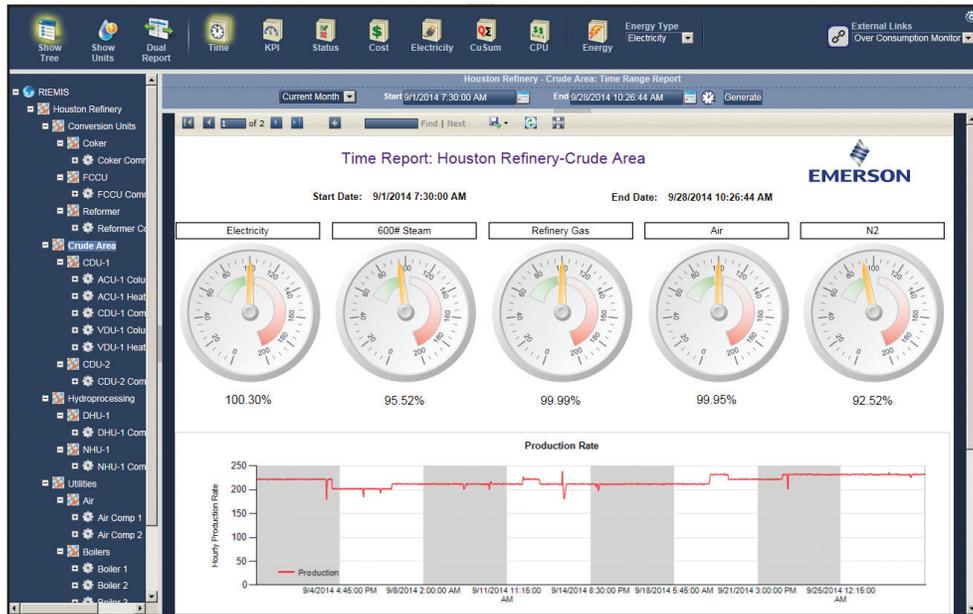


Energy Advisor



Reduce energy consumption and increase energy visibility with Energy Advisor

- Manage energy targets with up-to-the minute information across multiple Energy Account Centers (EAC's).
- Easily aggregate and make valuable information visible to key stakeholders.
- Reveal new savings opportunities down to individual energy consumers.

Introduction

To better manage site energy consumption and costs, organizations need an accurate way to visualize where and how energy is being consumed. Once there is a clear picture, this information can be analyzed in order to take immediate action on over-consumption events, identify and prioritize energy saving projects, and track improvement over time.

Improving energy conservation can require a cultural shift that starts from the top and permeates down through the organization. All site personnel can affect the energy footprint, so a consistent way to measure, track and highlight good or bad energy performance is critical to achieving energy optimization goals.

Initial questions that must be addressed include: Are the right measurements present? Can the underlying data be trusted? Is it current? Is it accurate? Most organizations do a good job measuring at the boundary limits of their site, but often there is little detail about what is happening inside the plant as to which processes are causing energy usage to go up or down.

Energy Advisor is a real-time Energy Management Information System (EMIS) that automates the process of mapping and managing energy consumption, across a site, as it is being consumed. Real-time alerts, dashboards and emails notify decision-makers when energy consumption is above expected so that actions may be taken to drive down energy costs.

Energy Advisor empowers key stakeholders in an organization to:

- Reduce total energy costs by 5% – 10%.
- Establish, track and maintain real and achievable targets for energy reduction.
- Implement a positive corporate social responsibility program towards energy and emissions reduction.

Energy Advisor integrates seamlessly with current site control, SCADA and/or enterprise systems, allowing implementation of an EMIS solution in a straight forward and cost-effective manner.

Emerson can also provide the means to obtain needed energy measurements by specifying and delivering best-in-class wired or wireless devices. With wireless technology, the cost of measurement implementation can be reduced by two thirds, allowing any missing flow, pressure and/or temperature instruments to be brought back to the monitoring system cost-effectively.

Benefits

With Energy Advisor a site can take active control of energy use. It can be leveraged to turn one of the highest variable costs of operation into a managed expense. The benefits of the solution can be felt across all levels of the organization:

On the plant floor:

Obtain a real-time view of energy consumption.

This means having information to make decisions that can immediately make a positive impact on the organization's bottom line.

Create automatic notifications. Alerts allow action to be taken quickly when there is an energy over-consumption event, such that the negative impact can be limited.

Monitor equipment/unit performance. Know when equipment is beginning to deteriorate (i.e. foul) and draw more energy than optimal by comparing actual use to consumption targets.

Identify common root causes. Track and allocate over-consumption events to root causes in order that strategies to solve recurring high energy use issues can be developed.

At the executive level:

Turn energy into a managed expense. Understand the impact of energy on profitability and integrate production plans with energy procurement.

Forecast revenue, expenses, and profits with more accuracy. Use historical energy consumption data to predict and manage future consumption.

Take proactive steps towards energy management and corporate social responsibility. Reduce site impact on the environment by minimizing energy waste.

Product Description

Energy Advisor is built to receive energy measurement data and present it in a way that enables impactful decisions to be made quickly, without wasting time on data manipulation and complex calculations. The current state of site energy consumption can be easily understood and a simple roadmap can be accessed that highlights trouble spots. Energy Advisor is rich in features that allow smarter real-time energy decisions to be made for a site:

- Meets requirements to monitor, target, and report per the ISO 50001 energy standard.
- Aggregates data from any PLC, DCS or data historian.
- Web based user and configuration interface.
- Flexible and scalable – up to 5 levels of plant hierarchy for organizing energy use.
- Provides automatic roll-up of energy data to units, areas and sites in the hierarchy.
- Powerful analytical reports that build themselves regardless of plant hierarchy.
- Uses site process historical data or Emerson's first-principal models to derive target energy equations.
- Provides real-time calculations for target energy for each Energy Account Center and energy type.
- Creates automatic notifications and event logs for each over-consumption event for user review and action.
- Integrates seamlessly with MS Excel and other common reporting tools.
- Easy-to-use configuration tool – simple, scalable and sustainable.

Energy Advisor Reports

Energy Advisor provides an easy-to-use reporting package that works with any configured hierarchy structure. Changes to the hierarchy after initial configuration do not require any modifications to the report package. Standard reports are available on demand to multiple users via a web-based interface or on a scheduled frequency (printed and/or stored in a file).

Additional custom reports may be provided at the time of initial configuration or developed later using standard tools.

Users select from a list of reports available for an object in the hierarchy structure of the plant based on the context of the object (e.g. if in an Area view the dialog will show the list of Units. In a Unit view the list of Equipment is presented, and so on). Users pick a report type, the Area/Unit/Equipment to be reported on, as well as the time period, engineering units and increments for the report.

The following are available as standard reports:

Cost Per Unit (CPU) of Production – specific energy costs per production unit at selected hierarchy level.

Energy Key Performance Indicator (KPI) Status – real-time percentage consumption of energy use against target for each energy stream and hierarchy level (tabular format).

Energy KPI Trend – real-time percentage consumption of energy use against target for each energy stream aggregated to the selected hierarchy level.

CuSum – cumulative sum of savings against target.

Time Series – versatile trends for each energy stream at the selected hierarchy level.

Energy Cost – real-time cost of each energy stream aggregated to the selected hierarchy level.

Energy Trend – total use for a particular energy stream plotted with target for same energy.

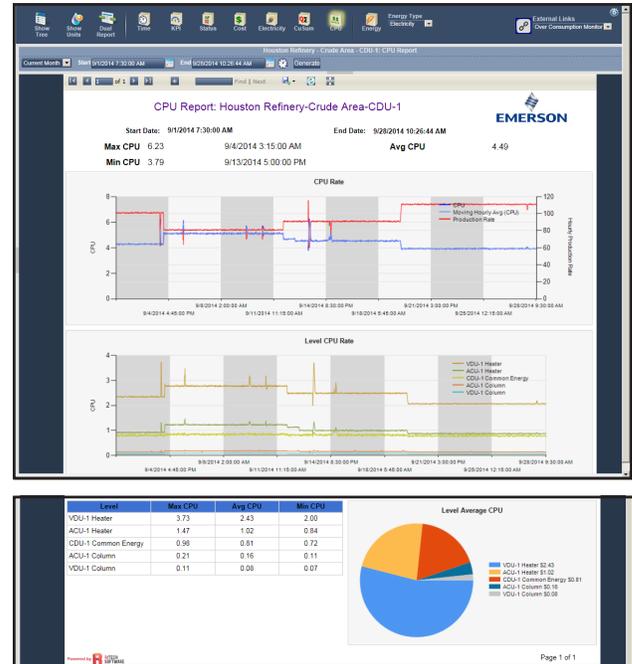
Electrical Trend – electrical use plotted against peak value for current demand period.

Electrical Demand Cost – allocates electrical usage and demand costs based on configurable contract constraint criteria for the current demand period.

The default KPI (percentage energy use versus target) can be customized with a user specific KPI calculation.

Energy Advisor is an ISO 50001 compliant solution. The standard reports help document the results of site

energy improvement activities. Information needed to support optimization of energy-relevant processes and derive new strategic goals is provided by this system.



View powerful analytic reports easily with Emerson's Energy Advisor Report Launcher

Consumption Monitoring Module

The Energy Advisor Consumption Monitoring Module allows users to identify and log root causes for energy over-consumption events. From this data, energy managers can review Pareto charts indicating the most frequent and costly reasons for energy excursions. Such root cause analysis is critical for developing strategies to address key energy difficulties that are having the largest impact on the organization's bottom line.

Start Time	End Time	Machine Centre	Duration	Comment	Reason Code	Variable	Cost
30-Dec-2013 10:30:00	30-Dec-2013 12:15:00	VDU-1 Heater Steam	00:01:45:00		Equipment malfunction	Change	6,179
30-Dec-2013 09:15:00	30-Dec-2013 11:00:00	ACU-1 Heater Steam	00:01:45:00		General failure	Change	6,065
29-Dec-2013 18:45:00	30-Dec-2013 04:00:00	ACU-1 Heater Refinery Gas	00:11:15:00		Feed stock quality	Change	79,177
29-Dec-2013 12:45:00	29-Dec-2013 14:30:00	VDU-1 Heater Refinery Gas	00:01:45:00	New supplier	Feed quality	Change	2,096
29-Dec-2013 05:00:00	29-Dec-2013 07:30:00	ACU-1 Heater Refinery Gas	00:02:30:00		Feed quality	Change	9,639
29-Dec-2013 03:00:00	29-Dec-2013 06:00:00	VDU-1 Heater Refinery Gas	00:03:00:00		Feed quality	Change	2,051
27-Dec-2013 16:00:00	27-Dec-2013 17:45:00	ACU-1 Heater Refinery Gas	00:01:45:00	New supplier	Feed stock quality	Change	2,015
27-Dec-2013 07:30:00	27-Dec-2013 09:15:00	VDU-1 Column Steam	00:01:45:00		Equipment degradation	Change	0,183
27-Dec-2013 04:45:00	27-Dec-2013 04:45:00	ACU-1 Heater Steam	00:00:00:00		Equipment degradation	Change	9,980
27-Dec-2013 03:00:00	27-Dec-2013 07:30:00	VDU-1 Heater Steam	00:04:30:00		Feed quality	Change	20,350
26-Dec-2013 15:15:00	26-Dec-2013 17:00:00	VDU-1 Heater Refinery Gas	00:01:45:00	New supplier	Feed quality	Change	0,842
26-Dec-2013 12:30:00	26-Dec-2013 14:15:00	ACU-1 Heater Steam	00:01:45:00		Equipment malfunction	Change	6,533
26-Dec-2013 09:00:00	26-Dec-2013 09:00:00	ACU-1 Heater Refinery Gas	00:01:45:00		Feed quality	Change	2,156
25-Dec-2013 17:00:00	25-Dec-2013 19:15:00	ACU-1 Heater Refinery Gas	00:02:15:00		Equipment degradation	Change	4,112
25-Dec-2013 07:45:00	25-Dec-2013 09:30:00	VDU-1 Heater Steam	00:01:45:00		Equipment degradation	Change	0,160
25-Dec-2013 03:30:00	25-Dec-2013 05:00:00	ACU-1 Heater Steam	00:02:30:00		Feed quality	Change	1,543
24-Dec-2013 15:15:00	24-Dec-2013 15:15:00	CDU-1 Electricity	00:00:00:00		Equipment malfunctions	Change	2,361
24-Dec-2013 11:30:00	24-Dec-2013 13:15:00	ACU-1 Heater Refinery Gas	00:01:45:00	Instrument has been modified	Feed quality	Change	3,801
24-Dec-2013 09:00:00	24-Dec-2013 10:45:00	CDU-1 Electricity	00:01:45:00	Sensor failure	Change	1,038	
24-Dec-2013 01:30:00	24-Dec-2013 07:15:00	CDU-1 Electricity	00:02:00:00		Change	1,920	
23-Dec-2013 18:30:00	23-Dec-2013 12:45:00	ACU-1 Heater Refinery Gas	00:00:15:00	Supplier has been notified	Feed stock quality	Change	2,233
23-Dec-2013 04:45:00	23-Dec-2013 08:30:00	ACU-1 Heater Refinery Gas	00:01:45:00		Feed quality	Change	2,247
23-Dec-2013 21:30:00	23-Dec-2013 23:15:00	CDU-1 Electricity	00:01:45:00		Catalytic activity	Change	6,684
22-Dec-2013 18:30:00	22-Dec-2013 21:00:00	VDU-1 Heater Steam	00:02:30:00		Change	10,265	
22-Dec-2013 18:30:00	22-Dec-2013 20:30:00	VDU-1 Column Steam	00:02:00:00		Change	6,217	

Over-consumption events quickly point to real saving opportunities

Users can navigate through any Energy Account Center and filter events relevant to a specific energy type on that EAC. For each event the log attributes such as:

- Start time and end time.
- Machine or equipment involved.
- Duration.

It also shows information that users have entered such as:

- Comments.
- Reason Codes for the over-consumption event.
- Variable (input) that caused the event.
- Cost of the over-consumption event.

The Consumption Monitoring Module helps to identify significant root causes of energy over-consumption and prioritize performance improvement projects. Once again, this supports the continual improvement process required by ISO 50001.

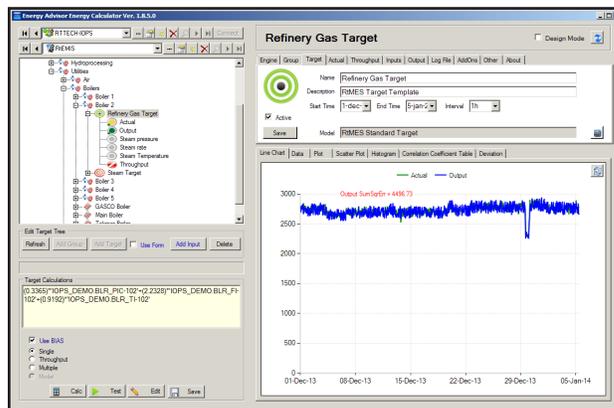
Energy Target Calculator

An essential part of any Energy Management Information System is monitoring energy use against a target. The simplest target is a constant value, usually based upon an allocation or budgeted amount. More useful targets are ones that are dynamic and change with process conditions. The Energy Calculator tool allows the user to create models that predict target energy consumption for particular energy types consumed by an energy account.

The tool can be used to create empirical models based upon historical data. The user defines which operational parameters are used to develop the equation, along with determining a period of history to analyze.

Within seconds, data are analyzed and a least square regression model is created to predict energy use based upon the desired input parameters. The tool creates an output tag and the resulting equation is used to calculate a dynamic energy target in real-time. New models can be subsequently created and tested against actual energy use and/or the previous model.

Energy Advisor also provides Standard Equipment energy consumption models that utilize an Emerson-proprietary, semi-empirical approach. These models are based on known process relationships, which are then adapted to individual instances of the equipment type.



The Energy Calculator tool develops performance equations based upon history to calculate energy targets

The necessary input parameters for the Emerson Standard Equipment models are predefined. The user simply maps these inputs to tags in the historical database. The outputs include predicted energy use, like fuel consumption on a boiler, as well as other KPIs such as boiler efficiency or produced steam cost. There are Standard Equipment models for boilers, fired heaters, heat exchangers, compressors, steam turbines and steam headers.

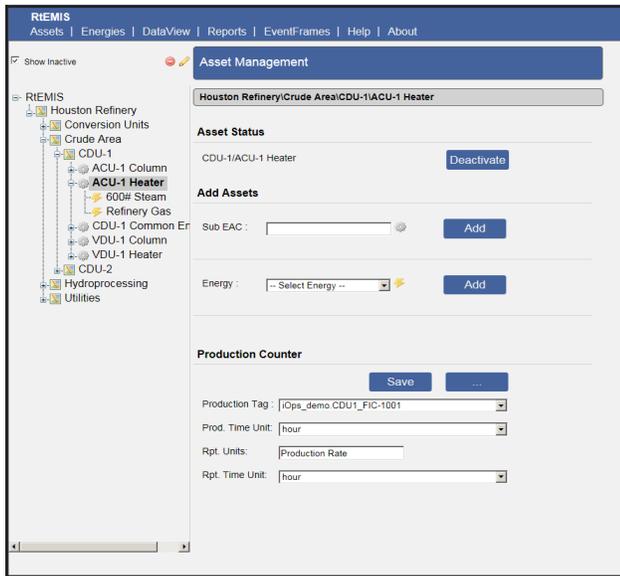
The Energy Calculator is also used to create deviation plots that provide visual indication of how the input parameters are contributing to energy use. This is a useful tool when troubleshooting an over-consumption event – the deviation plot shows which input, or inputs, contributed most to the high energy use.

Setting targets and being able to record the information that proves that these goals are being met is an important requirement of the ISO 50001 standard. The Energy Calculator can be a powerful tool to help improve energy consumption and meet this industry standard.

Configuration Toolkit

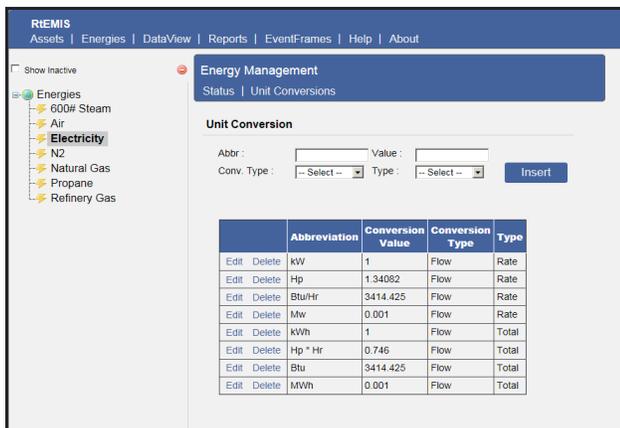
Configuration of Energy Advisor is done through a web interface called the Energy Advisor Toolkit.

The toolkit provides visibility of the site using a hierarchy structure created by the user. Up to five different levels can be defined. An Energy Account Center (EAC) represents a specific energy boundary. The EAC is the equipment, asset or unit on which primary energy tracking, both in and out, is done. An energy account can be assigned at any level of the hierarchy, but they are primarily at the lowest level, with several EAC's grouped together to form a unit.



The web based Toolkit is used to create a plant hierarchy to organize the various Energy Account Centers

Once an Energy Account Center is created, the energies produced or consumed by it are assigned either from the predefined energy types in the system or by creating a new one.



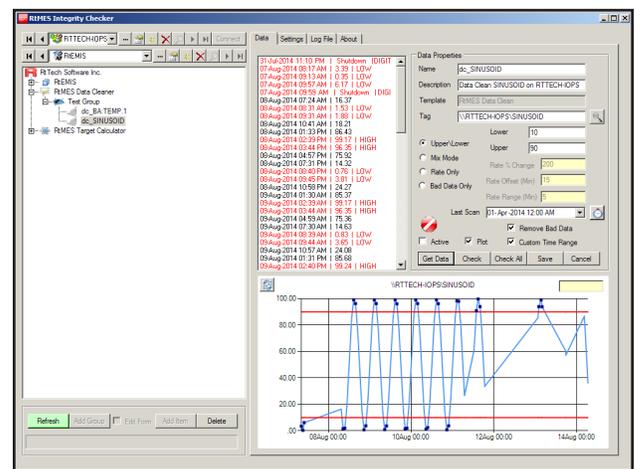
Energy Advisor allows the user to create multiple energy types in order to configure the system

Energy Advisor automatically prompts users to define the information required by each energy type. This is then used by the system to perform the calculations necessary to deliver energy performance information.

Data Integrity Checker

Energy Advisor’s Data Integrity Checker is a tool that verifies the integrity of the data before it is used for any type of energy rollup, energy target or efficiency calculation.

Data integrity checking is an automated function that cleans data received from the field by applying validity ranges, removing statistical outliers, and deleting bad data from the data stream. This cleaned data are then used by the Target Calculator and the real-time calculations, assuring that the EMIS results are based on valid data.



Data Integrity Checker removes 'bad' data and maps process data into 'clean' tags

Any (or all) energy measurement data streams can be configured for data integrity checking, creating clean data tags to be used for all energy reports and calculations. The data integrity checking tool can also create clean tags retroactively, going back in history.

Ordering Information

Energy Advisor is licensed by the number of Energy Accounts within the plant hierarchy that require energy tracking. The system does not limit

the number of energy streams to be monitored, the number of measurement values or the number of simultaneous users.

Description	
Emerson Energy Advisor with 5 Energy Account Centers	Base system requirement
License for additional Energy Account Centers	Order additional as needed

Hardware Requirements

	Small	Medium		Large	XLarge
Number of EAC's	25	50	100	500	>500*
Operating system	Server 2008 R2 (x64)				
CPU Speed (GHz)	2.4	2.4	2.4	2.4	2.8
Number of CPUs	1	2	4	4	4
Effective Number of Processors	4	8	8	16	16
RAM (GB)	8	16	32	64	128
Hard Drive (GB)	300	500	1000	1000	1000
Note: * For systems above 500 EAC's, a user may want to run the calculation engine in distributed mode with multiple server running on separate machines.					

Requirements & Recommendations

Operating Systems requirements

- Windows Server 2003 (SP1 or later), Windows Server 2008, Windows Server 2008 R2, Windows Server 2008 R2 Server Core or Windows Server 2012. Both 32 and 64-bit versions of the applicable operating systems are supported.

Notes: Windows Server x64 is recommended for the Emerson Energy Advisor engine and Web based components. The system is supported in virtualized environments with VMware.

Microsoft and Other requirements

- Internet Information Services (IIS) supported versions 6.0, 7.0, 7.5, 8.0 or 8.5.
- .NET Frameworks supported versions 2.0, 3.5 or 4.0.
- Internet Explorer Web Browser IE8, IE9 or IE10.
- SharePoint environment. Versions supported are 2007 and 2010.
- SharePoint Services, SharePoint Server or Microsoft Offices SharePoint Server.

Related Products

- **Acoustic Steam Trap Monitoring:**
 The *Rosemount® 708* Wireless Acoustic Transmitter provides constant visibility to and accurate measurement of all your critical steam traps without the effort of a manual inspection, enabling you to dramatically reduce steam trap failures and save 10–20% annually in fuel costs.
- **Essential Asset Monitoring:** Solution that delivers continuous diagnostics, equipment alerts and process health. Timely corrective actions can be taken to keep the plant on-line and avoid production losses, expensive reactive maintenance, and potential environment or safety incidents.
- **Wireless Gateway:** Connects IEC 62591 (*WirelessHART®*) self-organizing networks with host systems and data applications.
- **Rosemount Wireless Temperature Transmitter:** A wireless solution for high density temperature measurement applications. Monitors up to four independently configurable RTD, thermocouple, ohm, millivolt and 4-20 mA inputs, allowing you to access more temperature measurements without any signal wire.

Energy Measurement Best Practices

■ Ideal ■ Suitable ■ Not Advisable ■ Not Suitable ■ Lowest Installed Cost					
	Orifice DP Flow Meters	Annubar DP Flow Meters	Vortex	Magnetic	Coriolis
Energy Measurements					
Superheated Steam	■	■	■	■	■
Saturated Steam	■	■	■	■	■
Compressed Air	■	■	■	■	■
Condensate Return	■	■	■	■	■
Process Water	■	■	■	■	■
Fuel Gas	■	■	■	■	■
Fuel Oil	■	■	■	■	■

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