data Quality Workflow Report
- Data Quality Executive Summary Report
- Data Quality Comparison Report

Energy Management Systems w/ PA Data Quality Analytics



Consumption can't be analyzed effectively without quality energy data

Identify possible causes and how to correct issues with the Data Quality Detailed Report


Data Quality Report
Detailed Report
Page 1 of 8
EcoStruxure Power Advisor
Report Summary
Report Run Date: 21-November-2018
Demo
295 Tech Park Dr
LaVergne, TN 37086
17%
System Affected
This number indicates the total percentage of your system load affected by one or more chronic data quality issue(s).
Report Details
Date Range: 1 May 2018 - 1 Jun 20
Potential Issue: No Power or Energy Data In Query Period
Device (s) missing data. Unable to perform some diagnostics on device(s).
System Load Affected: —
Possible Causes | Recommended Actions
Device has been removed. | Confirm that meter is still installed.
Device is in place and functioning, but communication has been lost. | Check historical data for time of last communication, have qualified personnel inspect the meter installation.
The device is not logging any of the requested measurements. | Check historical data to see if other measurements are logged for the device during the query period.
Device Name | Device Type | Comment
RTU 3 | PM 8000
Potential Issue: Meter Underreporting or Overreporting Consumption
Device(s) suspected of either under or over reporting energy consumption.
System Load Affected: 19.84 %
Possible Causes | Recommended Actions
Misconfigured CT ratio in submeter. | Have qualified personnel inspect metering installation and audit CT values.
Misconfigured PT ratio in submeter. | Have qualified personnel inspect metering installation and audit PT values.
Miswired or disconnected meter phase. | Check phasor diagram for device for correct three phase operation.
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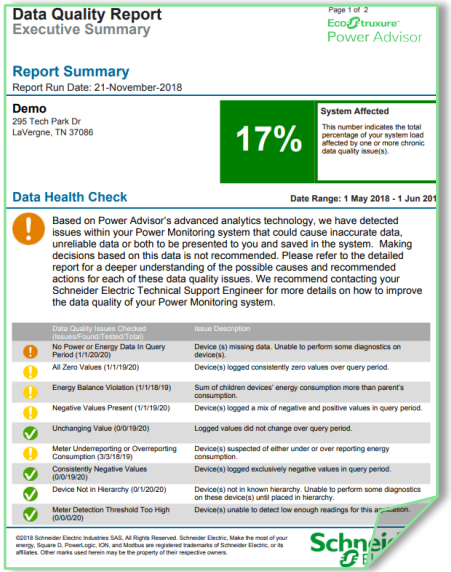
Understand quality of your data at a glance with Data Quality Executive Report


Data Quality Report
Executive Summary
Page 1 of 2
EcoStruxure Power Advisor
Report Summary
Report Run Date: 21-November-2018
Demo
295 Tech Park Dr
LaVergne, TN 37086
17%
System Affected
This number indicates the total percentage of your system load affected by one or more chronic data quality issue(s).
Data Health Check
Date Range: 1 May 2018 - 1 Jun 201
Based on Power Advisor's advanced analytics technology, we have detected issues within your Power Monitoring system that could cause inaccurate data, unreliable data or both to be presented to you and saved in the system. Making decisions based on this data is not recommended. Please refer to the detailed report for a deeper understanding of the possible causes and recommended actions for each of these data quality issues. We recommend contacting your Schneider Electric Technical Support Engineer for more details on how to improve the data quality of your Power Monitoring system.
Data Quality Issues Checked (Issues/Found/Tested/Total) | Issue Description
No Power or Energy Data In Query Period (1/1/20/20) | Device (s) missing data. Unable to perform some diagnostics on device(s).
All Zero Values (1/1/19/20) | Device(s) logged consistently zero values over query period.
Energy Balance Violation (1/1/18/19) | Sum of children devices' energy consumption more than parent's consumption.
Negative Values Present (1/1/19/20) | Device(s) logged a mix of negative and positive values in query period.
Unchanging Value (0/0/19/20) | Logged values did not change over query period.
Meter Underreporting or Overreporting Consumption (3/3/18/19) | Device(s) suspected of either under or over reporting energy consumption.
Consistently Negative Values (0/0/19/20) | Device(s) logged exclusively negative values in query period.
Device Not in Hierarchy (0/1/20/20) | Device(s) not in known hierarchy. Unable to perform some diagnostics on these device(s) until placed in hierarchy.
Meter Detection Threshold Too High (0/0/0/20) | Device(s) unable to detect low enough readings for this application.
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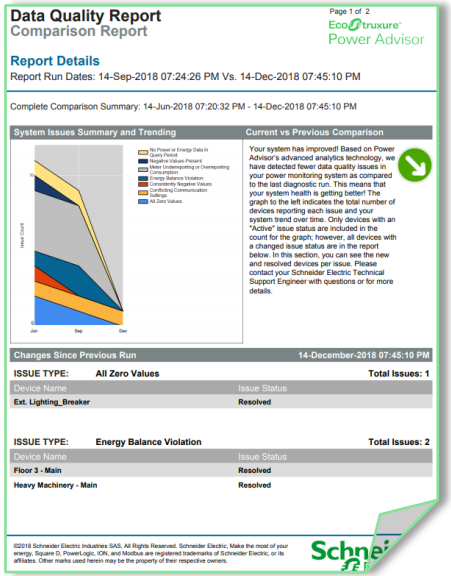
Measure improvement of data quality with Data Quality Comparison Report


Data Quality Report
Comparison Report
Page 1 of 2
EcoStruxure Power Advisor
Report Details
Report Run Dates: 14-Sep-2018 07:24:26 PM Vs. 14-Dec-2018 07:45:10 PM
Complete Comparison Summary: 14-Jun-2018 07:20:32 PM - 14-Dec-2018 07:45:10 PM
System Issues Summary and Trending
Current vs Previous Comparison
Your system has improved! Based on Power Advisor's advanced analytics technology, we have detected fewer data quality issues in your power monitoring system as compared to the last diagnostic run. This means that your system health is getting better! The graph to the left indicates the total number of devices reporting each issue and your system trend over time. Only devices with an "Active" issue status are included in the count for the graph; however, all devices with a changed issue status are in the report below. In this section, you can see the new and resolved devices per issue. Please contact your Schneider Electric Technical Support Engineer with questions or for more details.
Changes Since Previous Run
14-December-2018 07:45:10 PM
ISSUE TYPE: All Zero Values
Total Issues: 1
Device Name | Issue Status
Ext. Lighting_Breaker | Resolved
ISSUE TYPE: Energy Balance Violation
Total Issues: 2
Device Name | Issue Status
Floor 3 - Main | Resolved
Heavy Machinery - Main | Resolved
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Learn more about Power Advisor and its Data Quality Analytics

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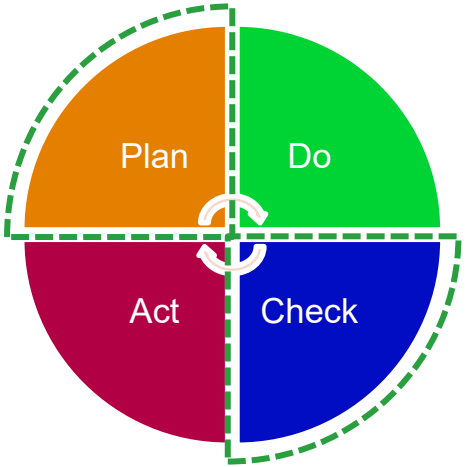
Energy Management is simple with PME and EPO w/ AR

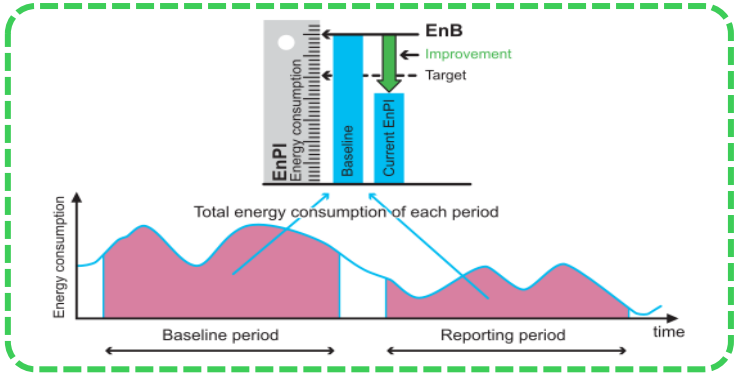
ISO 50001

Energy Management Systems



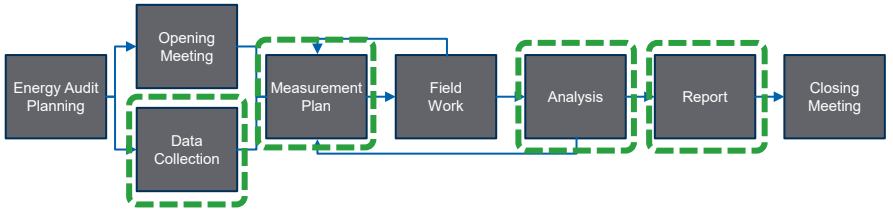
ISO 50006

Measuring Energy Performance



ISO 50002

Energy Audit



- Energy Data Collection
- Energy Monitoring
- Energy Alarms
- Pareto Charts
- Sankey Charts
- Energy Heat Maps
- Energy Modeling
- Energy KPI Gadget
- Energy Calendar Report

Certification to ISO 50001, ISO 50002 and ISO 50006

Scope of Certification – PME and EPO with AR

The system components as specified before verifiably support compliance with the requirements of ISO standards

ISO 50001	ISO 50002	ISO 50006
Chapters: • 4.4.3 a), b) Energy review • 4.4.4 Energy baseline • 4.4.5 Energy performance indicators • 4.5.5 Operation control • 4.6.1 Monitoring, measurement and analysis • 4.7.2 c) Input to management review	Chapters: • 5.4 a), c) Data collection • 5.5 a) Measurement plan • 5.7.2 Analysis • 5.8.2 c) 1, 2 Energy audit reporting	Chapters: • 4.2 Obtaining relevant energy performance information from energy review • 4.3 Identifying energy performance indicators

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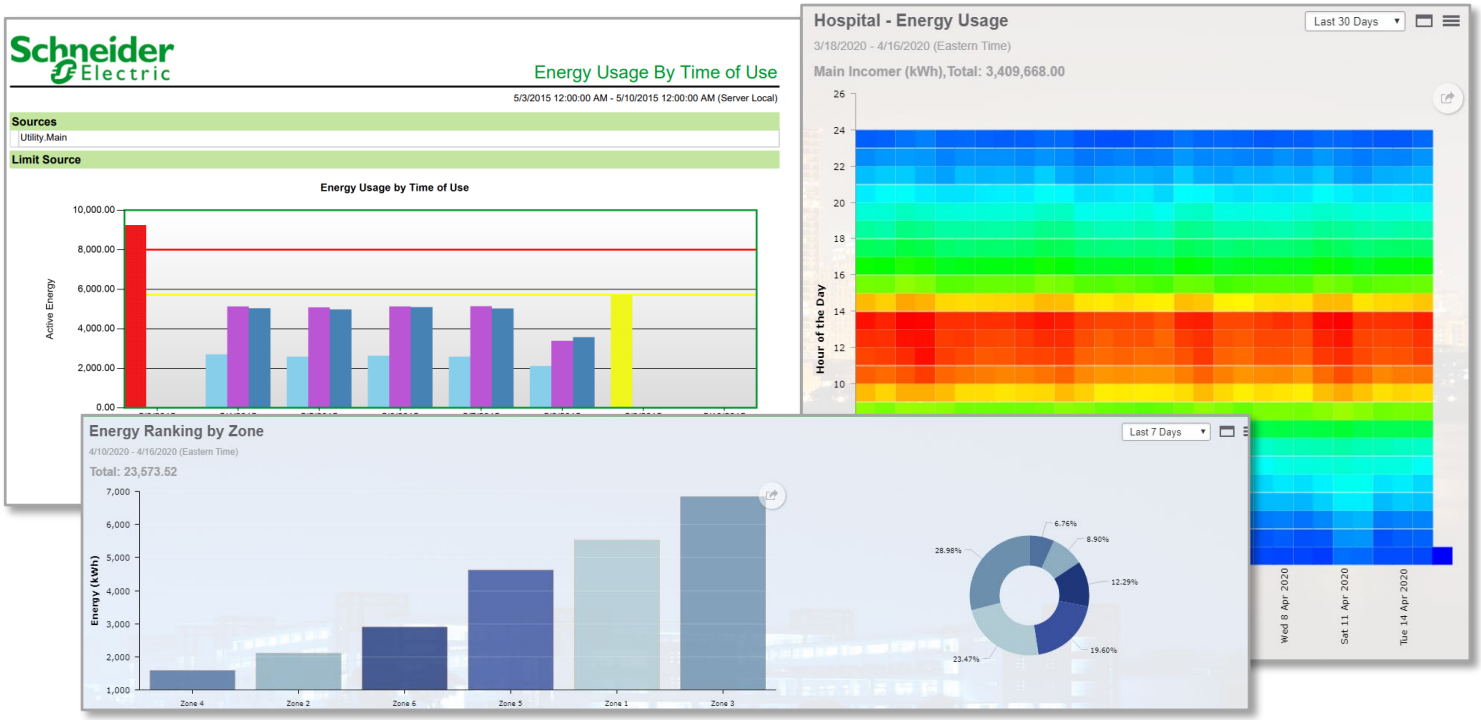
Energy Management Systems with PME & EPO w/ AR

Planning

- Establish energy policy
- Conduct energy review
- Set objectives and energy targets

Analyze energy use	Establish energy baseline (EnBs)	Identify energy performance indicator (EnPIs)

Evaluate past and current energy use and identify areas of significant energy use



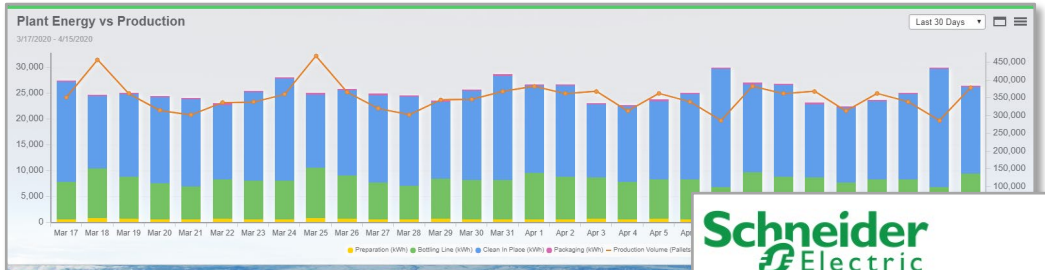
Energy Management Systems with PME & EPO w/ AR

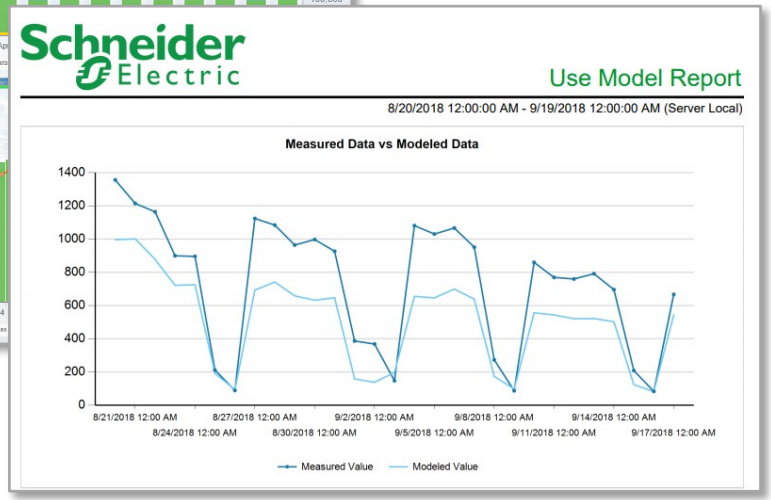
Planning

- Establish energy policy
- Conduct energy review
- Set objectives and energy targets

Analyze energy use	Establish energy baseline (EnBs)	Identify energy performance indicator (EnPIs)

Identify variables affecting energy performance and estimate future energy use





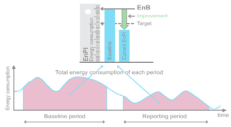
Energy Management Systems with PME & EPO w/ AR

Planning

- Establish energy policy
- Conduct energy review
- Set objectives and energy targets

Analyze energy use | Establish energy baseline (EnBs) | Identify energy performance indicator (EnPIs)

Measure energy performance changes against energy baseline



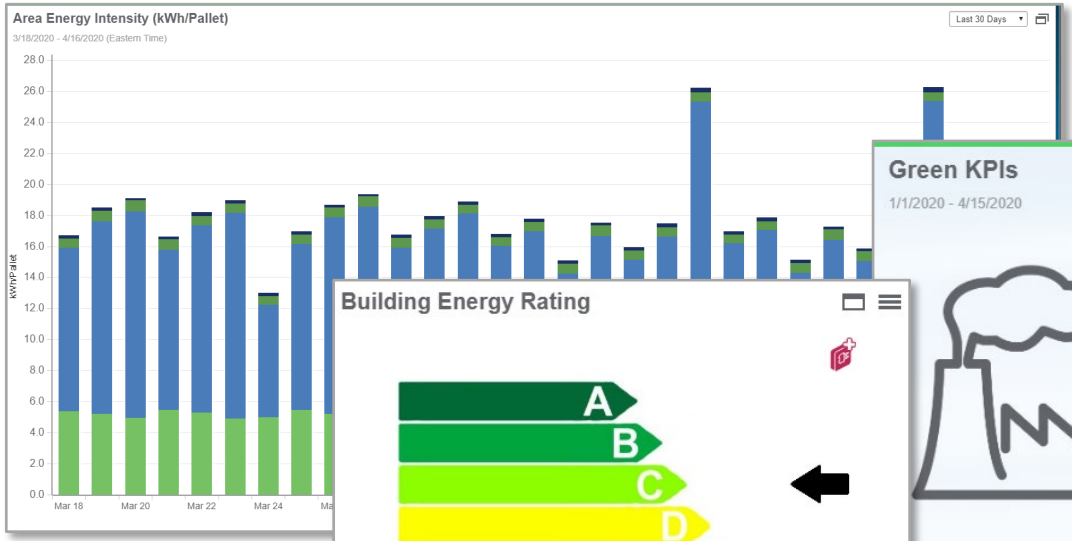
Energy Management Systems with PME & EPO w/ AR

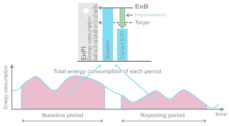
Planning

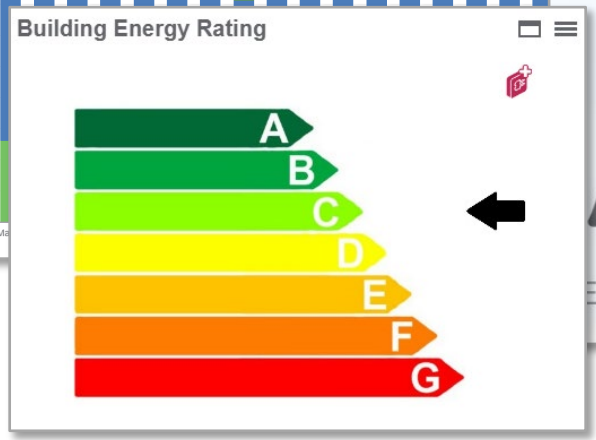
- Establish energy policy
- Conduct energy review
- Set objectives and energy targets

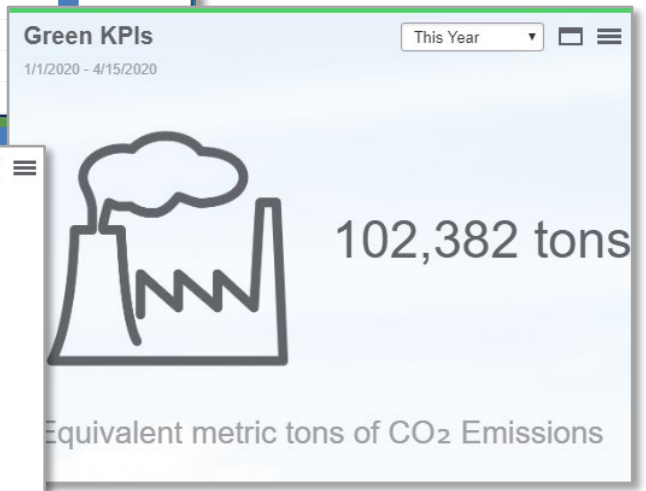
Analyze energy use	Establish energy baseline (EnBs)	Identify energy performance indicator (EnPIs)

Gauge the effectiveness of energy management efforts







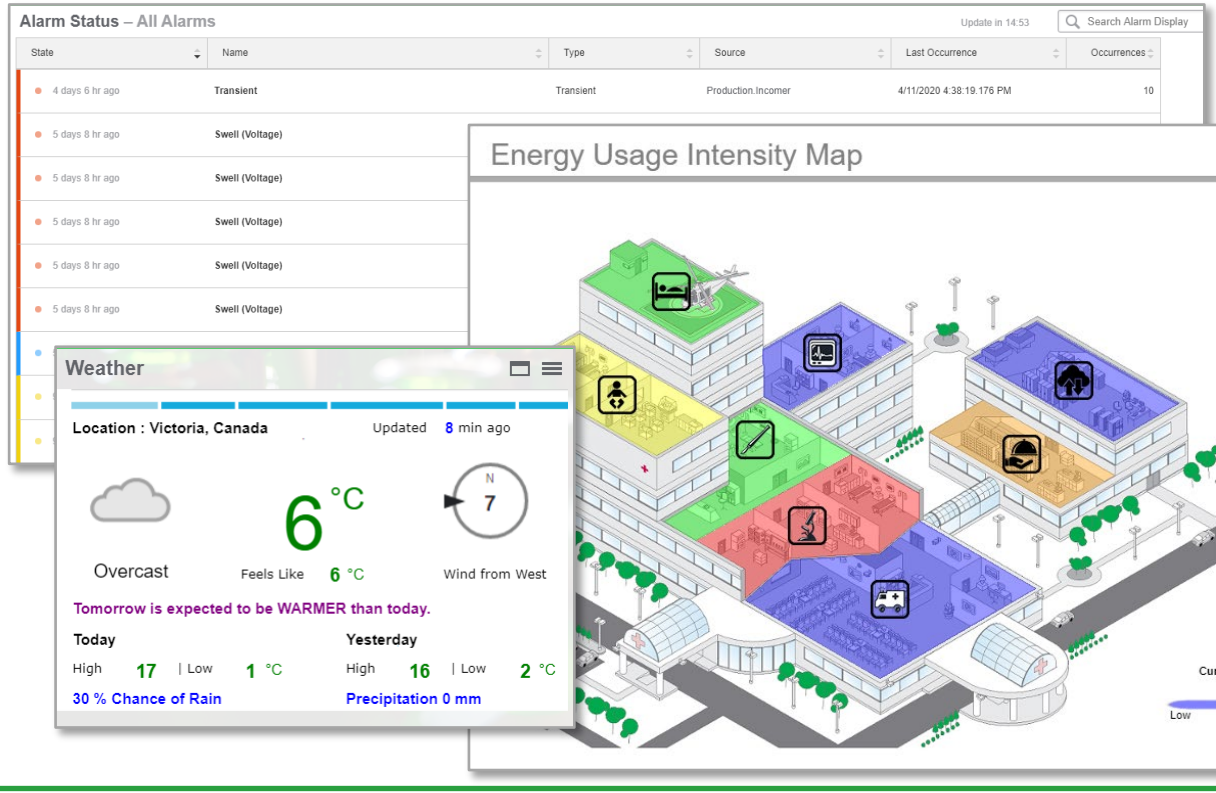


Energy Management Systems with PME & EPO w/ AR

Checking

- Monitoring
- Analysis
- Audit

Monitor energy use so that corrective action could be perform

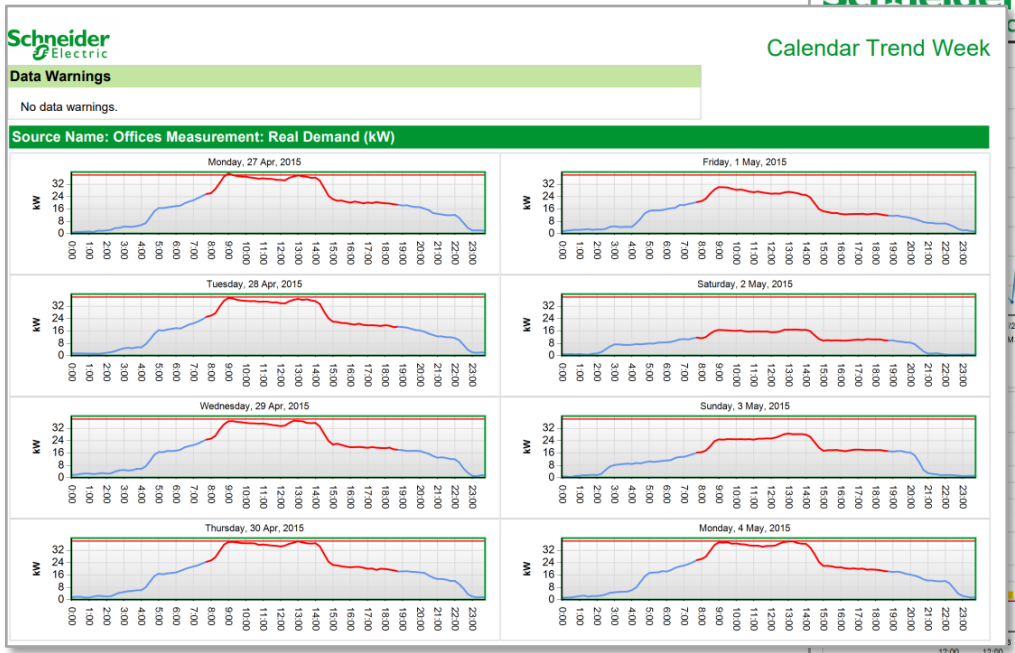


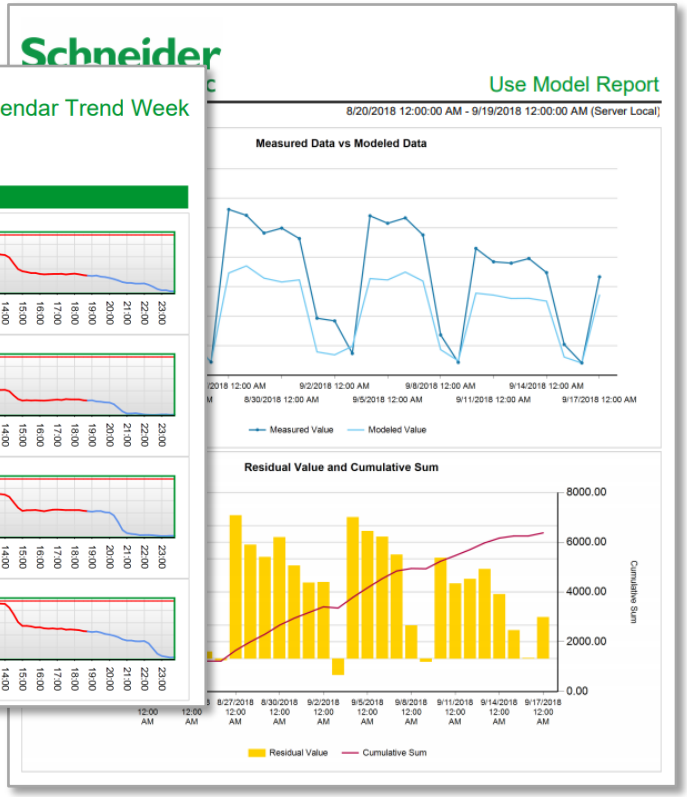
Energy Management Systems with PME & EPO w/ AR

Checking

- Monitoring
- Analysis
- Audit

Analyze energy use to allow preventive action if needed



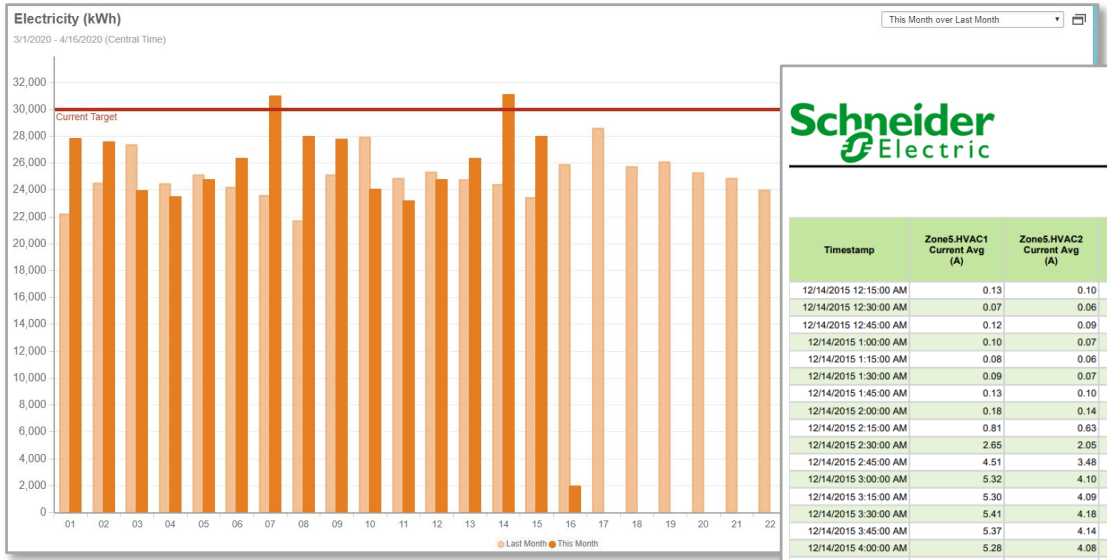


Energy Management Systems with PME & EPO w/ AR

Checking

- Monitoring
- Analysis
- Audit

Present appropriate data for analysis of current energy performance for management review



Schneider Electric

Tabular

12/14/2015 12:00:00 AM - 12/21/2015 12:00:00 AM (Server Local)

Timestamp	Zone5.HVAC1 Current Avg (A)	Zone5.HVAC2 Current Avg (A)	Zone5.HVAC3 Current Avg (A)	Zone5.HVAC4 Current Avg (A)	Zone5.HVAC5 Current Avg (A)
12/14/2015 12:15:00 AM	0.13	0.10	0.58	0.93	0.20
12/14/2015 12:30:00 AM	0.07	0.06	0.32	1.04	0.11
12/14/2015 12:45:00 AM	0.12	0.09	0.52	0.95	0.18
12/14/2015 1:00:00 AM	0.10	0.07	0.44	0.99	0.15
12/14/2015 1:15:00 AM	0.08	0.06	0.01	1.19	0.13
12/14/2015 1:30:00 AM	0.09	0.07	0.78	1.59	0.14
12/14/2015 1:45:00 AM	0.13	0.10	1.41	1.91	0.20
12/14/2015 2:00:00 AM	0.18	0.14	1.60	2.02	0.27
12/14/2015 2:15:00 AM	0.81	0.63	2.33	2.51	1.22
12/14/2015 2:30:00 AM	2.65	2.05	2.40	2.94	4.01
12/14/2015 2:45:00 AM	4.51	3.48	2.50	3.39	6.79
12/14/2015 3:00:00 AM	5.32	4.10	2.37	3.52	8.03
12/14/2015 3:15:00 AM	5.30	4.09	2.20	3.83	8.00
12/14/2015 3:30:00 AM	5.41	4.18	2.76	4.87	8.17
12/14/2015 3:45:00 AM	5.37	4.14	2.61	5.61	8.11
12/14/2015 4:00:00 AM	5.28	4.08	2.22	5.83	7.98
12/14/2015 4:15:00 AM	5.26	4.06	2.53	6.15	7.94
12/14/2015 4:30:00 AM	5.23	4.04	3.19	6.92	7.91
12/14/2015 4:45:00 AM	5.24	4.05	4.01	7.74	7.92
12/14/2015 5:00:00 AM	5.15	3.97	4.01	7.94	7.78
12/14/2015 5:15:00 AM	5.18	4.00	4.54	8.38	7.83
12/14/2015 5:30:00 AM	5.23	4.04	5.63	9.28	7.90
12/14/2015 5:45:00 AM	5.15	3.98	6.18	9.96	7.78
12/14/2015 6:00:00 AM	5.14	3.97	6.50	10.31	7.76
12/14/2015 6:15:00 AM	5.17	3.99	7.36	11.46	7.81

References

- Energy management case studies on Better Buildings
  - https://betterbuildingssolutioncenter.energy.gov/iso-50001/resources/case-studies
- Natural Resources Canada on ISO 50001
  - https://www.nrcan.gc.ca/energy-efficiency/energy-efficiency-industry/energy-management-industry/iso-50001-energy-management-systems-standard/20405