



# **Introduction to the Power Monitoring and Power Control Function**

July 21, 2015

Rev.3.2

NEC Corporation

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## **About this Manual**

This manual provides descriptions of the power control function that comes loaded on the NEC Express5800 Server. Please refer to this manual when using the power control function. This manual is for individuals who sufficiently understand the functions and operational procedures of NEC ESMPRO, BMC Configuration, and EXPRESSSCOPE Engine 3. Please refer to the User's Guide or the online help for the operations and any questions about these programs.

The names listed on the screen images published in this manual are all fictitious. They have absolutely no relation to any real product, corporate name or individual's name. Furthermore, the set values on the screen images are examples and there are no operational guarantees in relation to these.

## Symbols in this Manual

In this manual the following three types of symbol are used. The meanings of each of these are shown.

	This symbol is displayed at points that require special precautions and things that must be followed in the handling of software and devices.
 Check	This symbol is displayed at points where confirmation is necessary in the handling of software and devices.
 Hint	This symbol is displayed when there is information that is helpful to know and when there is something useful.

## Glossary

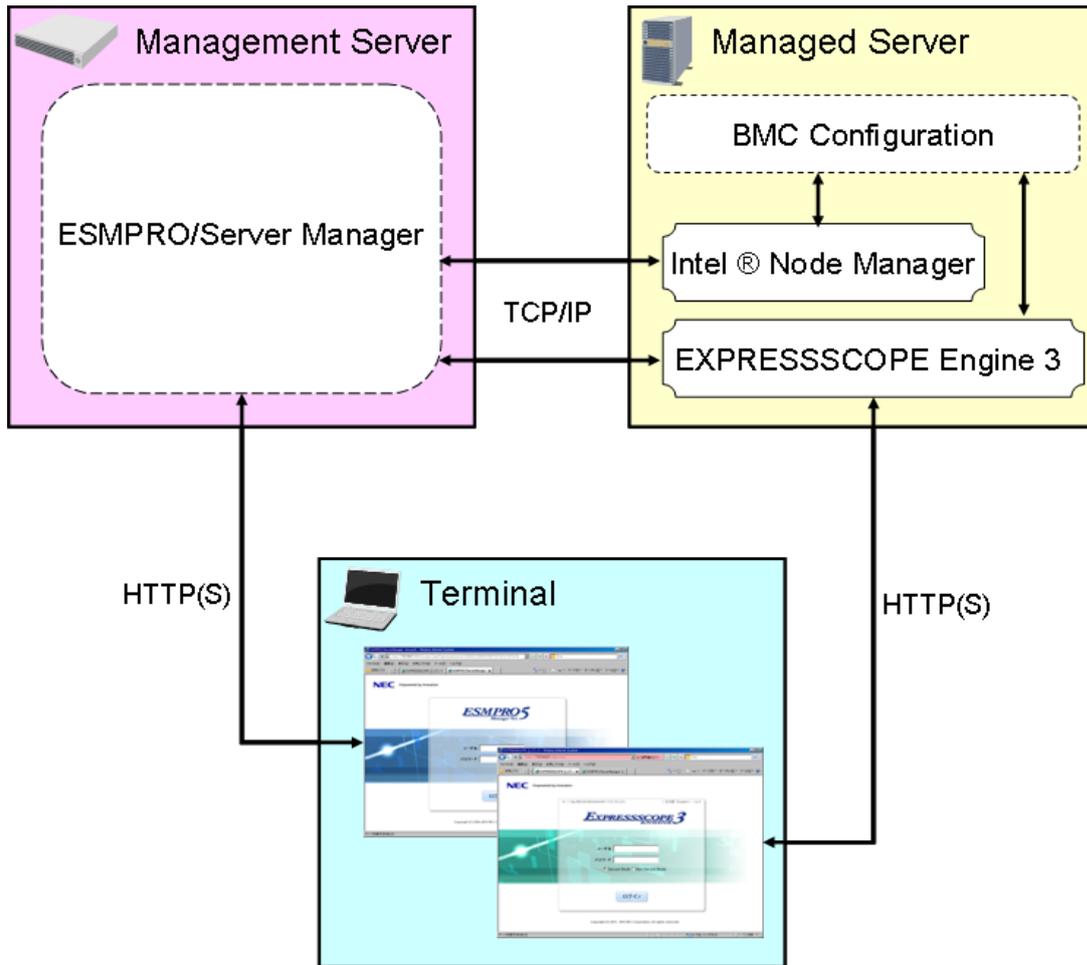
The following terms are used in this manual.

**Table 1 Terms**

<b>Term</b>	<b>Explanation</b>
IPMI	An abbreviation of Intelligent Platform Management Interface. This is a standard interface specification to manage servers, without relying on the system or the OS.
BMC	An abbreviation of Baseboard Management Controller. A management controller that monitors and makes reports about the system hardware, without relying on the state of the system or the OS.
BMC Configuration	A tool to perform the BMC configuration settings. This is operated from the OS of Windows or Linux and is a server built-in ROM version that is operable during the device startup.
NEC ESMPRO Manager	An abbreviation of NEC ESMPRO Manager
Management Server	Servers with NEC ESMPRO Manager installed. Used in the management of the servers. It is also possible to use as a management server the managed server itself and the usage of a personal computer.
Managed Server	Servers that are managed by NEC ESMPRO Manager
EXPRESSSCOPE Engine 3	This is a management controller for NEC Express5800 servers. This has been loaded onto some of the latest servers and offers a variety of functions. This includes a BMC function that conforms to the IPMI.
CPU Throttling	A function to reduce the CPU clock frequency depending on the load on the server.
Memory Throttling	A function to reduce the memory bandwidth depending on the load on the server.
Intel® Node Manager	An electric power management policy engine that monitors the CPU power consumption and controls the system power consumption according to the power consumption target set.
Non-Aggressive Mode	A function to reduce the power consumption by using the CPU throttling function. (Former name: Non-Critical Power Capping)
Aggressive Mode	A function to reduce the power consumption by using the CPU throttling function and memory throttling function. (Former name: Critical Power Capping)

Safe Power Capping	A function to perform power control even when it becomes impossible to measure the amount of power consumption in the server.
Boot Time Configuration	A function to limit the power consumption when booting the OS and to change the number of CPU cores.

Connection diagrams for each component are shown below.



**Figure 1 Component Connection Diagram**

The managed server may also run as the management server.

You can access the NEC ESMPRO Manager or BMC from the Web browser on the terminal connected to the LAN.

## **Chapter 1 What is Power Monitoring and Power Control?**

In recent years, when operating and managing a great many servers in one place (e.g. a data center) there has been a growing demand for server management from increasing concerns about reducing the environmental impact and severe restrictions on power devices in line with the high degree of integration.

In such circumstances, NEC has expanded the power monitoring and power control functions in our NEC Express5800 Series servers.

In the power monitoring function it is possible to measure power consumption by collecting statistical information related to power consumption (maximum power (W), minimum power (W), and average power (W), etc.) and periodically reading the sensors inside the server.

In the power control function, while there is control of the total power consumption of the main unit (the managed server) to reduce the power consumption that has been set, operational continuity is provided. This is effective when you want to make efficient use of limited power and when system operations continue without causing excessive power.

For example, you can set the upper power limits that you wish to control for managed servers in advance. Here, it is possible to automatically switch to an energy-saving mode when the load on the server increases, power consumption increases, and the set values are approached, and then make a report when these set values are exceeded.

## **Chapter 2 Power Monitoring Function**

### **2.1 Overview**

In this function, software such as NEC ESMPRO Manager in conjunction with EXPRESSSCOPE Engine 3 make the following possible:

- Display of statistical information related to power consumption (maximum power (W), minimum power (W), and average power (W), etc.).
- Power consumption measurement and measurement data file output

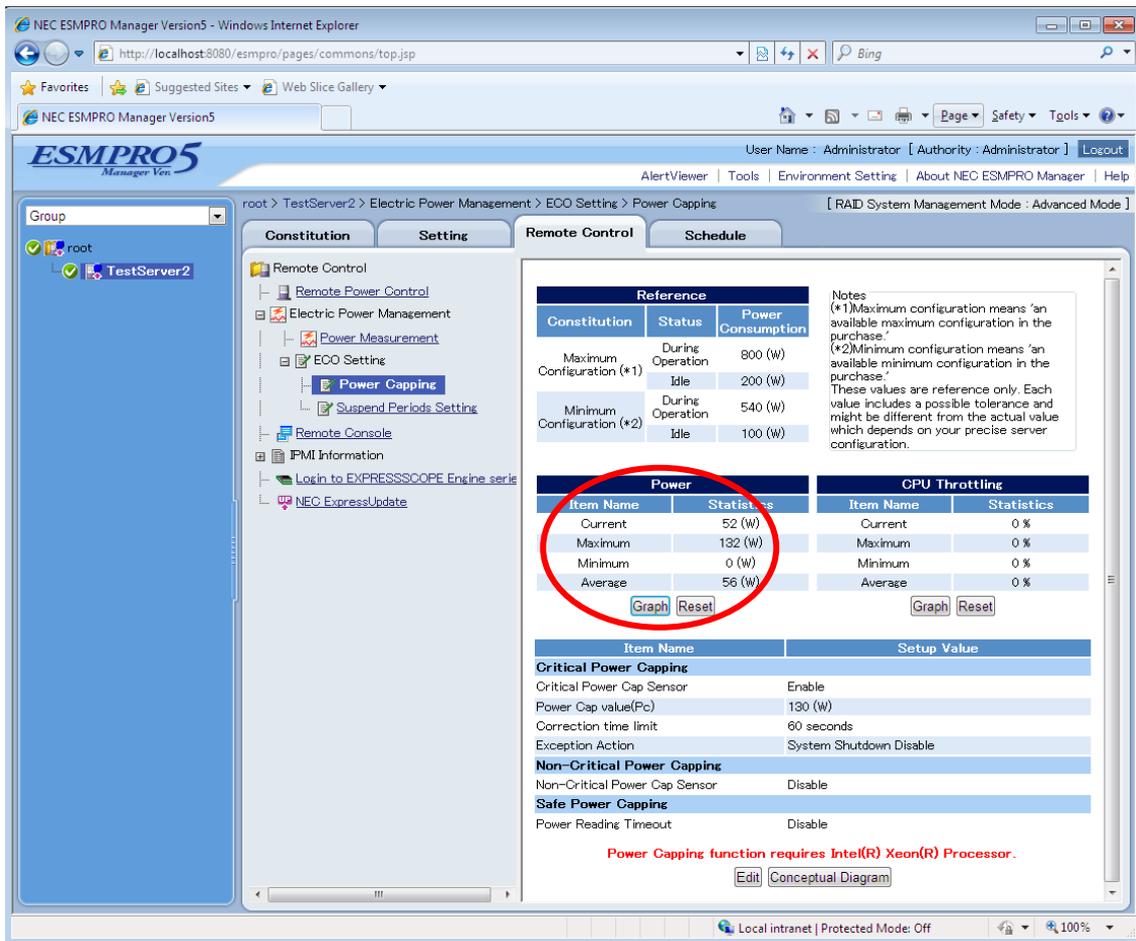
### **2.2 Usage Examples**

The following are descriptions of specific operational examples.

#### **2.2.1 Confirming the Power Consumption Statistical Values**

##### **Operation Procedures (NEC ESMPRO Manager)**

On a specified target server in NEC ESMPRO Manager, select [Electric Power Management] - [ECO Setting] - [Power Capping] in the [Remote Control] tab.



**Figure 2 Power Consumption**

The current values (W) along with the following statistical information will be displayed.

- Maximum power (W)
- Minimum power (W)
- Average power (W)

### Operation Procedures (BMC Configuration)

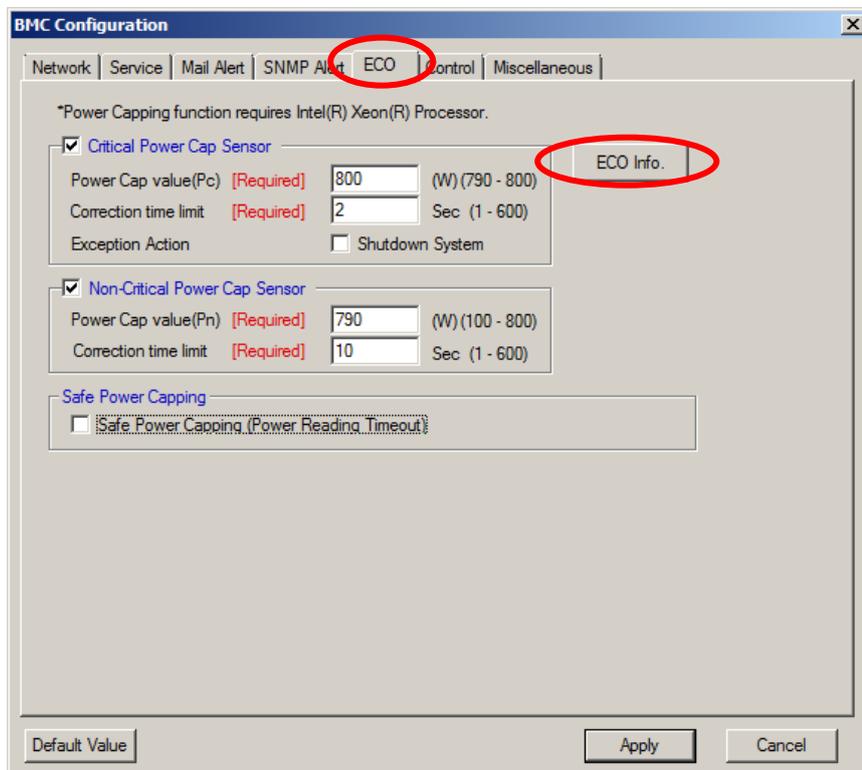
In the BMC Configuration, there is an online version that is controlled from the OS and an offline version that can be controlled before the startup of the OS, but the functions are basically the same. In this manual, the procedures for the online (Windows) version are explained.

First, run the BMC Configuration.



**Figure 3 BMC Configuration**

Click [Set BMC Configuration], and then click the [ECO] tab.



**Figure 4 ECO**

When [ECO Info.] is clicked, the following statistical values are displayed.

The screenshot shows a dialog box titled "ECO Information" with a close button (X) in the top right corner. The dialog is divided into two main sections: "Reference" and "Statistics".

**Reference Section:**

- Maximum Configuration (\*1):**
  - During Operation: 800 [W]
  - Idle: 200 [W]
- Minimum Configuration (\*2):**
  - During Operation: 540 [W]
  - Idle: 100 [W]

Footnote text: (\*1) Maximum configuration means 'an available maximum configuration in the purchase.'  
(\*2) Minimum configuration means 'an available minimum configuration in the purchase.'  
These values are reference only. Each value includes a possible tolerance and might be different from the actual value which depends on your precise server configuration.

**Statistics Section:**

- Power:** (This section is circled in red in the image)
  - Current: 54 [W]
  - Maximum: 132 [W]
  - Minimum: 0 [W]
  - Average: 60 [W]
  - Reset button
- CPU Throttling:**
  - Current: 0 [%]
  - Maximum: 0 [%]
  - Minimum: 0 [%]
  - Average: 0 [%]
  - Reset button
- Memory Throttling:**
  - Current: 0 [%]
  - Maximum: 0 [%]
  - Minimum: 0 [%]
  - Average: 0 [%]
  - Reset button

At the bottom center of the dialog is an "OK" button.

Figure 5 ECO Information

## Operation Procedures (EXPRESSSCOPE Engine 3: Web Console)

Open the Web console of the EXPRESSSCOPE Engine 3 on the target server, and when you click [BMC] - [ECO] in the [Configuration] tab, the same information will be displayed as with NEC ESMPRO Manager.

The screenshot shows the EXPRESSSCOPE Engine 3 web console interface. The 'Configuration' tab is selected, and the 'ECO' menu item is highlighted in the left sidebar. The main content area displays the following data:

Reference		
Configuration	Status	Power Consumption
Maximum Configuration (*1)	During Operation	250(W)
	Idle	60(W)
Minimum Configuration (*2)	During Operation	100(W)
	Idle	30(W)

Warning (\*1)Maximum configuration means 'an available maximum configuration in the purchase'. (\*2)Minimum configuration means 'an available minimum configuration in the purchase'. These values are reference only. Each value includes a possible tolerance and might be different from the actual value which depends on your precise server configuration.

Power		CPU Throttling		Memory Throttling	
Item Name	Statistics	Item Name	Statistics	Item Name	Statistics
Current	52(W)	Current	0%	Current	-
Maximum	93(W)	Maximum	0%	Maximum	-
Minimum	0(W)	Minimum	0%	Minimum	-
Average	55(W)	Average	0%	Average	-

Reset buttons are present below each of these tables.

Item Name	Setup Value
<b>Critical Power Capping</b>	
Critical Power Cap Sensor	Enable
Power Cap value(Pc)	250(W)
Correction time limit	2Second
Exception Action	Shutdown System Disabled
<b>Safe Power Capping</b>	
Power Reading Timeout	Disable

A green notification bar at the bottom indicates 'POST Completed Successfully'.

Figure 6 Web Console

Please refer to "Appendix 1 Power Monitoring Function Display Items Table" at the end of this manual for each item.

These can be reset by pressing the reset button.

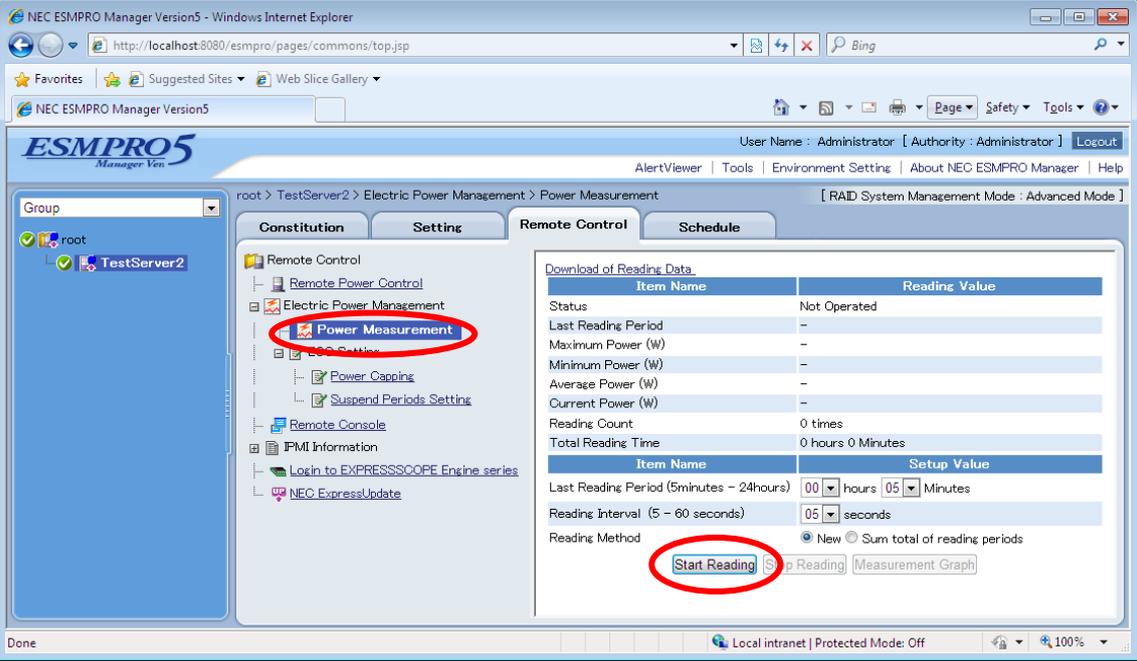
- Maximum power (W)
- Minimum power (W)
- Average power (W)

## 2.2.2 Measuring Power Consumption and Saving Measured Data

In the NEC ESMPRO Manager and the Web console of the EXPRESSSCOPE Engine 3, it is possible to measure the amount of power consumption on the servers.

### Operation Procedures (NEC ESMPRO Manager)

Select [Electric Power Management] - [Power Measurement] in the [Remote Control] tab.



The screenshot shows the NEC ESMPRO Manager web interface. The browser address bar indicates the URL is `http://localhost:8080/esmpro/pages/commons/top.jsp`. The user is logged in as Administrator. The interface is divided into several sections:

- Left Navigation Tree:** Shows a tree structure under 'TestServer2' with 'Electric Power Management' expanded, and 'Power Measurement' highlighted with a red circle.
- Top Tabs:** 'Constitution', 'Setting', 'Remote Control', and 'Schedule'. 'Remote Control' is the active tab.
- Main Content Area:** Contains a 'Download of Reading Data' table and configuration options. The 'Start Reading' button is circled in red.

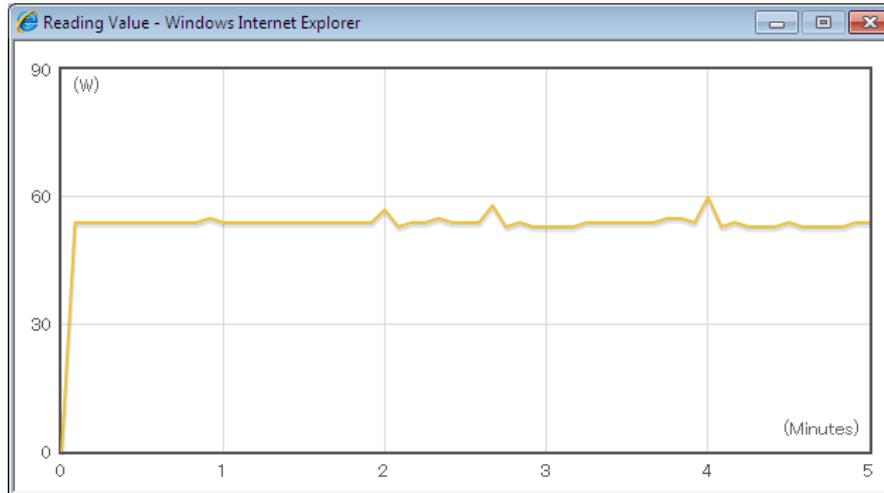
Item Name	Reading Value
Status	Not Operated
Last Reading Period	-
Maximum Power (W)	-
Minimum Power (W)	-
Average Power (W)	-
Current Power (W)	-
Reading Count	0 times
Total Reading Time	0 hours 0 Minutes

Item Name	Setup Value
Last Reading Period (5minutes - 24hours)	00 hours 05 Minutes
Reading Interval (5 - 60 seconds)	05 seconds
Reading Method	<input checked="" type="radio"/> New <input type="radio"/> Sum total of reading periods

Figure 7 Power Measurement

When you click the [Start Reading] button, measurement of power consumption will begin and at the same time it is possible to display a measured values graph. The measured values graph displays data up to the point in time from when you clicked [Start Reading] to [Measurement Graph].



**Figure 8 Measured Values**

The measurement period can be set in a range from 5 minutes to 7 days (the default is 5 minutes). The measurement interval can be set in a range from 5 seconds to 60 seconds (the default is 5 seconds).

From the measured data, the following statistical information is calculated and displayed along with the current value (W).

The power consumption data that is measured by NEC ESM PRO Manager can be output in CSV format. Please click [Download of Reading Data] at the top of the screen.

Use the power control data based on the statistical values and measurement data obtained by the above.

- Measurement period
- Maximum power (W)
- Minimum power (W)
- Average power (W)
- Number of measurements
- Cumulative total of the measurement time
- Power Threshold (Pa)<sup>1</sup>
- Power Threshold (Pn)<sup>2</sup>

In addition, it is possible to take over the 'statistical' power consumption data of previous measurement to 'Maximum power', 'Minimum power', 'Average power', 'Cumulative total of

<sup>1</sup> Power threshold that is set for the Aggressive Mode.

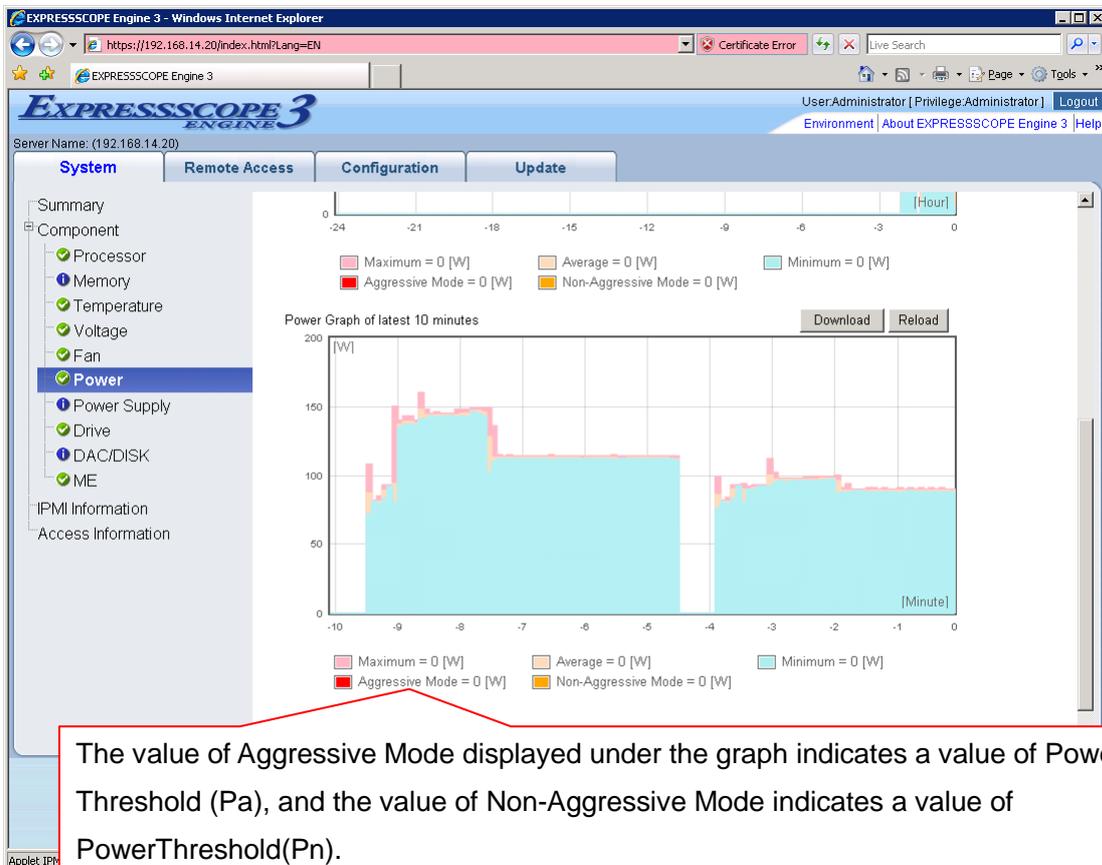
<sup>2</sup> Power threshold that is set for the Non-Aggressive Mode.

measurement time, and Number of measurements, by selecting [Sum total of reading periods].

However, it is not possible to take over the 'detail' power consumption data of previous measurement. To save detail power consumption data, please download data by selecting [Download of Reading Data] before starting next measurement.

### Operation Procedures (EXPRESSSCOPE Engine 3 Web Console)

In the [System] tab, select [Component] – [Power].



**Figure 9 Power Graph**

As the EXPRESSSCOPE Engine 3 acquires the power consumption data at all times, a graph for past 24 hours and a graph for past 10 minutes are displayed at all times.

In addition, the power consumption data can be downloaded in CSV format by clicking the [Download] button.

Note that the power consumption data retained within the EXPRESSSCOPE Engine 3 will be cleared when turning the AC power off/on, resetting the BMC or updating the firmware.

## Chapter 3 Power Control Function (Power Capping)

### 3.1 Outline

The power control function is achieved by performing the settings with software called NEC ESMPRO Manager or BMC Configuration and by making the EXPRESSSCOPE Engine 3 in conjunction with Intel® Node Manager.

The following are the special features of this function:

- Two-stage control (Non-Aggressive Mode and Aggressive Mode) is available and it allows you to set a flexible power control policy
- Capable of releasing the power control function periodically
- Capable of reporting an event if power consumption exceeds the set value
- Capable of performing power control even when it becomes impossible to measure the amount of power consumption in the server
- Capable of reducing the power consumption when booting the OS
- Capable of changing the number of activated cores per CPU socket

When the power consumption exceeds the Power Threshold (Pn) that is set for the Non-Aggressive Mode, this function will attempt to suppress power consumption to a level that does not reduce the system usage efficiency too much.

When the power consumption exceeds the Power Threshold (Pa) that is set for the Aggressive Mode, this function will perform proactive controls in order to suppress power consumption.

The settings of the power control function are performed from the NEC ESMPRO Manager and BMC Configuration (or the Web console/command line interface of the EXPRESSSCOPE Engine 3). The Intel® Node Manager receives power control function parameters via the EXPRESSSCOPE Engine 3. The Intel® Node Manager also performs power control by CPU throttling and memory throttling, which suppress power consumption by reducing the clock frequency or duty cycle. However, this may not be supported by some devices.

The following table is a list of the power management functions that can be set by each tool. Please refer to the User's Guide or help of each tool for more information.

**Table 2 Power Management Functions Table**

	NEC ESMPRO Manager Ver. 5	BMC Configuration	BMC(EXPRESSSCOPE Engine 3) Web console / Command line interface
Non-Aggressive Mode	Yes	Yes	Yes <sup>1</sup>
Aggressive Mode	Yes	Yes	Yes
Safe Power Capping	Yes	Yes	Yes
Boot Time Configuration <sup>1</sup>	Yes	Yes	Yes

Furthermore, NEC ESMPRO Manager and BMC (EXPRESSSCOPE Engine 3) Web console can display the power consumption and CPU throttling state in a timely manner.

The following graph shows a transition in the amount of the power consumption and a CPU throttling rate as an example. In the NEC ESMPRO Manager, select [Electric Power Management] - [ECO Setting] - [Power Capping] in the [Remote Control] tab with specifying the target server.

The data are measured every 5 seconds and the values measured in the last 60 seconds are depicted in a graph, which can be displayed in a pop-up by clicking the [Graph] button in the [Power] and [CPU Throttling] fields.

---

<sup>1</sup> For servers on which the items are not displayed, the power management functions are not supported.

In this example, the Power Threshold (Pn) is set to 70 [W] and Power Threshold (Pa) is set to 75 [W]. Details are given in 3.2 Usage Examples.

Power Control Function: Not set

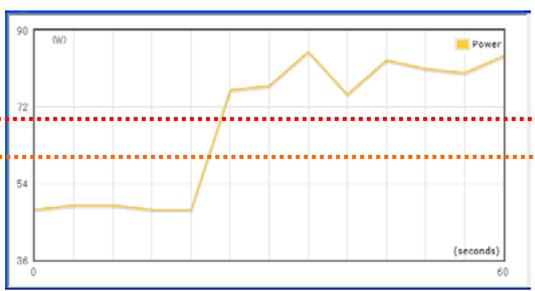
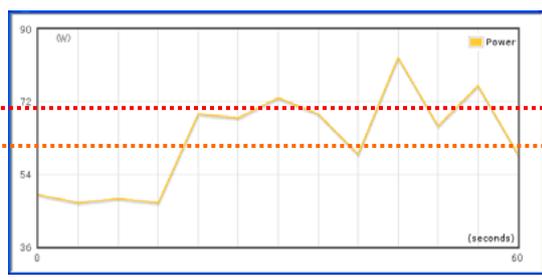


Figure 10 Power Statistical Values 1

Power Control Function: Set

Power Threshold (Pn) 70 [W]  
Power Threshold (Pa) 75 [W]



75 [W]  
70 [W]

Figure 11 Power Statistical Values 2

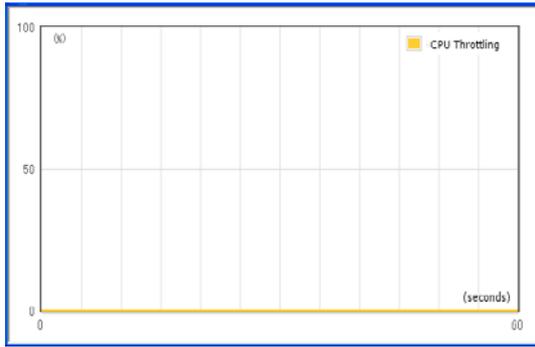


Figure 12 CPU Throttling Statistical Values 1

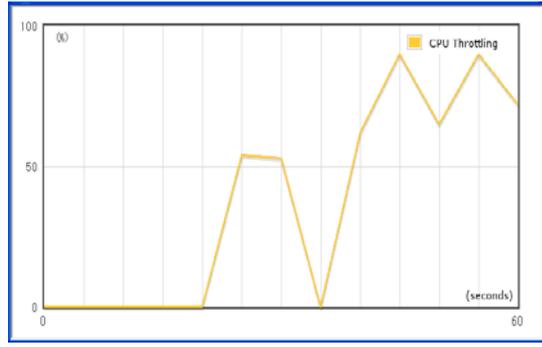


Figure 13 CPU Throttling Statistical Values 2

When the power control function has been set, compared to when it has not been set, power consumption is controlled close to the set values (70 – 75 [W]) and during that time it is possible to see the increase in the rate of the CPU throttling which shows the power control.



- This power control function controls the average values of power consumption in fixed periods. Accordingly, please note in advance that it is not possible to guarantee a maximum power limit.

In addition, the above statistical values can be confirmed in the [Electric Power Management] - [ECO Setting] - [Power Capping] in the [Remote Control] tab. Please refer to "Appendix 1 Power Monitoring Function Display Items Table" at the end of this manual for each item.

## 3.2 Usage Examples

Below, some setting examples are given while explaining how they can be used in specific conditions.



- If the managed server does not support this function, the settings screen will not be displayed.

Furthermore, the actual amount of power consumed is reliant on the server HW configuration, etc. When setting the power control function, please do so after confirming the actual power consumption. Please refer to "Chapter 2 Power Monitoring Function" for information on the confirmation method.

The table of items that can be set by this function are in "Appendix 2 Power Consumption Control Setting Items Table" at the back of this manual, and so please consult with this as necessary.

### 3.2.1 Suppressing Power Consumption

One advantage of this function is that it is possible to flexibly control power due to the fact that two-stage settings are available; Non-Aggressive Mode and Aggressive Mode. These setting examples are given below.

#### 3.2.1.1 Using without Lowering too much the System Usage Efficiency (Power Control: Low)

It is possible to set it when you want to control power without lowering the performance of the system too much. The power control is low, but due to the emphasis on system efficiency, little performance is sacrificed.

## Setting Method (NEC ESMPRO Manager)

On a specified target server in the NEC ESMPRO Manager, select [Electric Power Management] - [ECO Setting] - [Power Capping] in the [Remote Control] tab.

The screenshot shows the NEC ESMPRO Manager interface. The breadcrumb path is: root > R120d-1M > Electric Power Management > ECO Setting > Power Capping. The 'Remote Control' tab is active, and the 'Power Capping' sub-tab is selected. The interface displays a 'Return to Power Capping List' section with a table of reference values and a 'Setup Value' section for various power management settings.

Reference		Power Consumption
Constitution	Status	
Maximum Configuration (*1)	During Operation	840 (W)
	Idle	250 (W)
Minimum Configuration (*2)	During Operation	180 (W)
	Idle	60 (W)

Power		CPU Throttling		Memory Throttling	
Item Name	Statistics	Item Name	Statistics	Item Name	Statistics
Current	114 (W)	Current	0 %	Current	0 %
Maximum	115 (W)	Maximum	100 %	Maximum	0 %
Minimum	111 (W)	Minimum	0 %	Minimum	0 %
Average	113 (W)	Average	0 %	Average	0 %

Item Name	Setup Value
<b>Aggressive Mode</b>	
Aggressive Mode	Enable
Power Threshold(Pa)	840 (W)
Correction time limit	2 seconds
Shutdown System	Disable
<b>Non-Aggressive Mode</b>	
Non-Aggressive Mode	Enable
Power Threshold(Pn)	830 (W)
Correction time limit	10 seconds
<b>Safe Power Capping</b>	
Power Reading Timeout	Enable
<b>Boot Time Configuration</b>	
Boot Time Configuration	Enable
Performance Mode	Performance Optimized
Disable CPU Cores	0

The 'Edit' button in the 'Disable CPU Cores' row is circled in red.

Figure 14 Power Consumption Control 1

The next screen will be displayed when you click the lower right [Edit] button.

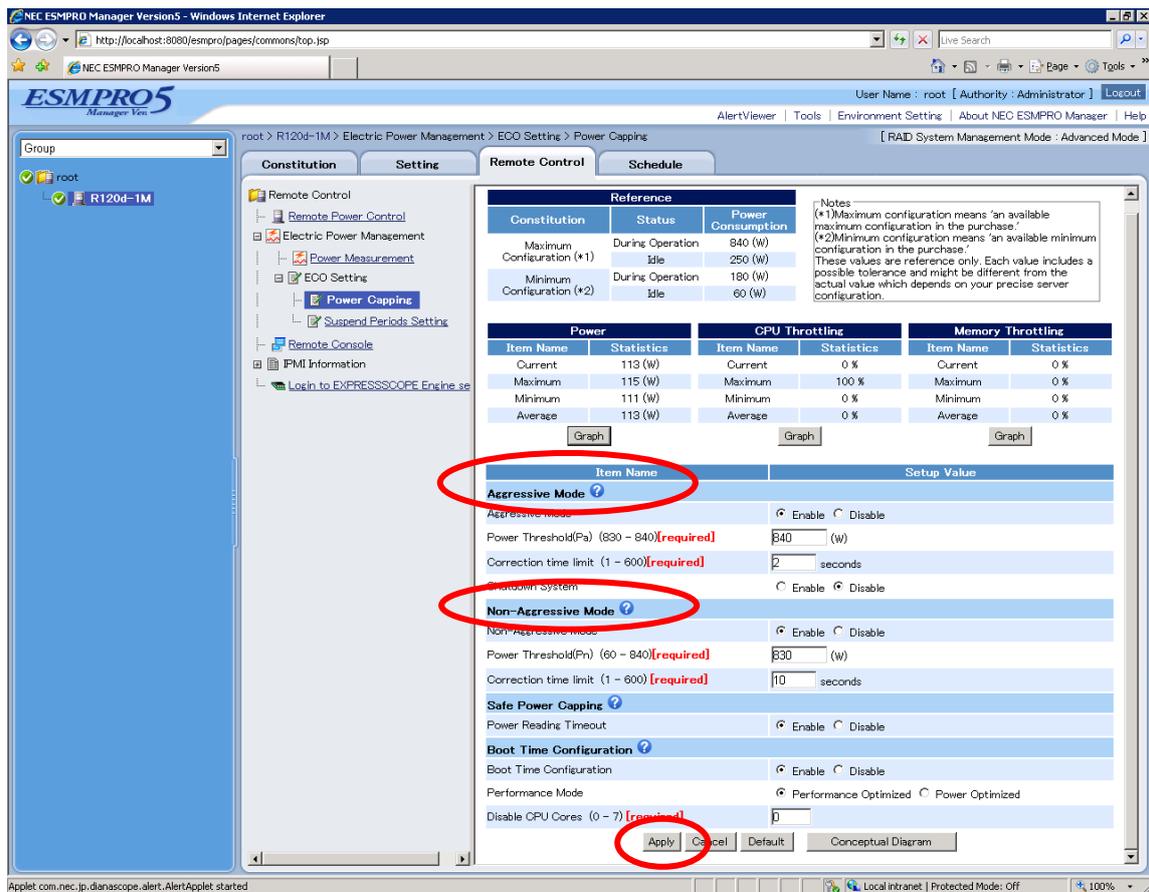


Figure 15 Power Consumption Control 2

Please set the [Non-Aggressive Mode] to [Enable].

This setting suppresses the amount of power consumption in the Non-Aggressive Mode. For example, when the Power Threshold (Pn) is set to 100 [W], power control is enabled in the Non-Aggressive Mode when the power consumption of the server exceeds 100 [W].

Furthermore, when the Power Threshold (Pn) is reached, an event is issued to that effect and it is possible to report this.



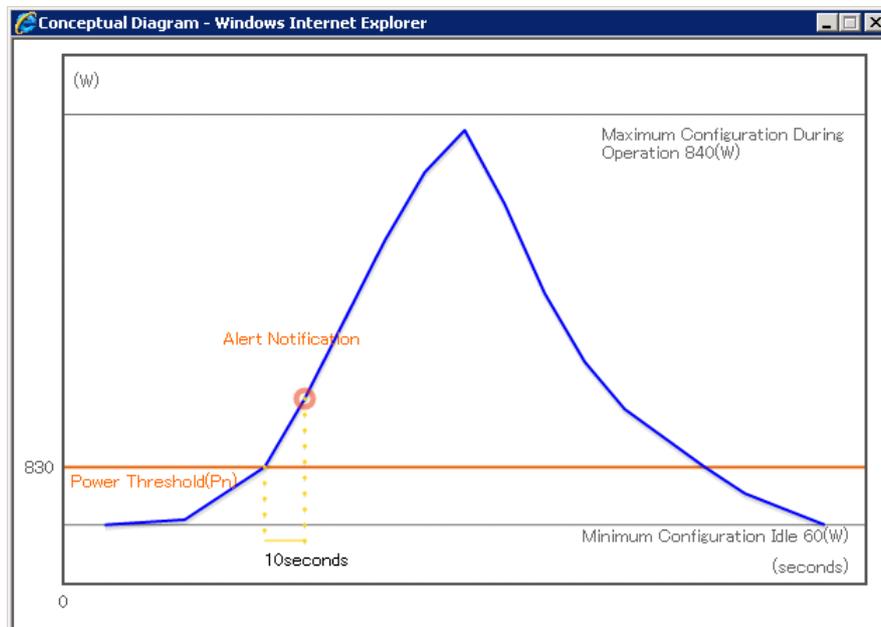
- In addition to events that are issued if the power consumption amount exceeds the threshold, when a state change or similar occurs in the Intel® Node Manager, it is possible to make a report of the event to that effect. Please refer to "3.2.1.5 Additional Settings: Event Reports" for more details on events and the setting method.

In addition, depending on the conditions, the threshold may be exceeded for a moment, but when it is possible to return the values to below the threshold immediately; it may be considered a case where a report is unnecessary. In cases such as these, it is possible to set a [Correction time limit (1 - 600 seconds)<sup>1</sup>]. This decides how long to wait after the threshold is exceeded before a report is made.

The [Non-Aggressive Mode] and [Aggressive Mode] are initially set to [Disable]. The [Power Threshold] and [Correction time limit] settings are displayed by placing a check in [Enable], and then the values can be entered here. The settings are applied by clicking [Apply] at the bottom of the screen.

Below is a conceptual diagram that shows these power control settings (When the Correction time limit has been set to 10 [seconds]).

In the NEC ESMPRO Manager, the figure below pops up when the above-mentioned [Conceptual Diagram] in the lower right of the screen is clicked, and you can see what the current settings are.



**Figure 16 Conceptual Diagram**

<sup>1</sup> The range of available values in the Correction Time Limit will vary depending on the device.

## Setting Method (BMC Configuration)

First, run the BMC Configuration, click [Set BMC Configuration], and then, click the [ECO] tab to display the settings.

The screenshot shows the 'BMC Configuration' dialog box with the 'ECO' tab selected. The dialog contains the following settings:

- Aggressive Mode** (checked):
  - Power Threshold(Pa) [Required]: 570 (w)(560 - 570)
  - Correction time limit [Required]: 2 Sec (1 - 600)
  - Shutdown System:
- Non-Aggressive Mode** (checked):
  - Power Threshold(Pn) [Required]: 560 (w)(70 - 570)
  - Correction time limit [Required]: 10 Sec (1 - 600)
- Safe Power Capping** (checked):
  - Power Reading Timeout:
- Boot Time Configuration** (checked):
  - Performance Mode:  Performance Optimized  Power Optimized
  - Disable CPU Cores [Required]: 0 (0 - 7)

Buttons at the bottom: Default Value, Apply (circled in red), Cancel.

Figure 17 BMC Configuration

After entering the set values, click [Apply] to reflect the settings.

## Setting Method (EXPRESSSCOPE Engine 3 Web Console)

Open the Web console of the EXPRESSSCOPE Engine 3 and click [BMC] – [ECO] in the [Configuration] tab.

Clicking the [Edit] button at the bottom of the displayed screen allows you to configure the settings.

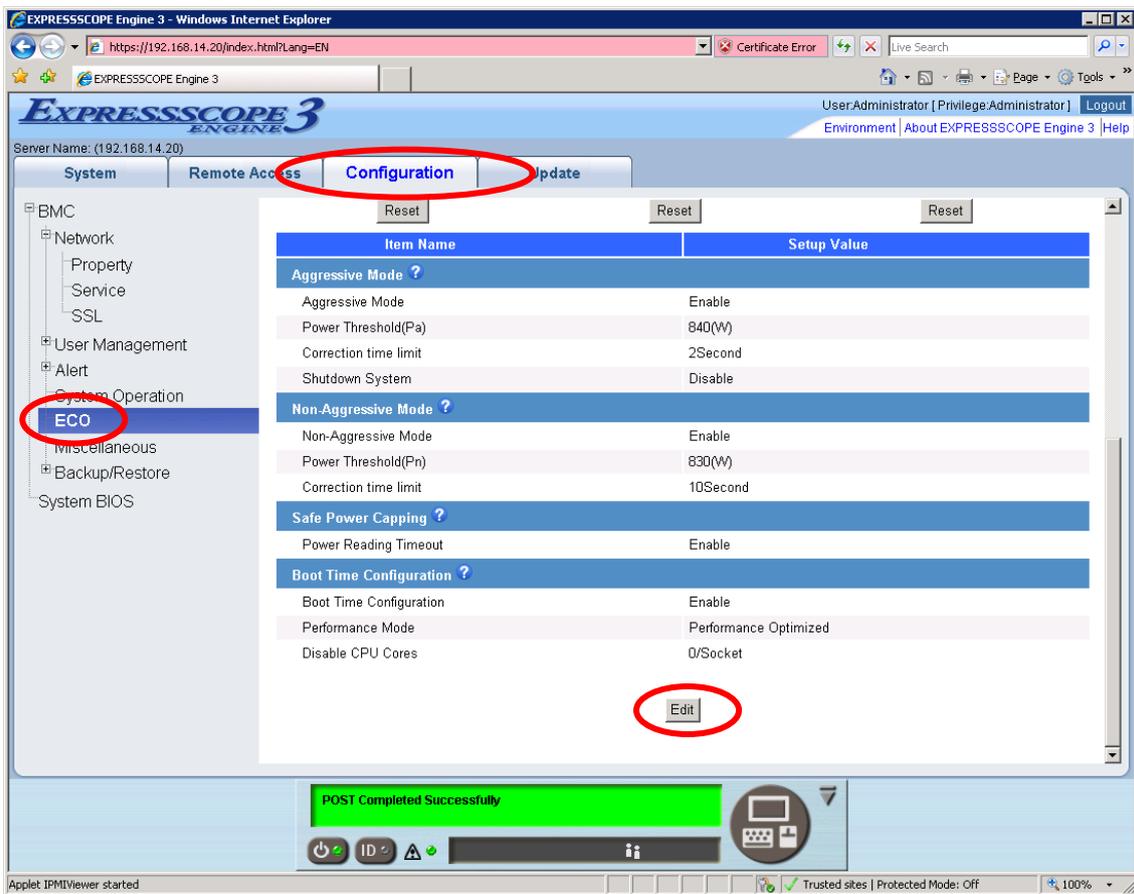


Figure 18 ECO Settings

Set [Non-Aggressive Mode] to [Enable] and set [Power Threshold (Pn)] and [Correction time limit] in the same way as the setting method of the NEC ESM PRO Manager. Click [Apply] after specifying the set values, and the settings will be reflected.

### Setting Method (EXPRESSSCOPE Engine 3 Command Line Interface)

Log in to the command line interface in the EXPRESSSCOPE Engine 3 on the target server, enter the command below from the command prompt to change the default target to **/admin1/system1**.

```
-> cd /admin1/system1
```

Set [Non-Aggressive Mode] to [Enable] by setting the properties to "enabled" for oemnec\_NonAggressiveMode by the **set** command as follows.

```
-> set oemnec_NonAggressiveMode=enabled
```

Set oemnec\_NonAggressiveModeCapvalue and oemnec\_NonAggressiveModeCorrectionTimeLimit by the **set** command in order to set [Power Threshold (Pn)] and [Correction time limit] in the same way as the setting method of the NEC ESMPRO Manager. After running the **set** command, the settings will be reflected immediately.

```
-> set oemnec_NonAggressiveModeCapvalue=400
```

```
-> set oemnec_NonAggressiveModeCorrectionTimeLimit=2
```

Please refer to "EXPRESSSCOPE Engine 3 User's Guide" for details on each command.

### 3.2.1.2 When There is Strong Need to Suppress Power Consumption in the Vicinity of the Set Values (Power Control: High)

This is the setting when you do not want to consume power above a certain upper limit.

#### Setting Method (NEC ESMPRO Manager)

On a specified target server in NEC ESMPRO Manager, select [Electric Power Management] - [ECO Setting] - [Power Capping] in the [Remote Control] tab and click [Edit] in the lower right.

Please set the [Aggressive Mode] on the displayed screen to [Enable]. This setting controls power consumption in the Aggressive Mode. For example, when the Power Threshold (Pa) is set to 100 [W], if the power consumption of the server exceeds 100 [W], power control is enabled in the Aggressive Mode, which has even stronger controls than the Non-Aggressive Mode.

In addition, when power consumption reaches the Power Threshold (Pa), an event is issued to that effect and it is possible to report this. Please see "3.2.1.5 Additional Settings: Event Reports" for more details.

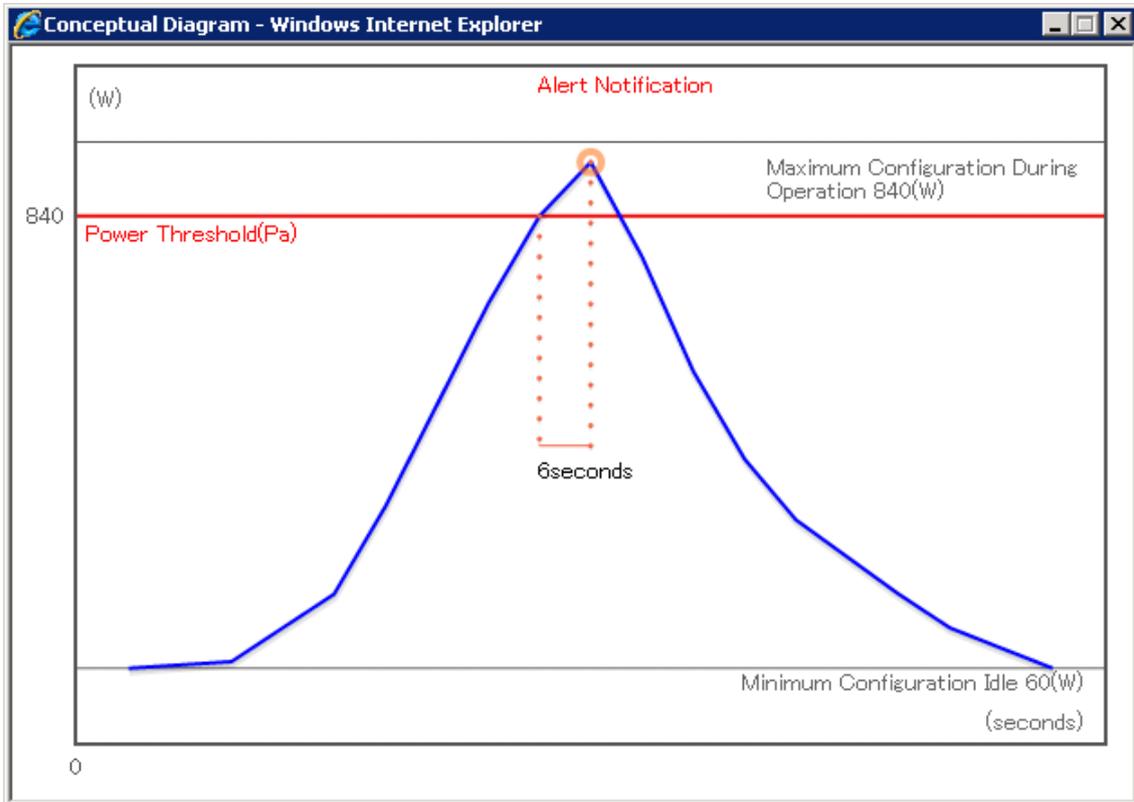
Depending on the conditions, the threshold may be exceeded for a moment, but when it is possible to return the values to below the threshold immediately, it may be considered a case where a report is unnecessary. In cases such as these, it is possible to set a (Correction time limit (1 - 600 seconds)<sup>1</sup>). This decides how long to wait after the threshold is exceeded before a report is made.

The [Aggressive Mode] is initially set to [Disable]. The [Power Threshold (Pa)] and [Correction time limit] settings are displayed by placing a check in [Enable], and then the values can be entered here. The settings are applied by clicking [Apply] at the bottom of the screen.

---

<sup>1</sup> The range of available values in the Correction Time Limit will vary depending on the device.

Below is a conceptual diagram that shows these power control settings (When the Correction time limit has been set to 2 [seconds]).



**Figure 19 Conceptual Diagram**

### **Setting Method (BMC Configuration)**

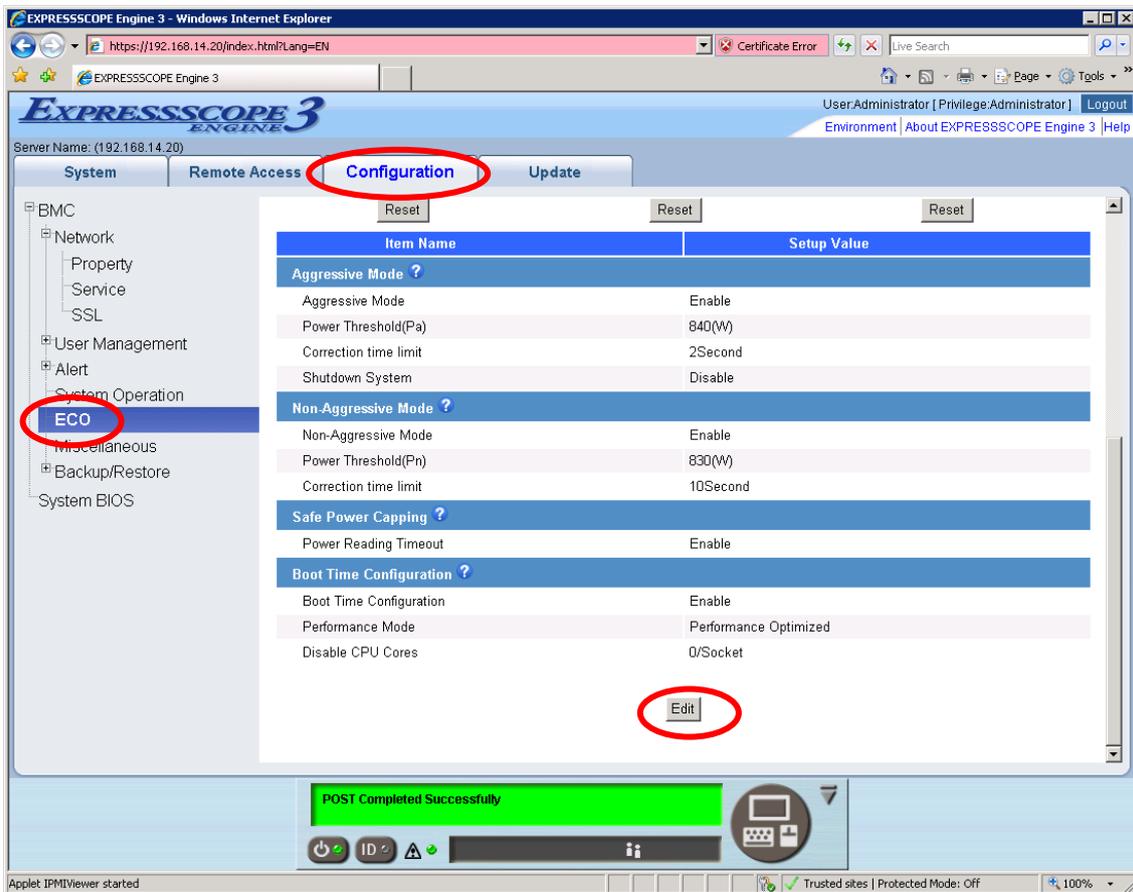
First, run the BMC Configuration and click [Set BMC Configuration], and then, click the [ECO] tab to display the settings. Set the [Aggressive Mode] to [Enable] and then please set the [Power Threshold (Pa)] and [Correction time limit] in the same way as the NEC ESM PRO Manager setting method.

After entering the set values, click [Apply] to reflect the settings.

### **Setting Method (EXPRESSSCOPE Engine 3: Web Console)**

First, open the Web console of EXPRESSSCOPE Engine 3 on the target server, and then, click [BMC] - [ECO] in the [Configuration] tab.

Click the [Edit] button at the bottom of the displayed screen and various settings become available.



**Figure 20 ECO Settings**

Set the [Aggressive Mode] to [Enable] and then please set the [Power Threshold (Pa)] and [Correction time limit] in the same way as the NEC ESM PRO Manager setting method. After entering the set values, click [Apply] to reflect the settings.

### Setting Method (EXPRESSSCOPE Engine 3: Command Line Interface)

First, log in to the command line interface in the EXPRESSSCOPE Engine 3 on the target server, enter the command below from the command prompt to change the default target to /admin1/system1.

```
-> cd /admin1/system1
```

Set the [Aggressive Mode] to [Enable] by setting the properties for

oemnec\_CriticalPowerCapSensor to "enabled" by the **set** command as follows.

```
-> set oemnec_AggressiveMode=enabled
```

Please set oemnec\_AggressiveModeCapvalue and oemnec\_AggressiveModeCorrectionTimeLimit by the **set** command in order to set the [Power Threshold (Pa)] and [Correction time limit] in the same way as the setting method of NEC ESM PRO Manager. After running the **set** command, the settings will take effect immediately.

```
-> set oemnec_AggressiveModeCapvalue=300
```

```
-> set oemnec_AggressiveModeCorrectionTimeLimit=2
```

Please refer to "EXPRESSSCOPE Engine 3 User's Guide" for details on each command.

### **3.2.1.3 Not Losing too much System Use Efficiency, but also Setting Power Consumption Upper Limit (Power Control: Low --> High)**

This is a setting for when you wish to adopt a policy in which you would like to control power without losing too much performance, but you do not want to consume power above a certain upper limit.

This case becomes possible by using together the Non-Aggressive Mode described in "3.2.1.1 Using without Lowering too much the System Usage Efficiency (Power Control: Low)" and the Power Threshold (Pn) described in "3.2.1.2 When There is Strong Need to Suppress Power Consumption in the Vicinity of the Set Values (Power Control: High)."

Set [Non-Aggressive Mode] and [Aggressive Mode] to [Enable] as has been described in each section. When the set value in Non-Aggressive Mode is exceeded, power will be controlled in the Non-Aggressive Mode, but when the Power Threshold (Pa) is exceeded without being controlled, there will be strict power consumption control in the Aggressive Mode.

For example, when the Power Threshold (Pn) is set to 100 [W] and the Power Threshold (Pa) is set to 120 [W], if the server power consumption exceeds 100 [W], power control will commence in the Non-Aggressive Mode, but if power consumption continues to rise and exceeds 120 [W], even stronger power control will commence in the Aggressive Mode.

Furthermore, in the same way, when power consumption reaches the Power Threshold (Pn)

and Power Threshold (Pa), an event will be issued to that effect and it is possible to report this. Please see "3.2.1.5 Additional Settings: Event Reports" for more details.

Please see "3.2.1.1 Using without Lowering too much the System Usage Efficiency (Power Control: Low)" and "3.2.1.2 When There is Strong Need to Suppress Power Consumption in the Vicinity of the Set Values (Power Control: High)" for the setting method of the Non-Aggressive Mode and Aggressive Mode.

Below is a conceptual diagram that shows these power control settings (when both of the Correction time limits are set to 10 [seconds]).

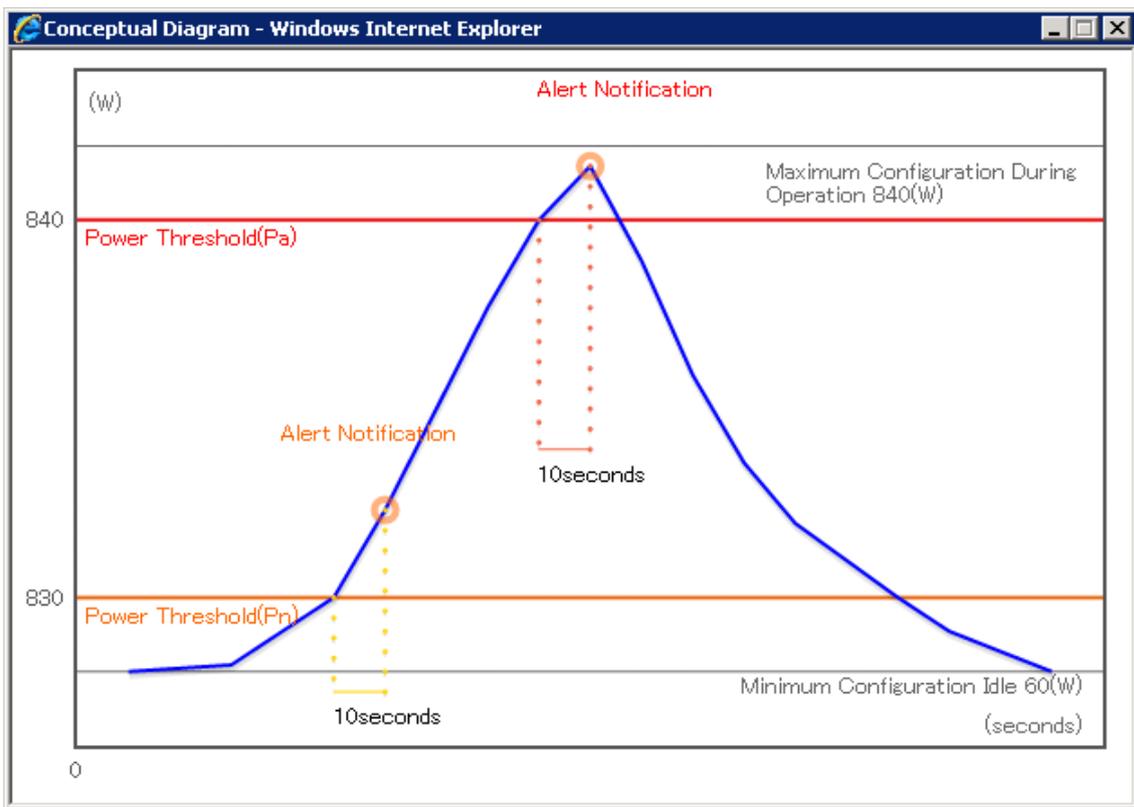


Figure 21 Conceptual Diagram

### **3.2.1.4 Strongly Controlling Power Consumption in the Vicinity of the Set Value, and Receiving Two-Stage Notifications Depending on the Duration of the Excess Power (Power Control: High)**

This is a setting for when you do not want to consume power above a certain upper limit, and at the same time you want to receive two-stage notifications depending on the duration of the excess power.

This becomes possible by using together the Non-Aggressive Mode and Aggressive Mode described in "3.2.1.3 Not Losing too much System Use Efficiency, but also Setting Power Consumption Upper Limit (Power Control: Low --> High)."

Suppose the Non-Aggressive Mode and Aggressive Mode have been set to [Enable], the Power Thresholds have both been set to the same value (for example 100 [W]), and the Correction time limit has been set to 10 [seconds] for Non-Aggressive Mode and 20 [seconds] for Aggressive Mode. In this case, if power consumption exceeds 100 [W], power will be controlled in the Aggressive Mode, but if it is not possible to reduce power consumption to less than 100 [W] within 10 seconds, then it is possible to make a report to the effect that Power Threshold (Pn) has been exceeded, and if it is not possible to reduce power consumption to less than 100 [W] within 20 seconds, then it is possible to make a report to the effect that Power Threshold (Pa) has been exceeded. Please refer to "3.2.1.5 Additional Settings: Event Reports" for the report settings.

Please see "3.2.1.1 Using without Lowering too much the System Usage Efficiency (Power Control: Low)" and "3.2.1.2 When There is Strong Need to Suppress Power Consumption in the Vicinity of the Set Values (Power Control: High)" for the setting method of the Non-Aggressive Mode and Aggressive Mode.

Below is a conceptual diagram that shows these power control settings.

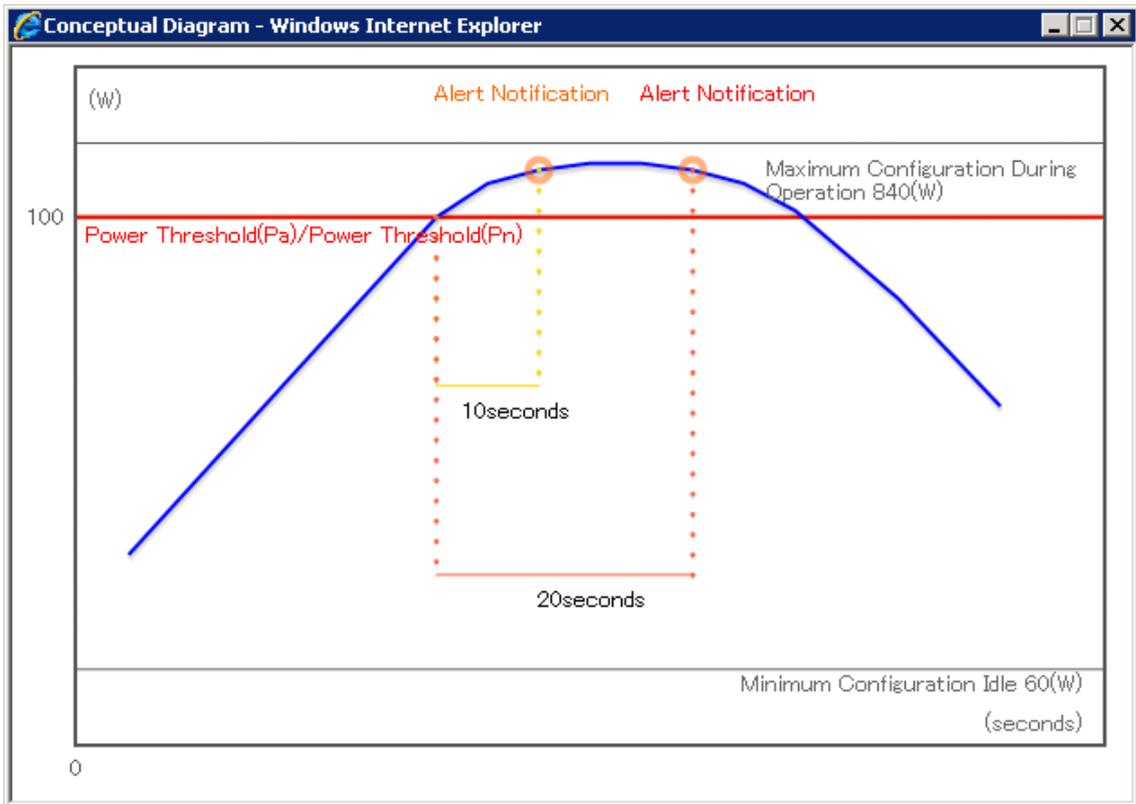


Figure 22 Conceptual Diagram

### 3.2.1.5 Additional Settings: Event Reports

Below are the report contents related to the power control function.

- (1) In the event that power consumption of the target server exceeds the threshold (Power Threshold (Pa)) that was set for the Aggressive Mode:

[Event information]

Item: Management Engine  
Type: Critical  
Details: Not Recover from Power Consumption (Critical)  
Power Domain: Entire Platform  
Policy ID: 1h

- (2) In the event that the power of the target server has exceeded the threshold (Power Threshold (Pn)) set for the Non-Aggressive Mode:

[Event information]

Item: Management Engine  
Type: Critical  
Details: Not Recover from Power Consumption (Non-critical)  
Power Domain: Entire Platform  
Policy ID: 2h

(3) In the event that an Intel® Node Manager state change (Critical level) has occurred:

[Event information]

Item: Management Engine

Type: Asserted

Details: Management Engine status change detected.

\*Furthermore, the following detailed information will be output.

"Operational Firmware image corrupted"

"Flash ROM erase error"

"Flash ROM corrupted"

"Internal error"

"BMC not responded to cold reset request"

"Wrong manufacturing configuration"

"Flash ROM file system error"

(4) In the event that an Intel® Node Manager state change (information level) occurs:

[Event information]

Item: Management Engine

Type: Asserted

Details: Management engine state change detected.

\*Furthermore, the following detailed information will be output.

"Force Recovery mode"

"Flash ROM update request received"

(5) In the event of an Intel® Node Manager operational state change:

[Event information]

Item: Microcontroller/Coprocessor

Type: Asserted

Details: Transition to Running.

Alternatively, Transition to Power OFF.

This is the setting to report the following pieces of information, but in the reports there are:

- (1) Email reports
- (2) SNMP reports

and each can be set as necessary. Please refer to each User's Guide or online help for more details. The settings for whether or not there will be report for each event are virtually all the same, and so below the settings for (1) email reports is described.

### **Setting Method (NEC ESM PRO Manager)**

First, select the target server that has been registered in NEC ESM PRO and then click the [Configuration] tab - [BMC] - [Alert] - [Mail Alert]. Here, if you place a check in [Alert]: [Enable] and set the report location and other information, you will be able to select the [Report Level] in the [Report Level Settings] field. If you want to select the report/do not want to report target for each event, please select the [Individual Settings] and implement the settings.

## Setting Method (BMC Configuration)

After clicking [Set BMC Configuration], click [Mail Alert]. Here, check [Alert]: [Enable] and set the report destination and other information.

[Report Level Settings] are possible in the same way as with NEC ESMPRO Manager.

## Settings Method (EXPRESSSCOPE Engine: Web Console)

Check [Alert] - [Mail Alert] in the [Configuration] tab. Here, check [Alert]: [Enable] and set the report destination and other information.

[Report Level Settings] are available in the same way as with NEC ESMPRO Manager in the screens below.

The screenshot shows the EXPRESSSCOPE Engine 3 web console in Internet Explorer. The 'Configuration' tab is active, displaying a list of alert settings. The left sidebar shows the 'Mail Alert' section selected. A green status bar at the bottom indicates 'POST Completed Successfully'.

Alert Category	Severity	Report Level	Enabled
Warning	Warning		<input type="checkbox"/>
Information	Information		<input type="checkbox"/>
Microcontroller State	Information		<input checked="" type="checkbox"/>
Error	Error		<input type="checkbox"/>
Warning	Warning		<input type="checkbox"/>
Information	Information		<input checked="" type="checkbox"/>
Slot/Connector	Information		<input type="checkbox"/>
Error	Error		<input type="checkbox"/>
Warning	Warning		<input type="checkbox"/>
Information	Information		<input type="checkbox"/>
Watchdog Timer	Information		<input type="checkbox"/>
Error	Error		<input type="checkbox"/>
Warning	Warning		<input type="checkbox"/>
Information	Information		<input type="checkbox"/>
Power Capping	Information		<input checked="" type="checkbox"/>
Error	Error		<input checked="" type="checkbox"/>
Warning	Warning		<input checked="" type="checkbox"/>
Information	Information		<input type="checkbox"/>
Management Engine	Information		<input checked="" type="checkbox"/>
Error	Error		<input checked="" type="checkbox"/>
Warning	Warning		<input type="checkbox"/>
Information	Information		<input checked="" type="checkbox"/>
Sensor Failure	Information		<input type="checkbox"/>

**(5) In the event of an Intel® Node Manager operational state change,**  
If you would like to receive reports, check here

**(1) When power consumption has exceeded the threshold (Power Threshold (Pa)) that has been set for the Aggressive Mode,**  
If you would like to receive reports, check here

**(2) When power consumption has exceeded the threshold (Power Threshold (Pn)) that has been set for the Non-Aggressive Mode,**  
If you would like to receive reports, check here

**(3) In the event that an Intel® Node Manager state change (abnormal level) has occurred,**  
If you would like to receive reports, check here

**(4) In the event that an Intel® Node Manager state change (information level) has occurred,**  
If you would like to receive reports, check here

Figure 23 Report Level Settings

### 3.2.1.6 Additional Settings: Safe Power Capping

Even when it becomes impossible to measure the amount of power consumption on the server, it comes equipped with a function that carries out power control (Safe Power Capping).

If this function is enabled, an appropriate value will be set for the power control to suppress the power consumption when it becomes impossible to measure the amount of power consumption on the server.

If this function is disabled, the above-mentioned operation will not be performed (default).



- If the managed server does not support this function, the settings screen will not be displayed. If the command line interface of the EXPRESSSCOPE Engine 3 is used, parameters for this function will not be displayed by using the show command.

#### Setting Method (NEC ESM PRO Manager)

On a specified target server in NEC ESM PRO Manager, if you select [Electric Power Management] - [ECO Setting] - [Power Capping] in the [Remote Control] tab, and then click [Edit] in the bottom right, a [Safe Power Capping] check box appears at the bottom of the screen. The initial setting is [Disable]. Place a check in [Enable] as necessary. The settings are applied by clicking [Apply] at the bottom of the screen.

#### Setting Method (BMC Configuration)

First, run the BMC Configuration, click [Set BMC Configuration], and then, click the [ECO] tab to display the settings. Place a check in [Enable] as necessary. After entering the set values, click [Apply] to reflect the settings.

#### Setting Method (EXPRESSSCOPE Engine 3: Web Console)

First, open the Web console of EXPRESSSCOPE Engine 3 on the target server, and then click [BMC] - [ECO] in the [Configuration] tab. Click the [Edit] button at the bottom of the screen that is displayed, place a check in [Enable] in the [Safe Power Capping] - [Power Reading Timeout] at the bottom of the displayed screen, and then click [Apply].

### **Setting Method (EXPRESSSCOPE Engine 3: Command Line Interface)**

First, log in to the command line interface of the EXPRESSSCOPE Engine 3 on the target server, and after moving to **/admin1/system1** by the **cd** command, set the properties of `oemnec_SafePowerCapping` by the **set** command to "enabled." After running the **set** command, the settings will take effect immediately.

```
cd /admin1/system1
```

```
set oemnec_SafePowerCapping=enabled
```

Please refer to "EXPRESSSCOPE Engine 3 User's Guide" for details on each command.

### 3.2.2 Shutting Down an OS after Power Consumption Exceeds the Threshold

A server which has had a power control threshold set, is controlled so power consumption does not exceed that threshold, but there are cases where it will continue on for a short time while the Power Threshold (Pa) set for the Aggressive Mode has been exceeded for some reason. It comes equipped with a function that forces a shutdown of the OS in this case.

#### Setting Method (NEC ESMPRO Manager)

On a specified target server in NEC ESMPRO Manager, select [Electric Power Management] - [ECO Setting] - [Power Capping] in the [Remote Control] tab, set [Shutdown System] of the [Aggressive Mode] field to [Enable] and click [Apply].

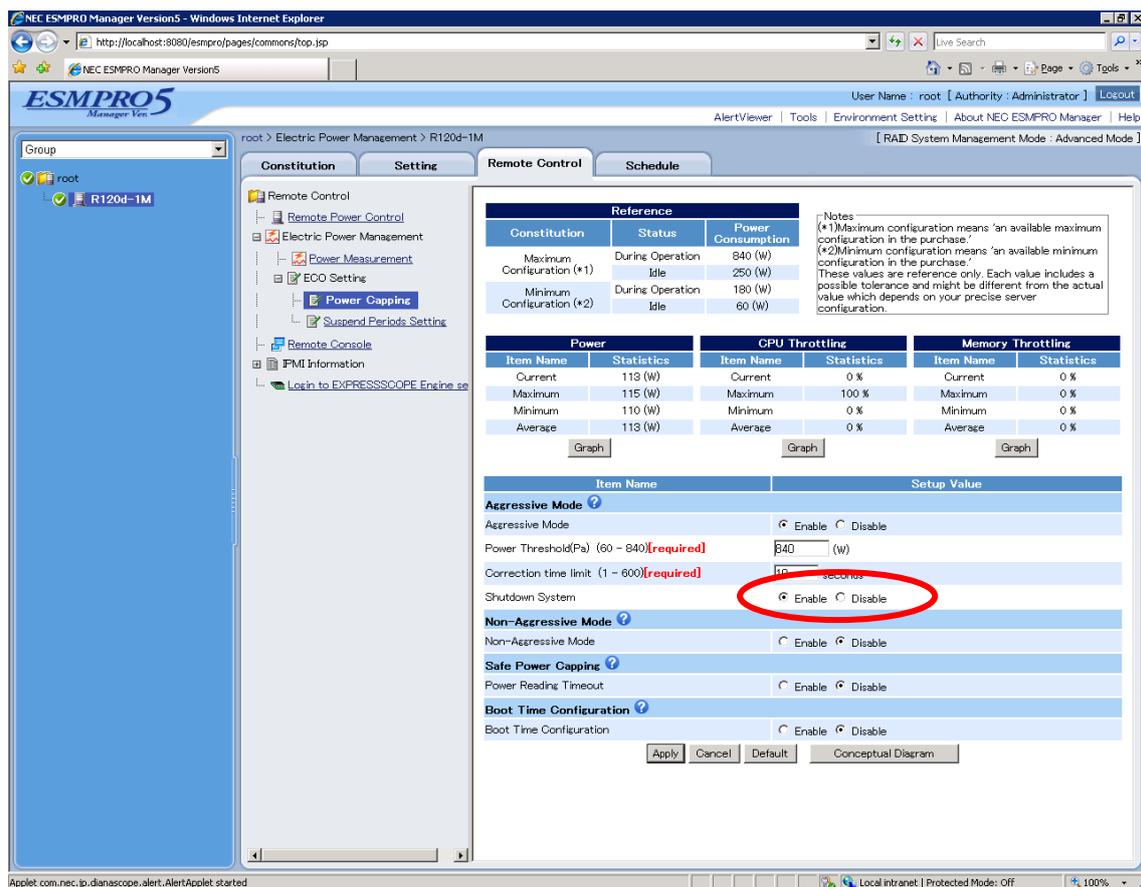


Figure 24 Shutdown System

Depending on these settings, the server will shut down when the period [seconds], which has consumed more power than the value set in the Power Threshold (Pa), has exceeded the specified Correction time limit.



- When this function is enabled and the value set for the Power Threshold (Pa) is less than the power required to start up the server, the server may shut down during the startup. In this case, release the setting from the Web console or command line interface of the EXPRESSSCOPE Engine 3.
- When this function is enabled, the Power Threshold (Pa) should be set to the value large enough to keep the server from becoming unavailable at the startup.

### Setting Method (BMC Configuration)

If you click [Set BMC Configuration] and then click the [ECO] tab, the settings will be displayed.

Place a check in the [Shutdown System] in the [Aggressive Mode] field, and click [Apply].

### Setting Method (EXPRESSSCOPE Engine 3: Web Console)

Click [BMC] - [ECO] in the [Configuration] tab. Click the [Edit] button at the bottom of the displayed screen, and various settings become available.

Set [Shutdown System] for [Aggressive Mode] to [Enable], and click [Apply].

### Setting Method (EXPRESSSCOPE Engine 3: Command Line Interface)

First, log in to the command line interface of the EXPRESSSCOPE Engine 3 on the target server, and after moving to **/admin1/system1** by the **cd** command, set the properties of `oemnec_ExceptionAction_Shutdown_Enable` by the **set** command to "enabled." After running the **set** command, the settings will take effect immediately.

```
-> cd /admin1/system1
```

```
-> set oemnec_ExceptionAction_Shutdown_Enable=enabled
```

Please refer to "EXPRESSSCOPE Engine 3 User's Guide" for details on each command.

### 3.2.3 Releasing the Period Power Control

There is a function that temporarily disables the set power control policy, such as when wanting to enable nighttime power and wanting to improve performance on a server only at a particular time.



- If the managed server does not support this function, the settings screen will not be displayed. If the command line interface of the EXPRESSSCOPE Engine 3 is used, parameters for this function will not be displayed by using the show command.

#### [Setting Method]

On a specified target server in NEC ESMPRO Manager,

Select the [Electric Power Management] - [Power Measurement] - [ECO Setting] - [Suspend Periods Setting] in the [Remote Control] tab.

You can register up to five schedules.

Click the [Addition of schedules] link at the top of the screen, or drag and drop the time to be registered with the mouse and add to the schedule.

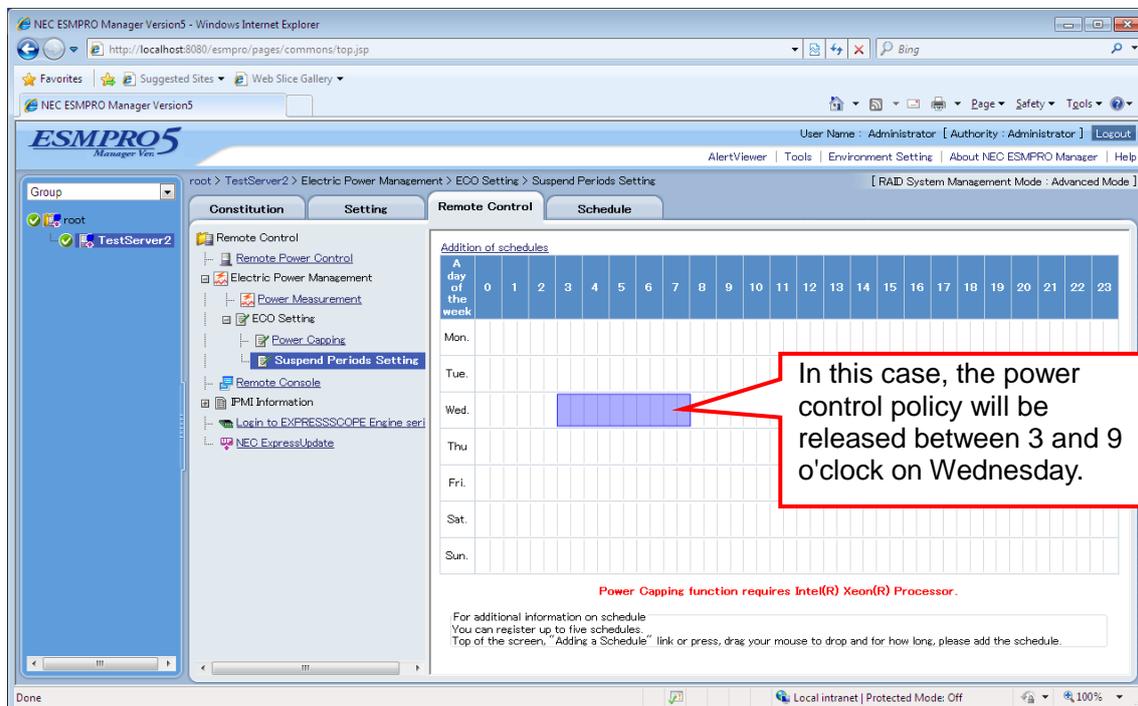


Figure 25 Suspend Periods Setting

The power control is disabled during the time selected above.



- The function that periodically releases the power control function (Suspend Periods Setting) is available only from NEC ESMPRO Manager.

### 3.2.4 Reducing the Power Consumption when Booting the OS

A function that reduces the power consumption by lowering the performance when booting the OS is provided.

Figure 27 shows an example of the power graph when booting the OS of a device supporting the power control function, which Performance Mode is set to "Power Optimized" to optimize the power consumption, although it depends on the configuration of the device. As you can see, there is not a drastic difference in booting time between "When booting the OS normally" and "When Power Optimized is selected", while the power consumption is reduced.

In addition, if "Boot Time Configuration" is disabled, the server will be booted while adjusting for the best performance and behavior of the system.



- If the managed server does not support this function, the settings screen will not be displayed. If the command line interface of the EXPRESSSCOPE Engine 3 is used, parameters for this function will not be displayed by using the show command.

#### Setting Method (NEC ESMPRO Manager)

In NEC ESMPRO Manager, select [Electric Power Management] - [ECO Setting] - [Power Capping] in the [Remote Control] tab with specifying the target server. Set [Boot Time Configuration] to [Enable] and set [Performance Mode] to [Power Optimized], and then, click [Apply].

NEC ESMPRO Manager Version5 - Windows Internet Explorer

http://localhost:8080/esmpro/pages/commons/top.jsp

NEC ESMPRO Manager Version5

User Name : root [ Authority : Administrator ] Logout

AlertViewer | Tools | Environment Setting | About NEC ESMPRO Manager | Help

[ RAID System Management Mode : Advanced Mode ]

root > Electric Power Management > R120d-1M

Constitution Setting Remote Control Schedule

Remote Control

- Remote Power Control
- Electric Power Management
  - Power Measurement
  - ECO Setting
    - Power Capping**
    - Suspend Periods Setting
- Remote Console
- IPMI Information
- Login to EXPRESSSCOPE Engine se

Reference		
Constitution	Status	Power Consumption
Maximum Configuration (#1)	During Operation	840 (W)
	Idle	250 (W)
Minimum Configuration (#2)	During Operation	180 (W)
	Idle	60 (W)

Notes  
 (\*1)Maximum configuration means 'an available maximum configuration in the purchase.'  
 (\*2)Minimum configuration means 'an available minimum configuration in the purchase.'  
 These values are reference only. Each value includes a possible tolerance and might be different from the actual value which depends on your precise server configuration.

Power		CPU Throttling		Memory Throttling	
Item Name	Statistics	Item Name	Statistics	Item Name	Statistics
Current	112 (W)	Current	0 %	Current	0 %
Maximum	115 (W)	Maximum	100 %	Maximum	0 %
Minimum	110 (W)	Minimum	0 %	Minimum	0 %
Average	113 (W)	Average	0 %	Average	0 %

Graph Graph Graph

Item Name	Setup Value
<b>Aggressive Mode</b>	
Aggressive Mode	<input type="radio"/> Enable <input checked="" type="radio"/> Disable
<b>Non-Aggressive Mode</b>	
Non-Aggressive Mode	<input type="radio"/> Enable <input checked="" type="radio"/> Disable
<b>Safe Power Capping</b>	
Power Reading Timeout	<input type="radio"/> Enable <input checked="" type="radio"/> Disable
<b>Boot Time Configuration</b>	
Boot Time Configuration	<input checked="" type="radio"/> Enable <input type="radio"/> Disable
Performance Mode	<input type="radio"/> Performance <input checked="" type="radio"/> <b>Timized</b> <input type="radio"/> Power Optimized
Disable CPU Cores (0 - 7) [required]	0

Apply Cancel Default Conceptual Diagram

Applet.com.nec.jp.danascopes.alert.AlertApplet started

Local Intranet | Protected Mode: Off

100%

Figure 26 Performance Mode

This setting allows the power consumption to be reduced when booting the OS.

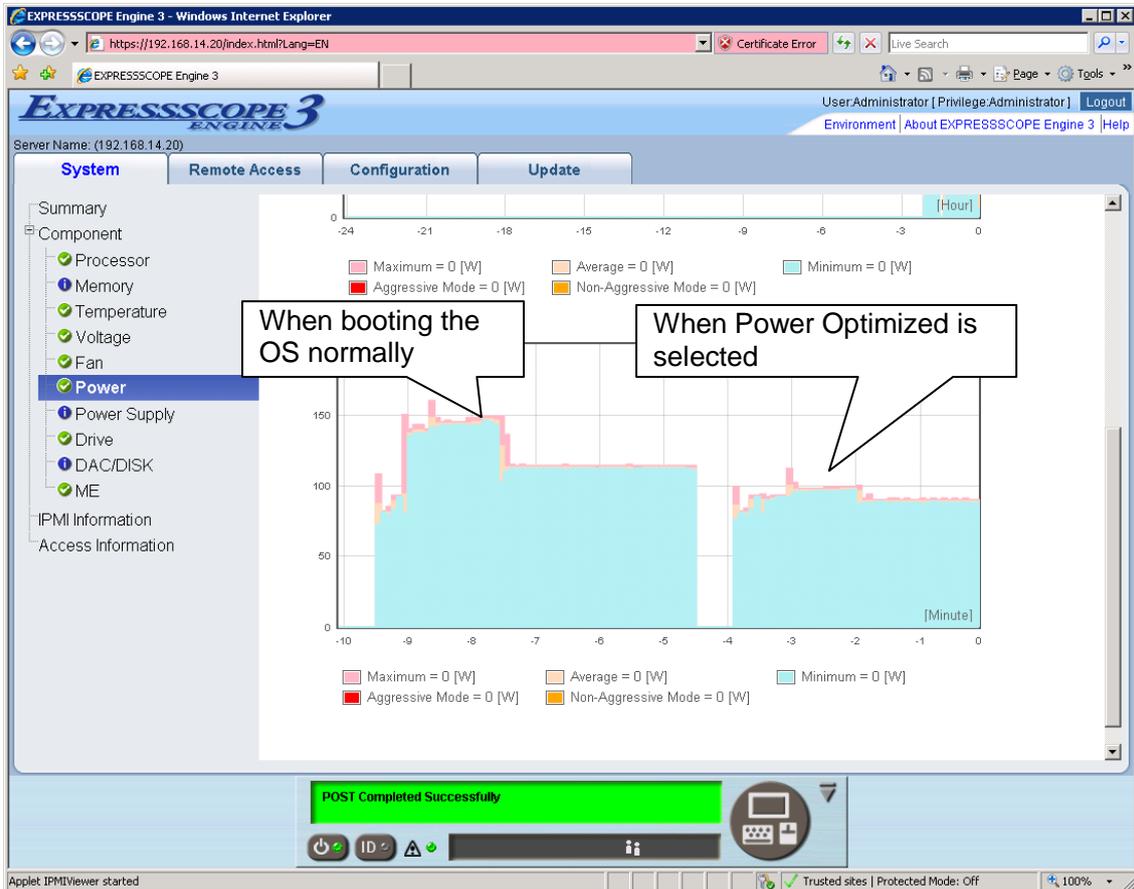


Figure 27 Example of the power graph when booting the OS

### Setting Method (BMC Configuration)

Run the BMC Configuration and click [Set BMC Configuration], and then, click the [ECO] tab to display the settings.

In the same way as the NEC ESM PRO Manager setting method, set [Boot Time Configuration] to [Enable] and set [Performance Mode] to [Power Optimized], and then, click [Apply].

### Setting Method (EXPRESSSCOPE Engine 3 Web Console)

Open the Web console of the EXPRESSSCOPE Engine 3 on the target server, and then, click [BMC] - [ECO] in the [Configuration] tab.

Click the [Edit] button at the bottom of the displayed screen to configure the settings.

Set [Boot Time Configuration] to [Enable] and set [Performance Mode] to [Power Optimized], and then, click [Apply].

### **Setting Method (EXPRESSSCOPE Engine 3 Command Line Interface)**

Log in to the command line interface of the EXPRESSSCOPE Engine 3 on the target server, and after changing the directory to **/admin1/system1** by the **cd** command, set the properties of **oemnec\_BootPerformanceOptimized** to "enabled" by the **set** command. And then, set the properties of **oemnec\_BootPerformanceOptimized**, which can be displayed by the **show** command, to "disabled."

After running the **set** command, the settings will be reflected immediately.

```
-> cd /admin1/system1
```

```
-> set oemnec_BootTimeConfig=enabled
```

```
-> set oemnec_BootPerformanceOptimized=disabled
```

Please refer to "EXPRESSSCOPE Engine 3 User's Guide" for details on each command.

## 3.2.5 Controlling the Number of Cores

A function to boot the OS with the number of CPU cores less than usual by setting the CPU cores to "disable" when booting the server is provided.

The available range is from 0 to the maximum number of cores allowed -1.

If this setting is configured during the boot process, the setting will be enabled the next time you boot the OS.

In this setting, the cores are continuously set to "disable" even after booting the OS.

BIOS has the same setting as described above. However, if you have configured the setting by using BIOS as well as by using the function above, the setting with less number of enabled cores will be used.



- If the managed server does not support this function, the settings screen will not be displayed. If the command line interface of the EXPRESSSCOPE Engine 3 is used, parameters for this function will not be displayed by using the show command.

### Setting Method (NEC ESMPRO Manager)

In the NEC ESMPRO Manager, select [Electric Power Management] - [ECO Setting] - [Power Capping] in the [Remote Control] tab with specifying the target server. Set [Boot Time Configuration] to [Enable] and enter the number of cores you want to disable for [Disable CPU Cores], and then, click [Apply].

### Setting Method (BMC Configuration)

Run the BMC Configuration and click [Set BMC Configuration], and then, click the [ECO] tab to display the settings.

In the same way as in the NEC ESMPRO Manager setting method, set [Boot Time Configuration] to [Enable] and enter the number of cores you want to disable for [Disable CPU Cores], and then, click [Apply].

### Setting Method (EXPRESSSCOPE Engine 3 Web Console)

Open the Web console of the EXPRESSSCOPE Engine 3 on the target server, and then click [BMC] - [ECO] in the [Configuration] tab.

Click the [Edit] button at the bottom of the displayed screen to configure the settings.

Set [Boot Time Configuration] to [Enable] and enter the number of cores you want to disable for [Disable CPU Cores], and then, click [Apply].

### Setting Method (EXPRESSSCOPE Engine 3 Command Line Interface)

Log in to the command line interface of the EXPRESSSCOPE Engine 3 on the target server, and after changing the directory to **/admin1/system1** by the **cd** command, set the properties of **oemnec\_BootTimeConfig** to "enabled" by the **set** command. And then, set the properties of **oemnec\_ProcessorCoreDisable**, which can be displayed by the **show** command, to the value within a range that does not exceed **oemnec\_ProcessorCoreDisableMax**.

```
-> cd /admin1/system1
```

```
-> set oemnec_BootTimeConfig=enabled
```

```
-> set oemnec_ProcessorCoreDisable=1
```

Please refer to "EXPRESSSCOPE Engine 3 User's Guide" for details on each command.

## Chapter 4 Automatic Power Distribution Function

### 4.1 Overview

NEC ESMPRO Manager (Version 5.54 or later) allows for automatic power distribution for each server within a power group.

Automatic power distribution function is the function which sets the allotted power to the power group and the server priority for the power distribution, controlling the power capping of each server to prevent the total power consumption value of the group from exceeding the allotted power. To use this function, use the "4.4 Group set for power management" described in the following section.

### 4.2 Power control algorithm

"Balance type" or "Priority type" can be selected from power control algorithms.

#### 4.2.1 Balance type

Balance type power distribution function can be selected by using NEC ESMPRO Manager (Version 5.7 or later). Power is distributed to all the managed servers in well balance, and the power consumption is regulated at a fixed rate.

For example, there is a group with 5 servers, A-E. When this function is enabled, prior to power shortage, the total amount of the power consumption of the group is controlled below the specified value by regulating the power distributed to all the servers at a fixed rate.

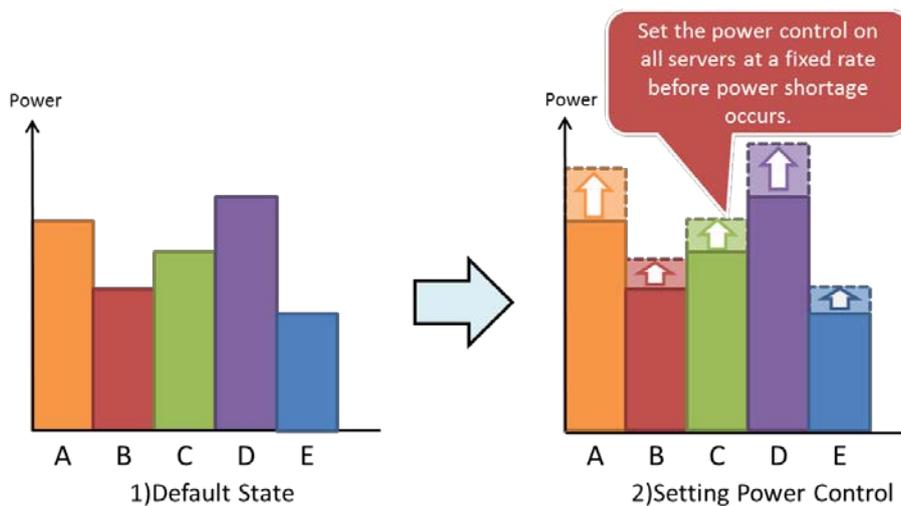


Figure 28 "Balance Type" group power control

## 4.2.2 Priority type

Power is preferentially distributed to the prioritized managed servers. The power consumption is controlled to the lower limit from lower priority managed servers in series.

For example, there is a group with 5 servers, A-E. When the order E, D, C, B and A is in the order of descending priorities to distribute power, if power runs short, the total amount of the power consumption of the group is controlled below the specified value by controlling from A.

In case the power regulation to A does not cover the shortage as a group, power control is performed from B, C, D to E in order.

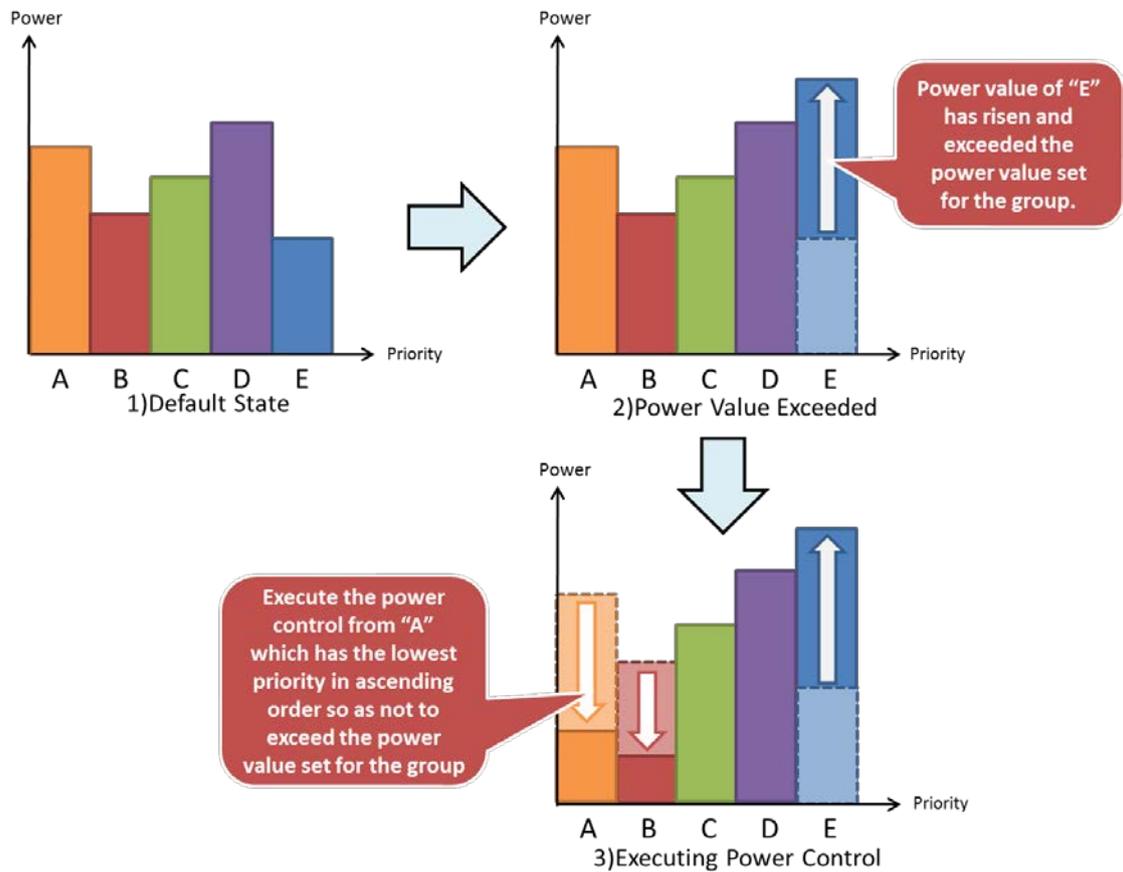


Figure 29 "Priority type" group power control

### 4.3 Coexistence with Power Control Function (Power Capping) for individual server

The automatic power distribution function can be coexisted with the Power Control Function (Power Capping) described in Chapter 3, which enables power control at even lower value. As for values set by automatic power distribution function, they can be found in the [Alloc.] field on the screen described in 4.4.2.

Additionally, because Shutdown and Report functions of Aggressive Mode/Non-Aggressive Mode are enabled, the server can be shut down or a report can be sent as long as the value of Power Threshold(Pa) set in Aggressive Mode is not less than during the period specified in Correction Time Limit.

### 4.4 Group set for power management

In NEC ESMPRO Manager Version 5.53 or earlier, a server can belong to only a single group created by using a group set. NEC ESMPRO Manager Version 5.54 or later allows a server to belong to not only a group created by using a group set already existing in Version 5.53 or earlier, but also a group created by using the group set for power management. However, the server cannot belong to multiple groups within a single group set, which is the same as the previous versions.

Additionally, only servers with Intel® Node Manager installed can belong to a power group set.

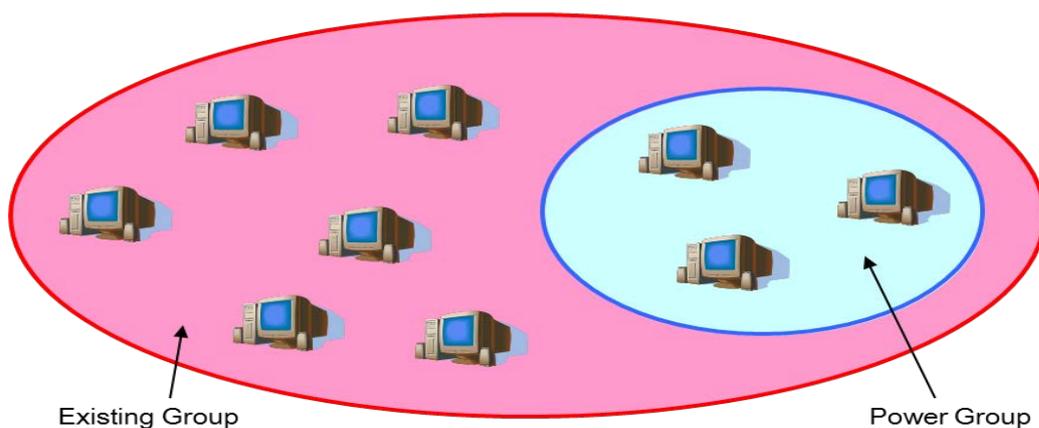


Figure 30 Power Group

## 4.4.1 Editing the power group set

This is the screen to add a new group, delete a group, or move a server within the power group set. To display the screen, select "Edit group set" from a pull-down menu shown in the following figure.

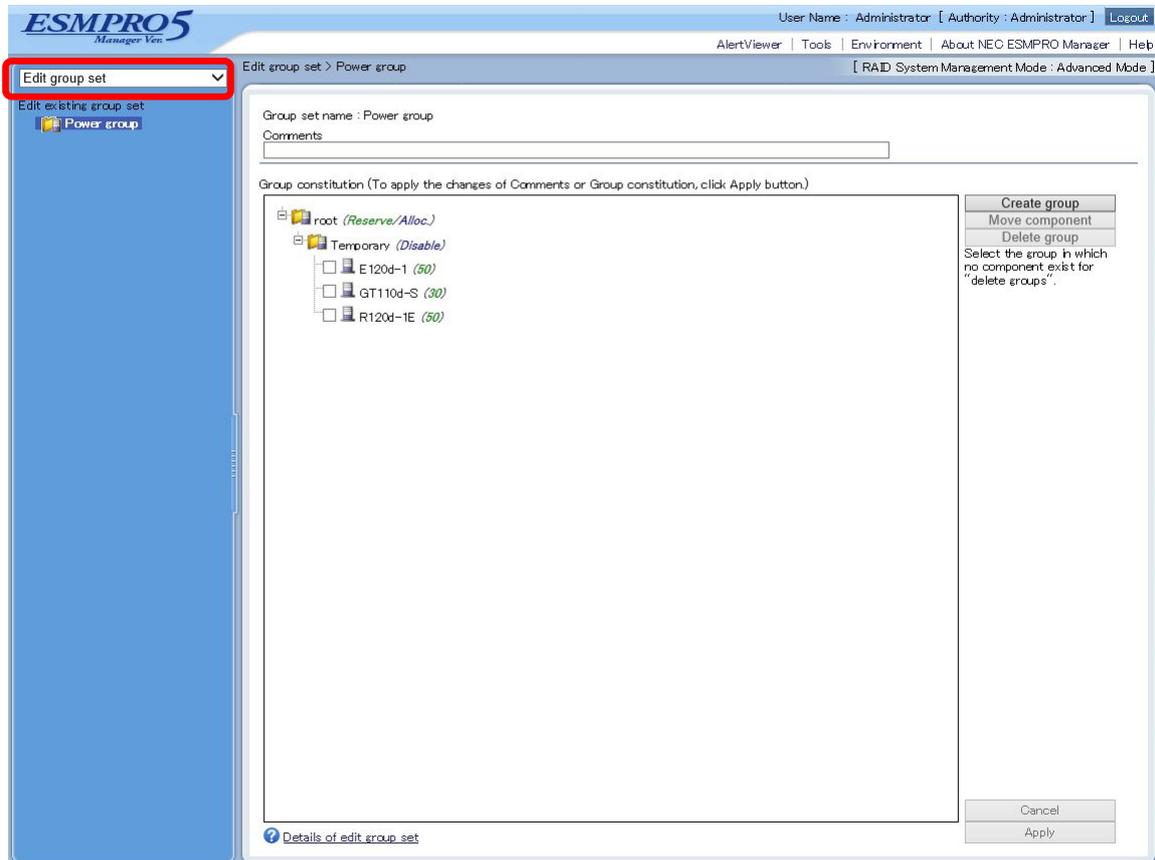


Figure 31 Screen of "Edit group set"

### 4.4.1.1 Temporary group

In default state, server with Intel® Node Manager installed belongs to "Temporary" group ("Default Group" in NEC ESMFPRO Manager before version 5.7). However, the settings of ["Management Controller" management] of the server need to be enabled in order to register the server as a managed server. To change those settings of the servers already registered as managed servers, follow the procedures below.

1. Select "Group" or "Power group" from a pull-down menu described in 4.3.1.section.
2. Select the server you wish to change the settings, and enable the settings of ["Management Controller" management] on the screen to be displayed by going to [Setting] tab -> [Connection Setting], and click [Check Connection].

### 4.4.1.2 Creating new power group

To create a new power group in the power group set, click [Create new group].

To reflect this change, click [Apply].

In addition, a power group cannot be created under an existing power group.

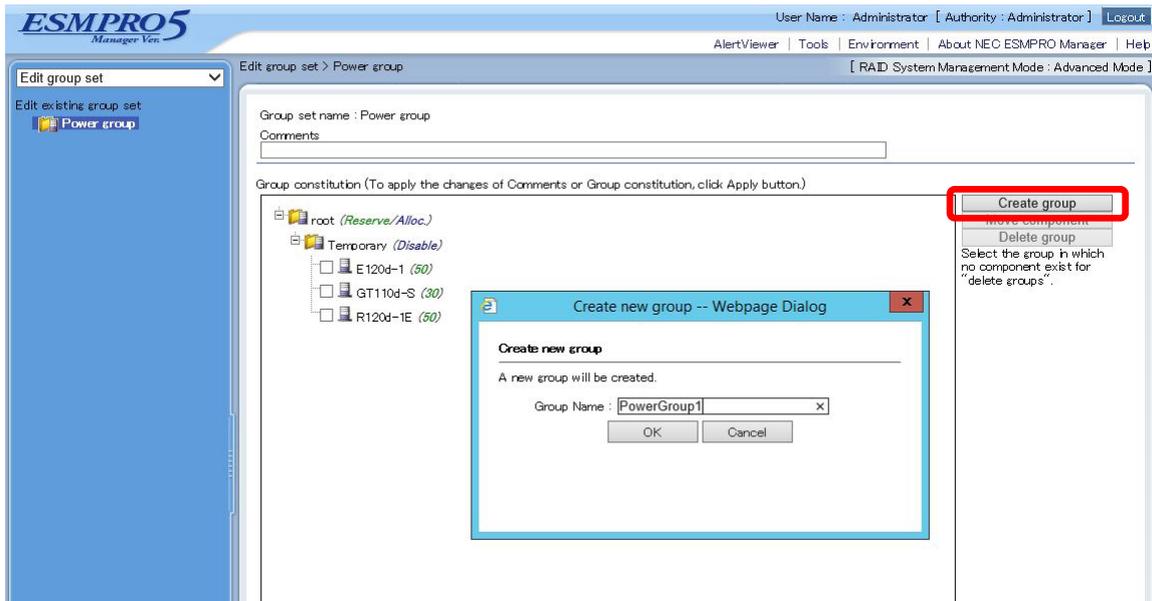


Figure 32 Creating new power group

### 4.4.1.3 Moving component

To move a server among groups within the power group set, after selecting the checkbox of the server you wish to move to different group, click [Move component].

On a new window to be appeared, select the group to which you wish to move the server.

Note that if the total lower limit value of the components should exceed the power value allocated to the group, the components cannot be moved. Be sure to move them after increasing the allotment value or disabling the power control of the destination group. Click [Apply] to reflect the change.

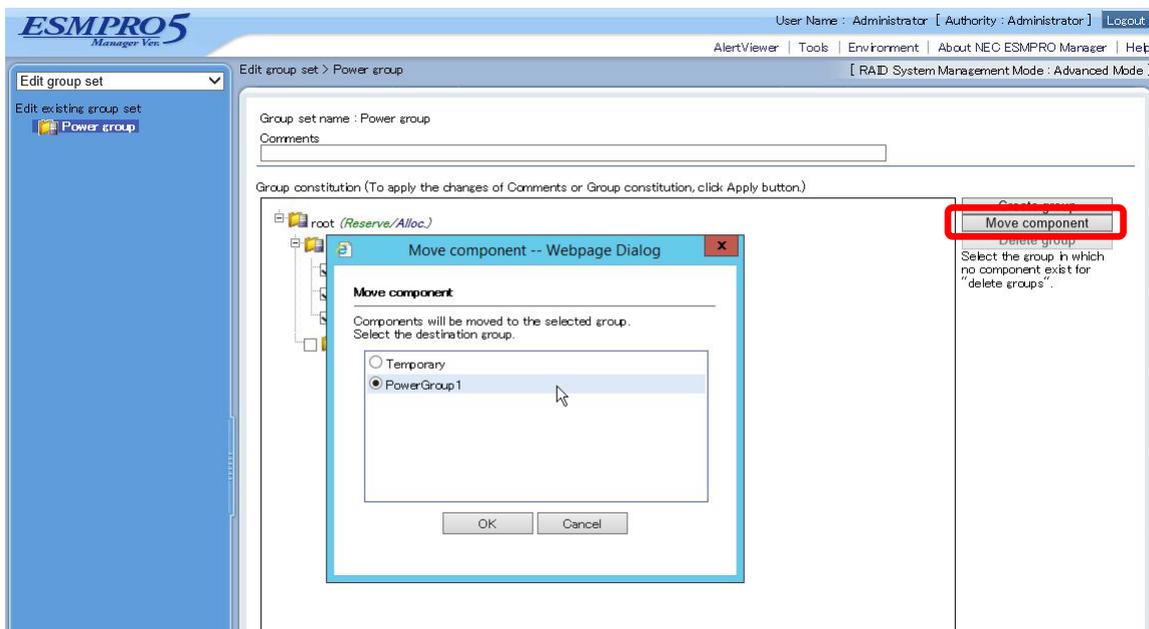


Figure 33 Moving component

### 4.4.1.4 Deleting group

To delete a group within the power group set, click [Delete group]. However, if any server exists in the group, the group cannot be deleted. After moving all servers in the group to different group, try again.

To reflect this change, click [Apply].

### 4.4.1.5 Deleting component

To delete a server from the power group set, display the screen for viewing a group set existing from the previous versions, and select the group to which the server belongs, and click [Delete] shown at right of the screen.



- When the server has been deleted, NEC ESMPRO Manager will disable the automatic power distribution setting set for the server. If NEC ESMPRO Manager cannot communicate with BMC, a pop-up dialog box asking you whether or not to delete the server forcibly will appear. In case of that the server was deleted forcibly, the capability of the server may not be fully utilized because the automatic power distribution setting remains to be set for the server. Therefore, please be very careful to do so.

### 4.4.2 Power group set view screen

To change from the view of "group set" displayed after logging in NEC ESMPRO Manager to the view of "Power group set", use the pull-down menu shown at the upper-left of the screen of NEC ESMPRO Manager. Select *Power group* as shown in the figure below, then the screen for setting the automatic power distribution function will be displayed.

After doing so, the screen will display "root" group. However, automatic power distribution function cannot be set to any root group.

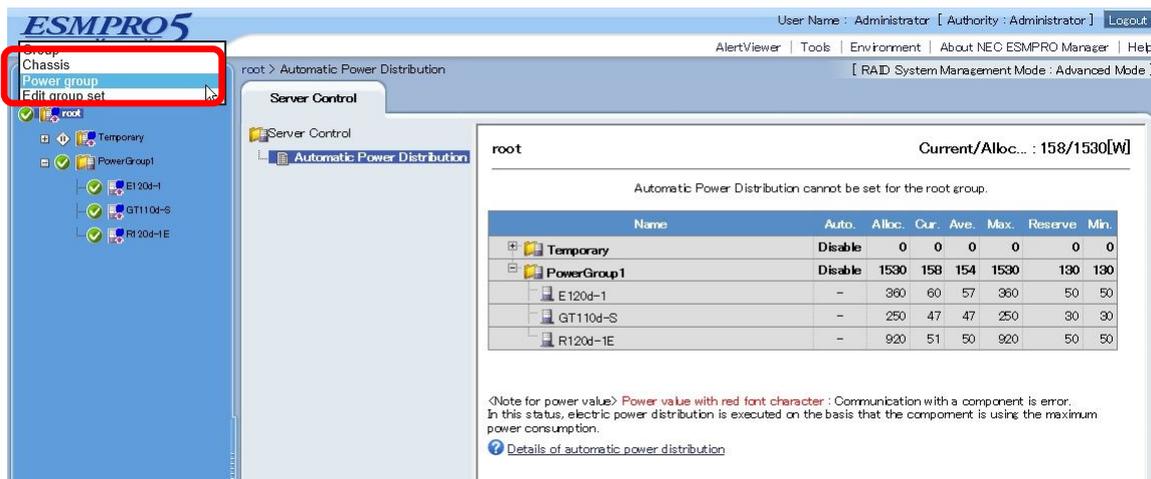


Figure 34 Changing group set view

## 4.5 Automatic power distribution setting

This section describes the screen to set automatic power distribution with a specific example.

Automatic power distribution function cannot be set to "root" group or "Temporary" group. Select a Power Group newly created on the Screen of "Edit group set."

In default state, the automatic power distribution setting is disabled. To display the screen for the automatic power distribution setting, click [Edit].

The screenshot shows the ESMPRO5 Manager Vm interface. The main window displays the 'Automatic Power Distribution' settings for 'PowerGroup1'. The 'Auto.' column is set to 'Disable'. The 'Current/Alloc...' is shown as '154/1530[W]'. A table lists the components and their power settings. The 'Edit' button is highlighted with a red box.

Name	Auto.	Alloc.	Cur.	Ave.	Max.	Reserve	Min.
PowerGroup1	Disable	1530	154	156	1530	130	130
E120d-1	-	360	57	59	360	50	50
GT110d-S	-	250	47	47	250	30	30
R120d-1E	-	920	50	50	920	50	50

Figure 35 Automatic power distribution setting screen view (Disabled)

## 4.5.1 Balance type

Selecting “Balance” from the pull-down menu of the “Auto.” column of the target group allows you to enter the allocated value to the group and lower limit of each server. If you do not wish to go below the fixed lower limit even when the power value of the group is short, enter the value in the “Reserve” field. By default, the minimum power value of each component is set.

PowerGroup1 Current/Alloc... : 160/0[W]

---

Name	Auto.	Alloc.	Cur.	Ave.	Max.	Reserve	Min.
PowerGroup1	Balance ▾	0	160	155	1530	130	130
E120d-1	-	360	62	58	360	50	50
GT110d-S	-	250	47	47	250	30	30
R120d-1E	-	920	51	50	920	50	50

<Note for power value> **Power value with red font character** : Communication with a component is error.  
In this status, electric power distribution is executed on the basis that the component is using the maximum power consumption.

[? Details of automatic power distribution](#)

**Figure 30 Automatic power consumption setting edit screen**

By default, the maximum power value of each component is displayed in the respective allocated value fields. Click “Apply” to execute the distribution calculation for appropriate power allocation.

Name	Auto.	Alloc.	Cur.	Ave.	Max.	Reserve	Min.
PowerGroup1	Balance	150	160	159	1530	130	130
E 120d-1	-	54	62	62	360	50	50
GT110d-S	-	34	48	47	250	30	30
R120d-1E	-	62	50	50	920	50	50

Edit

<Note for power value> Power value with red font character : Communication with a component is error.  
In this status, electric power distribution is executed on the basis that the component is using the maximum power consumption.

[? Details of automatic power distribution](#)

**Figure 31 Automatic power distribution setting display screen  
("Balance type" is enabled)**

Note that the power may not be lowered to the allocated power value depending on the server configuration

## 4.5.2 Priority type

For “Priority”, priority numbers of the servers in the automatic power distribution setting can be changed by dragging and dropping the icon shown when you place the mouse cursor on the row of a server you wish to change the priority number. To reflect this change, click [Apply].

PowerGroup1 Current/Alloc... : 157/150[W]

Name	Auto.	Alloc.	Cur.	Ave.	Max.	Reserve	Min.Pri.
PowerGroup1	Priority	150	157	154	1530	130	130
E120d-1	-	360	60	57	360	50	50
GT110d-S	-	250	46	47	250	30	30
R120d-1E	-	920	51	50	920	50	50

[Apply] [Cancel]

<Note for power value> Power value with red font character : Communication with a component is error.  
In this status, electric power distribution is executed on the basis that the component is using the maximum power consumption.

[? Details of automatic power distribution](#)

**Figure 32 Changing automatic power distribution setting**

When the group automatic power distribution function is enabled, the power supply to “Balance type” will be automatically controlled so as not to exceed the specified power value. In “Priority type”, when the total average power value exceeds the allocated power value, power control will be automatically enabled in ascending order.

Name	Auto.	Alloc.	Cur.	Ave.	Max.	Reserve	Min.	Pri.
PowerGroup1	Priority	180	172	167	1530	130	130	
GT110d-S	-	-	49	47	250	30	30	1
E120d-1	-	-	70	67	360	50	50	2
R120d-1E	-	50	53	53	920	50	50	3

Edit

<Note for power value> Power value with red font character : Communication with a component is error.  
In this status, electric power distribution is executed on the basis that the component is using the maximum power consumption.

[? Details of automatic power distribution](#)

**Figure 33 Automatic power distribution setting display screen  
("Priority type" is enabled)**

In the "Alloc." field of a server which power capping is enabled, the value set for power allocation for the server is displayed.

Additionally, because the value is set with the value of idle power of the server in minimum group constitution, power may not be reduced down to the value displayed in the setting screen, depending on the server configuration.

## Appendix 1 Power Monitoring Function Display Items Table

The meanings of the items that are displayed in the power monitoring function are as follows.

**Table 3 Display Items Table**

Item Name	Meaning
Maximum configuration* <sup>1</sup>	Displays the maximum configuration that is available at the time of purchase.
During Operation	Displays the power when the system is under a heavy load.
Idle	Displays the standby power only when the power is on.
Minimum configuration* <sup>1</sup>	Displays the minimum configuration that is available at the time of purchase.
During Operation	Displays the power when the system is under a heavy load.
Idle	Displays the standby power only when the power is on.
Power	Displays the power consumption of the managed server.
Current	The current power consumption.
Maximum	The maximum power consumption per unit of time.
Minimum	The minimum power consumption per unit of time.
Average	The average power consumption per unit of time.
CPU throttling* <sup>2</sup>	Displays the CPU throttling rate of the managed servers.
Current	The current CPU throttling rate.
Maximum	The maximum CPU throttling rate per unit of time.
Minimum	The minimum CPU throttling rate per unit of time.
Average	The average CPU throttling rate per unit of time.
Memory throttling* <sup>2,3</sup>	Displays the memory throttling of the managed server.
Current	The current memory throttling rate.
Maximum	The maximum memory throttling rate per unit of time.
Minimum	The minimum memory throttling rate per unit of time.
Average	The average memory throttling rate per unit of time.
Reset	Resets each statistical value.

\*1: The figures indicated are reference values and may change depending on the configuration of the device.

\*2: A technique that lowers the clock frequency or duty cycle and suppresses power consumption.

\*3: May not be supported by some devices. If not supported, it is not displayed.

## Appendix 2 Power Consumption Control Setting Items Table

A table of items that can be set in the [Electric Power Management] - [ECO Setting] - [Power Capping] in the [Remote Control] tab in the NEC ESM PRO Manager is as follows.

**Table 4 Setting Items Table**

Item Name	Meaning	Default Value
<b>Aggressive Mode</b>		
Aggressive Mode * <sup>1</sup>	Enables/disables the Aggressive Mode.	Disable
Power Threshold (Pa)	Sets the threshold. Configurable values are (XXX - the maximum configuration operating power). * <sup>2</sup> * <sup>3</sup>	Maximum configuration operating power
Correction time limit	Sets the control time up to the report and shutdown execution when power consumption exceeds the threshold. * <sup>2</sup> * <sup>4</sup>	2 or 6 (seconds)
Shutdown System	Enables/disables the function that carries out shutdown when power consumption has exceeded the time specified in the Correction Time Limit. * <sup>2</sup>	Disable
<b>Non-Aggressive Mode</b>		
Non-Aggressive Mode * <sup>1</sup>	Enables/disables the Non-Aggressive Mode.	Disable
Power Threshold (Pn)	Sets the threshold. Configurable values are (minimum configuration standby power - YYY) * <sup>5</sup> * <sup>6</sup>	The larger when the Power Threshold (Pa) – 10(W) and the minimum configuration standby power + 10(W) are compared
Correction time limit	Sets the control time until the report is executed when power consumption exceeds the threshold. * <sup>5</sup> * <sup>7</sup>	10 (seconds)
<b>Safe Power Capping</b>		
Safe Power Capping(Power Reading Timeout)	Enables/disables the power control when power cannot be read from the power source.	Disable
<b>Boot Time Configuration</b>		
Boot Time Configuration	Enables/Disables the power control when booting the OS.	no change
Performance Mode	Select whether to prioritize performance and operations or to optimize power consumption when booting the OS. * <sup>8</sup>	no change
Disable CPU Cores	Enter the number of cores to be disabled per socket when booting the OS. The setting remains effective after booting the OS as well. * <sup>8</sup>	no change

\*1: A function that provides operational continuity while controlling the total power consumption of the main unit in order to

suppress the set power consumption. If you wish to effectively use limited power, this becomes a useful feature when continuing to operate the system without causing excessive power.

\*2: This can only be set when the Aggressive Mode is enabled.

\*3: XXX is the value that is set in the [Minimum Configuration]: [Idle] power or the [Power Threshold (Pn)].

\*4: A report and shutdown is carried out when the watt value that is set in the Power Threshold (Pa) is exceeded for more than the number of seconds that has been set here.

\*5: This can only be set when the Non-Aggressive Mode is enabled.

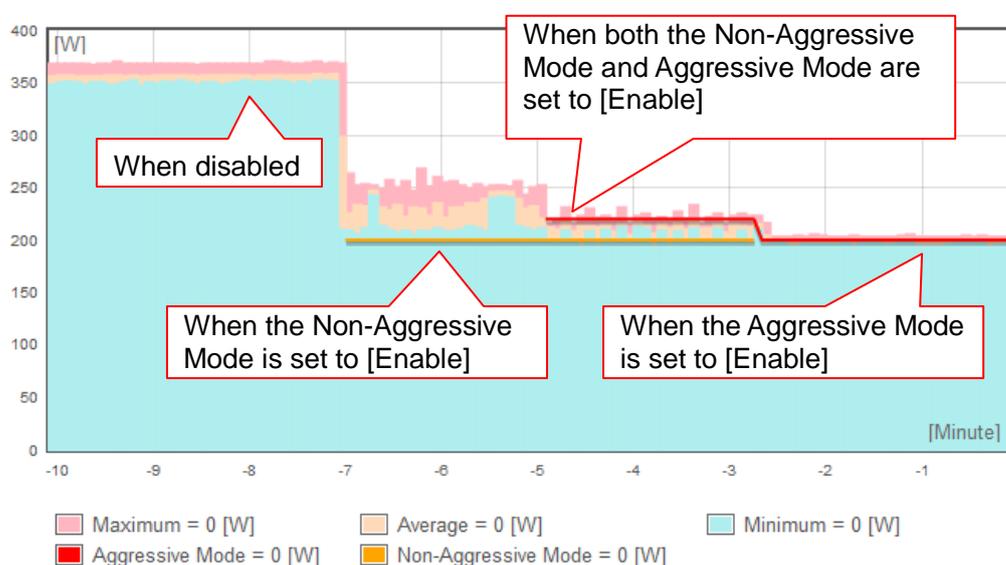
\*6: YYY is the maximum configuration operating power or the Power Threshold (Pa).

\*7: A report is made when the watt value set in the [Power Threshold (Pn)] is exceeded for more than the number of seconds that has been set here.

\*8: This can only be set when the Boot Time Configuration is enabled.

## Appendix 3 Comparing the Non-Aggressive Mode with the Aggressive Mode

The difference in the power consumption between the Non-Aggressive Mode and Aggressive Mode was compared by putting pressure<sup>1</sup> on the CPU and memory on a device<sup>2</sup> that supports the power control function and by setting the Non-Aggressive Mode and Aggressive Mode to [Enable/Disable]. The power graph displayed when changing the setting of each mode is as follows.



**Figure 34 Comparative Example of Power Control Settings**

First, it was found out that approx. 360 [W] of power was consumed at maximum (-7 ~ -10 minutes) by putting pressure on the CPU and memory when both the Aggressive Mode and Non-Aggressive Mode were set to [Disable]. Then, the power consumption was greatly reduced to 250 [W] at maximum (-5 ~ -7 minutes) after specifying 200 [W] for the Power Threshold (Pn). However, it was not reduced to 200 [W] (the specified value), as the Non-Aggressive Mode controls the power by changing the CPU frequency only.

<sup>1</sup> Floating-point operations were performed and memory space was reserved, accessed, released, etc. repeatedly.

<sup>2</sup> NEC Express5800/R120d-2M (CPU: Intel® Xeon® E5-2650 2, Memory: DDR3-1333 32GB 24, HDD 3)

Next, it was reduced to approx. 220 [W] (the specified value) (-3 ~ -5 minutes) after specifying 220 [W] for the Power Threshold (Pa) with leaving the set value for the Non-Aggressive Mode. This is because the Aggressive Mode controls the power more strongly by changing the frequency of the CPU, in addition to performing the CPU throttling and memory throttling (except for some models).

In the end, the amount of power consumption was reduced to approx. 200 [W] (0 ~ -3 minutes) after setting the Non-Aggressive Mode to [Disable] and specifying 200 [W] for the Power Threshold (Pa).

The above shows that the Aggressive Mode strongly reduces the power consumption than the Non-Aggressive Mode.



Check

- This result is an example and the result may differ depending on the configuration of the device.

## Revision History

1.0	09/06/2011	Initial edition
1.5	09/09/2011	Configuration update
2.0	03/14/2012	Configuration update
3.0	09/20/2012	Automatic Power Distribution Function is added
3.1	10/30/2014	Automatic Power Distribution Function is updated
3.2	07/21/2015	The way of measuring power consumption is updated.