



Managing EnergyWise Using CiscoWorks LAN Management Solution

White Paper



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Introduction

What Is EnergyWise?

Cisco® EnergyWise is a new energy management architecture that will allow IT operations and facilities to measure and fine-tune power usage to realize significant cost savings. Cisco EnergyWise focuses on reducing power utilization on all devices connected to a Cisco network ranging from Power over Ethernet (PoE) devices such as IP phones and wireless access points to IP-enabled building and lighting controllers. It uses an intelligent network-based approach, allowing IT and building facilities operations to understand, optimize, and control power across an entire corporate infrastructure, potentially affecting any powered device.

This white paper illustrates how businesses can utilize CiscoWorks LAN Management Solution (LMS) to effectively get started with enabling EnergyWise on a network enabled by Cisco and to better understand the power footprint of their organizations and optimize to reduce energy costs.

Why Use EnergyWise?

We briefly mentioned some of the benefits of EnergyWise. Here is a more comprehensive list of the benefits of deploying EnergyWise in your network:

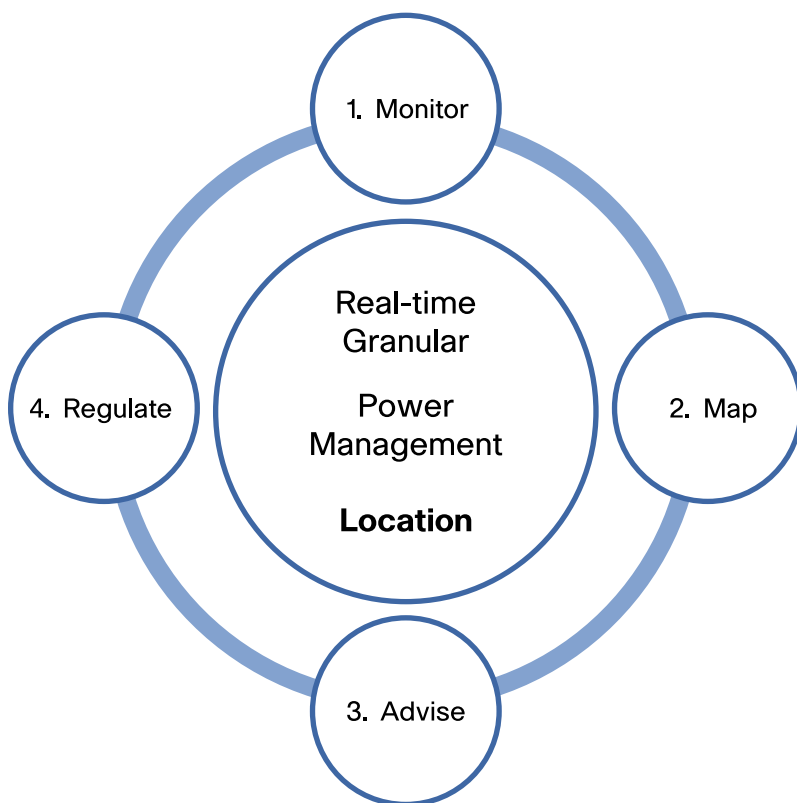
- Energy savings that ultimately translate into operating expenses (OpEx) savings
- Greenhouse gas regulation
- Carbon footprint savings
- Helps companies with go-green initiatives
- Allows monitoring, changing, and facilitating efficient operation and reducing power consumption across the enterprise

Supports Cisco and non Cisco devices that are IP or non-IP devices, thereby converging IT and facility networks

What Does It Take to Use and Manage EnergyWise in the Network?

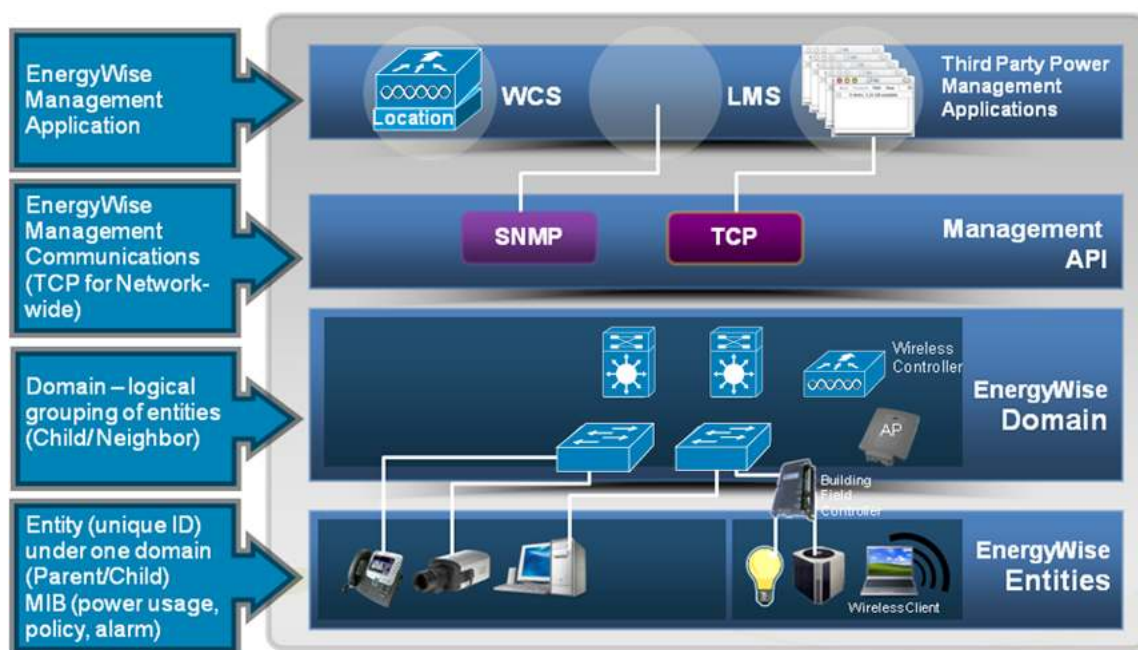
Figure 1 shows the steps needed to get started with EnergyWise. The first step in the process is monitoring. We need to know how much power the network consumes before we can achieve any savings. The second step would be to come up with some sort of action for mapping or correlating the power type. You can then see the power savings in the next step, the Advise step. For more power savings, you will need to generate some policies and push them to the network. This is an iterative process from monitoring to regulating. It is very simple, but how does one go about deploying this in the network? This is where good network management comes into play.

Figure 1. EnergyWise Operating Cycle



There are six key terms that are described in the EnergyWise management architecture (See Figure 2). They are as follows:

Figure 2. EnergyWise Management



- EnergyWise entity

An EnergyWise entity is any device that needs power. The device can be PoE or non-PoE; IP or non-IP. The entity can also be a non-IT device. This is the reason EnergyWise also behaves as a platform. Each entity has a unique identification associated with it. An entity can have either a parent-child or a neighbor relationship. If a switch is connected to a phone, the switch is a parent, while a laptop would be a child. The main objective of this relationship is to control the power to the end device, a phone in this case. A neighbor relationship is between two entities, for example, between two switches. The neighbor relationship is used to pass the control messages.

- EnergyWise domain

An EnergyWise domain is a logical grouping of EnergyWise-enabled entities. Grouping of such entities helps scale large EnergyWise deployments. Grouping of such entities also eases management. All entities in the domain can be visualized as one unit of power consumption. A domain in EnergyWise has a Domain Name System (DNS)-like naming hierarchy for referencing entities, for example, Domain=com.cisco.buildingN, Role=WirelessAP, Name=Lab.

- EnergyWise levels

An EnergyWise power level indicates the power state of an entity. In other words, it tells us whether the device is on, off, or in some standby mode. The entity can also communicate its power level back to the network. Cisco EnergyWise defines three categories including operational (1), standby (2), and nonoperational (3). These categories are color-coded and subdivided into levels from 0 to 10, which correspond to power off to full power, respectively. Table 1 depicts how the power level corresponds to the color and operational mode.

Table 1. EnergyWise Level Matrix

Mode	Color	Code	Color	Level	Label
Operational (1)	Red	FF0000	Red	10	Full
				9	High
	Yellow	FFFF00	Yellow	8	Reduced
				7	Medium
	Green	00FF00	Green	6	Frugal
5				Low	
Standby (0)	Blue	0000FF	Blue	4	Ready
				3	Standby
	Brown	A52A2A	Brown	2	Sleep
				1	Hibernate
Nonoperational (-1)	Black	000000	Black	0	Shut

- Importance

EnergyWise importance is a way to differentiate between devices as far as their power consumption is concerned. Given that everything else is similar, which entities should be powered down? An office phone has lower importance than a business-critical or emergency phone, so it will be powered down first when looking to save some energy. The emergency phone never goes into sleep mode.

- Priority

Priority determines which devices will be affected. Only if the priority is greater than the importance in the EnergyWise ecosystem will the action be taken. The priority is very useful, especially when querying the EnergyWise domain and taking an action based on it.

- Query

The EnergyWise ecosystem provides a way to query the domain for various parameters. There are three parameters available for taking any action: **set, collect, and sum**. Based on these three parameters, you could have the following queries, for example:

- Set power level
- Sum current power usage
- Collect power at power levels
- Delta or change of power usage at specific levels, keywords, and tags

We could also use keyword and tags in the query to make it more meaningful. We can see that we have various key terms that need to be understood along with the command-line interface (CLI). This is where a typical network management application like CiscoWorks LMS would help. CiscoWorks LMS makes deploying EnergyWise a breeze for a typical enterprise network.

Why Use LMS for Managing EnergyWise?

As we saw, there is already an ecosystem designed around EnergyWise. It is definitely useful to understand for a successful deployment. CiscoWorks LMS helps customers to jump quickly over the initial hurdle of deploying EnergyWise in an enterprise network. First of all LMS systematically takes network administrators from not knowing which devices are capable and enabled all the way to enabling, deploying, and monitoring EnergyWise. Let's step through some details to see how conveniently LMS can deploy EnergyWise in your network.

Free Add-on to LMS 3.2 Offering

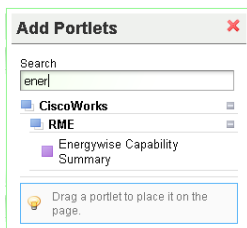
The first thing to note about the EnergyWise plug-in is that it's free. Anyone with CiscoWorks LMS 3.2 should be able to add the EnergyWise patch from Cisco.com and get started with EnergyWise deployment.

The URL for the EnergyWise patch can be found in the reference section at the end of this white paper.

A Quick Plug-in to an Existing Management Application

Once the EnergyWise plug-in to LMS 3.2 has been installed, the LMS portal framework can be used to add an EnergyWise Capability Summary and the Technology Portlet, which help you quickly get started with EnergyWise deployments (Figure 3).

Figure 3. LMS Portal Framework



From No EnergyWise to Full EnergyWise Deployment Using LMS

The Technology Portlet (Figure 4) on the dashboard is a very quick and guided way of getting started. Simply working from top to bottom following the link and the workflow should guide you in getting started with EnergyWise. For example, the first thing to do is to see whether the hardware that is running in the network is ready for EnergyWise or not. Once EnergyWise is deployed, you can then either run some preconfigured reports or create groups using the EnergyWise variables discussed above, such as domains, keywords, . We can then monitor EnergyWise and see the statistics showing what our power savings are.

Figure 4. The Technology Portlet



How Can LMS Help Manage EnergyWise?

EnergyWise Readiness Report

At a glance, see which devices are EnergyWise capable and which are not from the EnergyWise Capable Summary portlet (Figure 5). The pie chart quickly tell us which devices need hardware upgrades, which devices are running the correct hardware and software, and which devices are already EnergyWise enabled. Clicking the pie chart allows us to view the readiness report as shown in Figures 6 through 8.

Figure 5. EnergyWise Capability Summary

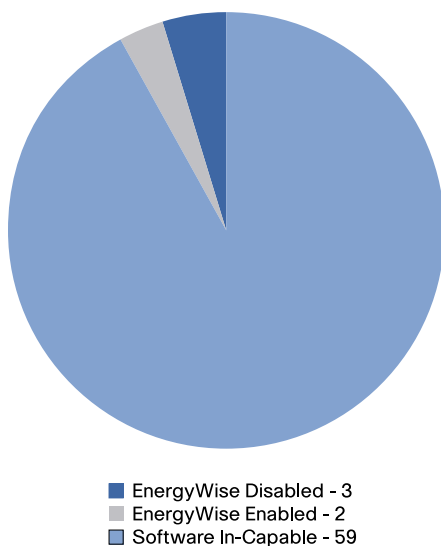


Figure 6. EnergyWise Enabled Devices

EnergyWise Enabled Devices			
Device Name	IP Address	Device Type	Running Image Version
10.77.209.241 EnergyWise	10.77.209.241	Cisco Catalyst 3660-24PS Switch	12.2(50)SE1
172.20.116.169	172.20.116.169	Cisco Catalyst 4507R-E Switch	12.2(53)SG
10.77.209.228 EnergyWise	10.77.209.228	Cisco Catalyst 2960-24TT Switch	12.2(50)SE1

The top section of this report (Figure 6) shows us which devices are already enabled with EnergyWise. All that needs to be done on these devices is to push out policies. We will come back to this toward the end of this white paper as a last step in the EnergyWise process.

Figure 7. EnergyWise Disabled Devices

<input type="checkbox"/>	Display Name	IP Address	Device Type	Running Image Version
<input type="checkbox"/>		172.20.118.247	Cisco Catalyst 4503-E Switch	12.2(53)90

Enable

The next section shows us which devices have the Cisco IOS® Software version needed to successfully run EnergyWise. As we can see in Figure 7, there is only one device running the needed software, but EnergyWise is not turned on yet. Users can quickly enable EnergyWise right from the report itself by checking the device and clicking the Enable button.

Figure 8. EnergyWise-Capable Devices

<input type="checkbox"/>	IP Address	Device Name	Current Image	Device Type	Minimum Supported Image
<input type="checkbox"/>	10.77.241.11	10.77.241.13	12.1(20)SE	Catalyst 3560	12.2(50)SE
<input type="checkbox"/>	10.77.241.12	10.77.241.14	12.1(20)SE	Catalyst 3560	12.2(50)SE

Upgrade Image

One of the main challenges is to find out which devices are running the correct Cisco IOS Software version. Another challenge is to find out which hardware is supported by EnergyWise. Putting these two together is a big challenge on its own. LMS conveniently scrubs this list for you and generates a list of those devices that need to be upgraded (Figure 8). Users can quickly launch into the software upgrade workflow and upgrade the devices. This saves many hours of time in generating this scrubbed list.

Don't Know the EnergyWise CLI? No Problem!

From the main EnergyWise Technology Portlet, we can set up the basic EnergyWise configuration for either the devices or ports. Just select the devices and the EnergyWise task (Figure 9), and a wizard guides the user all the way through (Figure 10).

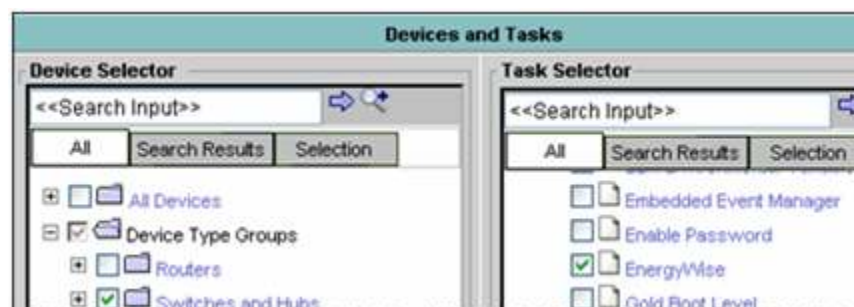
Figure 9. EnergyWise Devices and Tasks Window

Figure 10. EnergyWise Configuration Wizard

EnergyWise Configuration	
IOS Parameters	
Enable/Disable EnergyWise	
Configure EnergyWise:	Enable
EnergyWise Entity Domain (*):	AMER
EnergyWise Entity Secret (*):	En3rg3W1s3
Entity Keywords [comma seperated]:	Lab_Phones
Entity Role:	IP_Phone
EnergyWise Level:	1-Hibernate
EnergyWise Importance [1-100]:	60
(*) Enable EnergyWise with different Domain/Secret will overwrite the existing Domain/Secret	
Applicable Devices...	
<input type="button" value="Save"/> <input type="button" value="Reset"/> <input type="button" value="Cancel"/>	

The wizard makes it easy by asking users to enter some of the basic values for the six terms mentioned in the beginning of this white paper. Just populate the EnergyWise template with the appropriate values for domain, secret, entity, role, level, and importance.

LMS automatically generates the CLI that is required to enable EnergyWise with the parameters that were specified (Figure 11). As you can see LMS has the intelligence to see what type of device it is, and the CLI is generated accordingly. Users can then verify the CLI and configure the job, which can be executed in real time or can be scheduled during a planned downtime. LMS can dramatically reduce the time it takes to access the network for EnergyWise and deploy it at the same time. This is a big return on investment in itself.

Figure 11. EnergyWise Device Commands

Device Commands	
Devices	Commands
10.77.209.228-EnergyWise	energywise domain AMER secret En3rg3W1s3 energywise keywords Lab_Phones energywise role IP_Phone energywise level 1 energywise importance 60
10.77.209.241-EnergyWise	energywise domain AMER secret En3rg3W1s3 energywise keywords Lab_Phones energywise role IP_Phone energywise level 1 energywise importance 60
172.20.118.247	energywise domain AMER security shared-secret En3rg3W1s3 energywise keywords Lab_Phones energywise role IP_Phone energywise level 1 energywise importance 60
172.20.118.169	energywise domain AMER secret En3rg3W1s3 energywise keywords Lab_Phones energywise role IP_Phone energywise level 1 energywise importance 60
Non Applicable Devices	
None	

Port Policies

Once EnergyWise is enabled, the next step is to configure policies on individual ports. LMS makes it very easy to create and use groups based on various EnergyWise domains or entities or just keywords.

Users can input the policy parameter through an easy-to-use GUI into which you can just put in some of the key values, and LMS can then generate the CLI. There is also a GUI for generating cron policies for EnergyWise. See Figure 12.

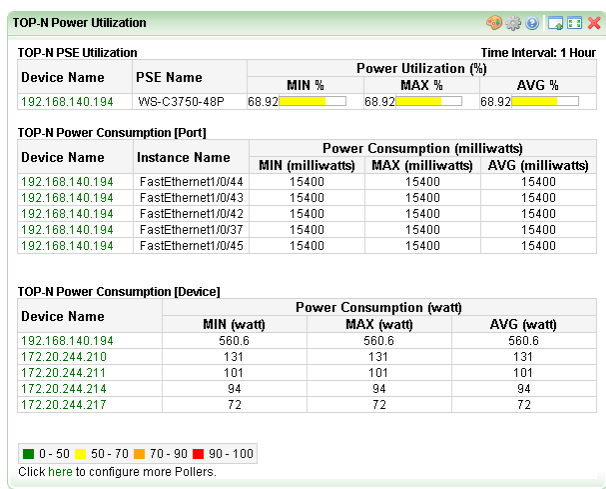
Figure 12. EnergyWise Events Configuration

EnergyWise Events Configuration	
IOS Parameters	
Action:	Enable <input type="button" value="v"/>
EnergyWise Level:	6-Frugal <input type="button" value="v"/>
Recurrence	
Configure Recurrence Level:	<input checked="" type="checkbox"/>
Importance [1 -100]:	75
Interval	
[If Month, Day of the Month and Day of the Week fields are left blank or unchecked, the Netconfig job considers it as applied for all days.]	
Hour [0 - 23]:	19 <input type="button" value="v"/>
Minute [0 - 59]:	00 <input type="button" value="v"/>
Month [1 - 12]:	
Day of Month [1 - 31]:	
Sunday:	<input type="checkbox"/>
Monday:	<input checked="" type="checkbox"/>
Tuesday:	<input checked="" type="checkbox"/>
Wednesday:	<input checked="" type="checkbox"/>
Thursday:	<input checked="" type="checkbox"/>
Friday:	<input type="checkbox"/>
Saturday:	<input type="checkbox"/>
Time Range [applicable for Energywise 2.0 enabled devices.]	
Enter the Time range:	
<input type="button" value="Applicable Devices..."/>	
<input type="button" value="Save"/> <input type="button" value="Reset"/> <input type="button" value="Cancel"/>	

Once Configured, Monitor EnergyWise

Now that EnergyWise is successfully configured and running on the device, the next logical thing to do is monitor for power consumption. Questions such as “Who is taking up more power in my network” can be easily addressed with the famous Top-N portlet in the CiscoWorks Health and Utilization Monitor (HUM) module. You can even find out which port is consuming more power. HUM has a dedicated portlet for Top-N Power Utilization to show the overall power consumption (Figure 13).

Figure 13. Top-N Power Utilization Window



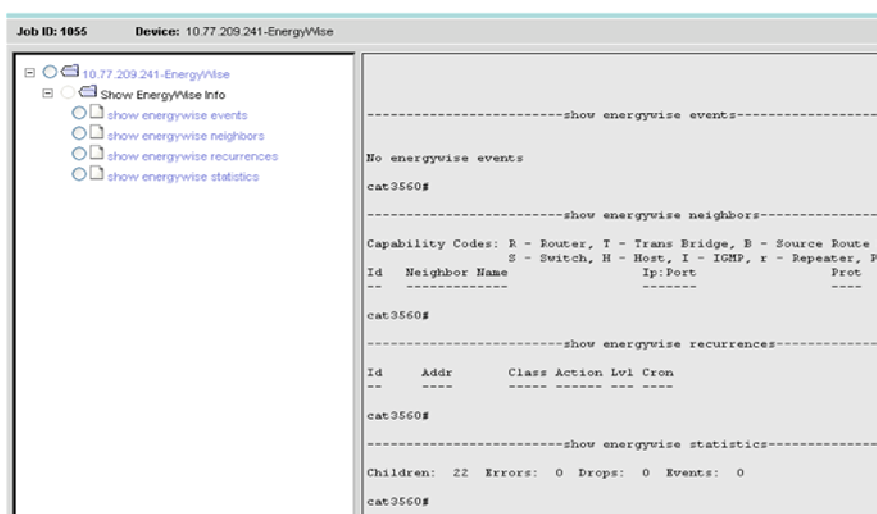
With the introduction of the Custom Top-N Portlet in LMS 3.2, EnergyWise MIBs may also be compiled and polled to show special MIB values.

CiscoWorks LMS 3.2 also brings in some powerful capabilities of TrendWatch. EnergyWise would also benefit from Thresholding and TrendWatch capabilities within LMS. Create a trendwatch for a certain threshold of power consumption either at a port or a device level.

Easily Run EnergyWise Show Commands Using NetShow

LMS has a good capability of running predefined EnergyWise or custom EnergyWise show commands on the device. The outputs are then collected and can be view right from the CiscoWorks portal (Figure 14). You can create your own set of EnergyWise commands for NetShow as well. This is particularly useful when you need to collect output from all the devices with particular EnergyWise attributes, for example, domain, keyword, or priority.

Figure 14. EnergyWise NetShow



Conclusion

Adding EnergyWise is a snap if you already have LMS 3.2 running. LMS 3.2 with the free EnergyWise plug-in takes the user from discovering the feasibility of EnergyWise in the network all the way to monitoring and saving power. EnergyWise creates a big impact on the bottom line for any IT, and CiscoWorks LMS can be an instrument in getting there.

References

Cisco EnergyWise Portal

<http://cisco.com/go/energywise>

EnergyWise White Paper

http://www.cisco.com/en/US/products/ps10195/prod_white_papers_list.html

EnergyWise Patch for LMS 3.2

<http://tools.cisco.com/support/downloads/pub/Redirect.x?mdfid=268439477>

EnergyWise MIB

<ftp://ftp.cisco.com/pub/mibs/v2/CISCO-ENERGYWISE-MIB.my>



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